Interim Action Work Plan

Anacortes Port Log Yard
Anacortes, Washington
Facility Site No. 21898438
Cleanup Site No. 3604
Ecology Agreed Order No. DE 10630

for
Washington State Department of Ecology
on Behalf of Port of Anacortes

October 5, 2026

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Acronyms and Abbreviations

Agreed Order	Agreed Order No. DE 10630
ARAR	Applicable or Relevant and Appropriate Requirements
BAZ	Biologically Active Zone
BCY	bank cubic yards
BMPs	Best Management Practices
CAO	cleanup action objective
City	City of Anacortes
CLARC	Cleanup Levels and Risk Calculation
COC	Contaminant of Concern
cPAH	carcinogenic polycyclic aromatic hydrocarbon
CSL	Cleanup Screening Level
CSM	Conceptual Site Model
CFR	Code of Federal Regulations
CMP	Compliance Monitoring Plan
CY	cubic yard
DCAP	Draft Cleanup Action Plan
DAHP	Department of Archaeology and Historic Preservation
DMMP	Dredged Material Management Program
DMMU	Dredged Material Management Unit
DNR	Washington State Department of Natural Resources
DOF	Dalton, Olmsted & Fuglevand, Inc.
Ecology	Washington State Department of Ecology
EIM	Environmental Information Management
EPA	United States Environmental Protection Agency
FS	Feasibility Study
GNSS	Global Navigation Satellite System
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPA	Hydraulic Project Approval
HPAH	high molecular weight polycyclic aromatic hydrocarbon
H:V	horizontal to vertical

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IAWP	Interim Action Work Plan
IDP	Inadvertent Discovery Plan
IDW	Inverse Distance Weighting
ISIS	Washington State Department of Ecology Integrated Site Information System
JARPA	Joint Aquatic Resources Permit Application
LPAH	low molecular weight polycyclic aromatic hydrocarbon
MBE	multibeam echosounder
MHHW	mean higher high water
MLLW	mean lower low water
MNA	monitored natural attenuation
MS	Manufacturing/Shipping Compilation
MTCA	Model Toxic Control Act
NFA	No Further Action
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCUL	Proposed Cleanup Level
Pier 2	Pier 2 Marine Terminal
PMA	Port Management Agreement
PND	PND Engineers, Inc.
PRDI	Pre-Remedial Design Investigation
PSL	Preliminary Screening Level
QA	quality assurance
QC	quality control
RCW	Revised Code of Washington
RI	Remedial Investigation
ROW	right-of-way
RTK	real-time kinematic
SBE	single-beam echosounder
SCO	Sediment Cleanup Objective
SCUM	Sediment Cleanup User's Manual
SEPA	State Environmental Policy Act

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Site	Anacortes Port Log Yard site
SMA	Sediment Management Area
SMS	Sediment Management Standard
SOC	Substance of Concern
SPCC	Spill Prevention, Control and Counter Measures
SUA	Site Use Authorization
SVOC	semi-volatile organic compound
SWAC	Surface Weighted Average Concentration
TBT	tributyltin ion
TEQ	toxic equivalency quotient
TLS	Terrestrial Laser Scanner
USACE	United States Army Corps of Engineers
UST	underground storage tank
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife
WISHA	Washington Industrial Safety and Health Act
WQC	Water Quality Certification
WWTO	Wastewater Treatment Outfall
WWTP	Wastewater Treatment Plant

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1.0 Introduction

This Interim Action Work Plan (IAWP) has been prepared to describe the approach and procedures to be used to complete a Model Toxics Control Act (MTCA) interim cleanup action (Interim Action) at the Anacortes Port Log Yard site (the Site) located in Anacortes, Washington. Pursuant to Agreed Order No. DE 10630 (Agreed Order) issued by the Washington State Department of Ecology (Ecology) and in accordance with MTCA cleanup regulations (Chapter 173-204 and 173-340 Washington Administrative Code [WAC]). The Interim Action will expedite part of the environmental cleanup at the Site addressing previously identified sediment contamination within the current and planned future operational area encompassing Pier 61 and commercial boat ramp facility (Wyman's Ramp) as well as the area containing elevated levels of wood waste resulting from historical log haul out operations (i.e., Former Log Haul Out). Pier 61 is used for moorage of commercial drop-framed barges that facilitates daily transit of goods and services to and from the San Juan Islands 7 days a week. At present, additional moorage space and deeper navigational depths are required to support the commercial demand for Pier 61. Due to the presence of sediment contamination within the existing location of Pier 61 and constructability access demand and impacts, the Port proposes an Interim Action to demolish Pier 61 and remediate the identified sediment contamination within the Pier 61 and Wyman's Ramp operational and Former Log Haul Out areas of the Site to clear environmental encumbrances to facilitate the replacement and redevelopment of Pier 61 to meet commercial demands.

As required by the Agreed Order, this IAWP has been prepared to describe the following:

- Background information describing the historical property use, environmental and ecological setting, and current conditions;
- Summary of existing environmental data with respect to screening levels to complete a preliminary delineation of the nature and extent of contamination;
- Summary of the interim action objectives, cleanup requirements, remedial alternatives considered for this interim remedial action and how it will be integrated with the final cleanup action;
- Identification of the components of the Interim Action;
- Identification of permitting and substantive requirements for the Interim Action;
- Schedule for the Interim Action to be implemented; and
- Identification of reporting requirements after the Interim Action is completed.

Ecology has completed a preliminary review of the remedial investigation (RI) completed to date in accordance with the Remedial Investigation/Feasibility Study (RI/FS) Work Plan (GeoEngineers 2015a) and subsequent RI/FS Work Plan Addenda (GeoEngineers 2021 and GeoEngineers 2022a); proposed cleanup levels (PCULs) developed based on potential ecological receptors and exposure routes under current and future land use assumptions; Site contaminants of concern (COCs) based on a screening of the RI data relative to the PCULs; nature and extent of Site COCs within the compliance interval and underlying sediments; and the Port's proposal for an Interim Action cleanup to expedite partial cleanup of the Site and facilitate the redevelopment of Pier 61. Based on this review, Ecology has determined that the proposed Interim Action meets the requirements under WAC 173-340-430 and may proceed under the current Agreed Order without amendment. A detailed description of the RI activities completed to date, PCUL development, evaluation completed to identify Site COCs and their nature and extent is presented in Appendix A.

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The Site is shown relative to the surrounding area in Figure 1. The current Site layout, features, facilities, sediment investigations completed to date area are shown in Figures 2 through 4. Site stratigraphy based on the investigations completed to date is shown in Figures 5 through 9. A summary of PCUL exceedances for the protection of benthic organisms and human health and higher trophic level ecological receptors are shown in Figures 10 and 11. The proposed Interim Action and restoration of the Site are shown in Figures 12 and 13. Information including Site location and description, historical Site use, environmental conditions and a description of the proposed Interim Action are discussed below.

2.0 Background Information

2.1 REGULATORY FRAMEWORK

Following the closure of log handling operations in 2004, the Port began working with Ecology to characterize sediment conditions at the Site due to evidence of degraded habitat resulting from wood debris. Initial investigations completed identified up to 75 percent wood waste by volume in shallow intertidal sediment. In addition to wood waste, the initial investigations also identified levels of organic carbon and volatile solids above recommended levels (Ecology 2013) and exceedances per Ecology's Sediment Cleanup Objective (SCO) and Cleanup Screening Level (CSL) criteria for benthic invertebrate community health (Chapter 173-204 WAC).

Based on the results of the initial and follow-up investigations, the Port entered into Agreed Order No. DE 10630 with Ecology on November 3, 2014, pursuant to MTCA. Under the Agreed Order, the Port is required to evaluate the nature and extent of contamination within affected media and develop and evaluate cleanup alternatives for addressing the identified contamination including preparation a RI/FS Report and Draft Cleanup Action Plan (DCAP). Provisions under the Agreed Order allow for completion of an Interim Action to facilitate cleanup activities in advance of the RI/FS and DCAP to address contamination that is an immediate threat to human health and the environment or substantially reduce one or more pathways for exposure.

The Site is listed in Ecology's Integrated Site Information System (ISIS) under Facility Site Identification No. 21898438 and Cleanup Site Identification No. 3604 and is part of the Ecology's Puget Sound Initiative and regional cleanup efforts on Fidalgo Island.

2.2 SITE LOCATION AND DESCRIPTION

The Site comprises the intertidal and subtidal marine areas within an embayment along the southern shoreline of Guemes Channel at the northern terminus of T Avenue in the nearshore area northwest of 718 4th Street (Figure 2). Tax parcels containing the Site are shown in Figure 3. Additionally, the Site extends north of these parcels into aquatic lands managed by the Washington State Department of Natural Resources (DNR) and is contained within portions of the City of Anacortes (City) U Avenue right-of-way (ROW). The area situated between inner-harbor and outer-harbor lines is managed by the Port under a Port Management Agreement (PMA) with DNR.

The Site is bounded to the west by the Port's Pier 2 Marine Terminal (Pier 2), which is an earth fill structure and pile-supported wharf along the northernmost portion of the facility. The slope of the earth fill is armored with large rock (riprap). Several mooring piles are located along the eastern toe of the armored slope and

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along the eastern flank of the Former Log Haul Out. The shoreline south and east of the Site includes a mixture of riprap, remnant structures, natural rock outcroppings, and sand and gravel beaches containing cobbles, large rock and concrete/asphalt debris. A wooden dock (Pier 61) used for commercial transient vessels extending into the Site marine area from the southern shoreline. Additionally, a commercial boat launch ramp (Wyman's Ramp), pocket beach (Robinson Cove constructed as a compulsory mitigation site as part of the Ports Pier 1 Redevelopment Project), and former full-service restaurant (Secret Cove) are situated along the shoreline south of the Site.

Public access to the Port's Pier 2 Terminal facility, including the beach area south of the Site between Pier 2 and Pier 61 (former log handling area) are restricted by fencing and signage to maintain security for the Port's marine terminal. No access restrictions are present for other portions of the shoreline south of the Site.

2.3 SITE HISTORY

Lumber and wood milling operations began in Anacortes during the late 1880s with the Bowman and Company Mill located at the intersection of 3rd Street and T Avenue. By the early 1900s, the Anacortes Sawmill, Storme and Ronnenberg Mill, and Great Northern Mill were operating in this area. In 1905, the Great Northern Mill along with 40 acres of land extending south to Cap Sante basin was purchased by the Anacortes Lumber and Box Company. The company incorporated in 1907 as the A.L.B. and continued operations until 1941 when the property was sold to the Everett Company following a series of fires that damaged a significant portion of the mill. In 1942, the property was purchased by Anacortes Shipways for the construction of wooden freight and passenger boats for the Army Transport Service. By 1954 the land transferred from Anacortes Shipways to Carl Edlund, Jack Mullen, H. MacDonald, and Will Lowman. In 1965, the Port purchased the Site and adjacent uplands (the "Property"). Between 1965 and 2004, the Port leased the Property to multiple tenants for log handling and loading operations. Log handling operations ceased after 2004, and the Site has remained largely unchanged since this time. The adjacent upland area is currently used for storing oil spill response booms, and Pier 61 is used for moorage of commercial vessels. Wyman's Ramp is used for loading and unloading commercial goods.

The development history for the Port's Pier 2 Terminal facility, Pier 61, Wyman's Ramp and surrounding area is further discussed below. Aerial photographs presented in Appendix B show Site features and area development from 1916 through 2016.

2.3.1 Pier 2 Terminal Development

Following purchase by the Port in 1965, the earthen fill structure and pile supported deep water berth of the Pier 2 Terminal facility was constructed. Subsequently, portions of the Pier 2 Terminal facility were leased or operated by a number of different businesses and by the Port itself for log handling operations. Logs were delivered to the Pier 2 Terminal facility either by truck or by log rafts. Rafted logs were delivered to the Site, pulled ashore, sorted and stacked for temporary storage pending shipment either by loading onto vessels or re-rafting for transport. In some instances, logs that had been delivered by trucks were rafted at the Site for shipment. According to Port records, portions of the facility were leased or operated by the following:

- Washington Loggers Association (1966 to 1967);
- C. Itoh & Co. (1967 to 1975);

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- Forest Sales, Inc. (1978 to 1986);
- Frontier Industries, Inc. (1986 to 1997); and
- Itochu (1998 to 2004).

These lessees or operators sometimes owned the logs and sometimes handled the logs owned by others. The Port never owned any of the logs. After 2004, log handling operations ceased. Since this time, the former log handling area has remained largely unchanged. The beach area south of the former log handling area is currently used for storage of oil spill response booms. The northern part of the Pier 2 Terminal facility is a deep-water moorage terminal used for berthing and product loading and offloading, including petroleum coke and prilled sulfur. Other portions of the Pier 2 Terminal facility are leased to various tenants for equipment laydown and storage.

2.3.2 Pier 61 Development

Pier 61 extends into the marine area east of the former log handling area. Limited information is available regarding the development history of Pier 61; however, based on historical photographs (Appendix B) and the timeline for the Port's acquisition of the surrounding Property, it is estimated that the pier was constructed in 1965 or shortly thereafter. The southern half of Pier 61 is supported on 20 driven creosote treated timber piles extending over the water surface. The northern half of Pier 61 is comprised of a marine float that is anchored in place with seven driven creosote treated timber piles. A gangway connects both the northern and southern portions of Pier 61. Based on observed sediment and bedrock conditions as shown in Figures 6 through 8 and further discussed in Section 3.3.1, these piles may only be embedded 10 to 15 feet below the existing mudline surface.

A 2017 assessment of the pier structure by PND Engineers, Inc. (PND; Appendix C) concluded that the current condition of the timber piles supporting the pier structure is generally poor with significant section loss visible from deterioration and marine borer damage. In 2025, the Port completed emergency actions to repair storm damaged parts of the pier structure to prevent its collapse in advance of the planned redevelopment discussed above. Currently, Pier 61 is used for moorage of commercial drop-framed barges that facilitate daily transit of goods and services to and from the San Juan Islands 7 days a week.

2.3.3 Wyman's Ramp, Wyman's Marina and Wholesale Supply Development and Project Pier 1 Habitat Mitigation Site

Prior to the late 1940s, the Property and surrounding area were used for lumber milling and ship building operations. With the decline in the demand for lumber and the high cost to rebuild many of the mill facilities following fires, the Wyman's Marina and Wholesale Supply property was sold to Raymond and Kathleen Robinson (Kohler 2003) who operated an 80-berth marina with a fueling, dry dock, and maintenance and storage facilities (Robinson's Marina). The area in front of the marina was reportedly dredged in the 1950s to create deep water mooring for up to 160 boats and the upland portion of the property south of the main building was graded to provide on-site parking. On December 15, 1964, Robinson's Marina and many of the moored boats were damaged by a storm event resulting in the discontinuation of the moorage and marina operations. Robinson's Marina continued with boat maintenance and engine repair services until 1965 when the property was sold to the Port. The Port leased the property to Don and Rayetta Wyman to continue the boat repair and fueling services as "Wyman's Marina and Wholesale Supply."

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Wyman's Marina and Wholesale Supply operated until 1998. At that time, marina and boat maintenance operations ceased and underground storage tanks (USTs) associated with the marine fueling operations were decommissioned and removed (GeoEngineers 2015b). In 2011, the Port replaced the boat ramp (Wyman's Ramp) located west of the former Wyman's building.

As part of the compensatory mitigation package for the Pier 1 Redevelopment Project (United States Army Corps of Engineers [USACE] reference 200501451), the construction of a habitat mitigation area was required by the permitting agencies. To fulfill these mitigation requirements, Wyman's Marina and Wholesale Supply property was selected as the location for replacing the aquatic habitat affected by the Pier 1 Redevelopment Project. Construction for the habitat mitigation project was completed from October 2013 through January 2014 and included the excavation of approximately 13,520 cubic yards of soil to provide intertidal habitat for juvenile salmonids. In total, the mitigation project resulted in the removal of approximately 7,600 square feet (approximately 0.17 acre) of overwater structures, creation of approximately 17,800 square feet (approximately 0.41 acre) of intertidal habitat, and approximately 8,500 square feet (approximately 0.2 acre) of riparian/salt marsh habitat.

In the process of completing the construction of the habitat mitigation site, remedial excavation activities included the removal of six shallow isolated areas containing gasoline-, diesel- and heavy oil-range petroleum hydrocarbon, metal (arsenic, cadmium, copper, lead and mercury), and/or pesticide (4,4 DDD) contamination as part of an independent cleanup action. Following completion of the remedial activities, the Wyman's Marina and Wholesale Supply Site was entered into Ecology's list of confirmed and suspected contaminated sites with Facility Site ID No. 2821735 and Cleanup Site ID No. 2097. Based on the completeness of the cleanup action, the Wyman's Marina and Wholesale Supply Site received a No Further Action (NFA) determination through the Voluntary Cleanup Program (VCP) in 2015.

A detailed description of the independent cleanup actions completed, and construction details of the mitigation site are presented in the Independent Remedial Action Report for the Wyman's Marina and Wholesale Supply Site (GeoEngineers 2015b).

2.3.4 City of Anacortes Wastewater Treatment Outfall Dredging Project

In 2024, the City constructed a new outfall extending approximately 1,100 feet north of the U Avenue ROW terminus to service the existing Wastewater Treatment Plant (WWTP). The design included installation of an outfall pipe through the eastern portion of the Site. The nearshore segment included the dredging of previously identified contaminated sediment and underlying clean native material to allow for the installation of the new outfall pipe with at least 1-foot of suitable import material cover to restore the existing grade. The offshore segment of the outfall pipe and diffuser was placed on top of the existing sediment surface using controlled submergence techniques with the assistance of certified divers.

Sediment sampling was performed by Dalton, Olmsted & Fuglevand, Inc. (DOF) in November 2020 to characterize the sediment conditions within the alignment of the outfall pipeline to be dredged. These characterization activities identified bulk tributyltin ion (TBT), total carcinogenic polycyclic aromatic hydrocarbons (cPAHs), polychlorinated biphenyl (PCB) Aroclors and total dioxin and furans at concentrations exceeding screening levels under the Sediment Management Standard (SMS). As a result, all dredged material generated during the City's outfall installation project was transported from the Site to an upland landfill for permitted disposal.

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The City's Wastewater Treatment Outfall (WWTO) Dredging Project area and sampling locations to characterize the dredged material are shown in Figure 4.

2.4 CURRENT AND FUTURE SITE USE

The land west and south of the Guemes Channel embayment containing the Site is zoned for industrial use (Manufacturing/Shipping [MS]) and is characterized by marine shipping, warehousing, bulk material storage, transportation, and other industrial uses. The west adjacent upland area is currently being used as storage for oil spill response equipment and to support the Port's marine terminal operations. West of the Port's Pier 2 facility is Pier 61, which is used for moorage of commercial vessels. Centrally located along the shoreline south of the Site is Wyman's Ramp which is utilized for the commercial transport of goods to Guemes Island and Robinson Cove (Pier 1 Redevelopment Project habitat mitigation site). Further east are residential properties.

The eastern portion of the Pier 2 vessel berth and associated mooring dolphins are located offshore of the Guemes Channel embayment. As described in Section 2.2, the Pier 2 Terminal is primarily used for bulk product exports, and a portion is used by a marine float manufacturer. Public access to the Port's Pier 2 Terminal facility (including the beach area south of the former log handling area) is restricted with fencing and signage. Access to other portions of the Port owned properties is generally unrestricted. Based on the structural condition of Pier 61 and commercial demands of this facility, the Port plans to demolish and replace the existing pier structure to allow for additional moorage as well as increase the navigational depth in the operational area of Pier 61 and Wyman's Ramp to reduce the risk of potential of vessel grounding during low tide.

3.0 Site Characterization

A summary of existing sediment conditions at the Site including previous environmental investigations and environmental conditions are presented below. A detailed summary of the previous environmental investigation activities and analytical results are presented in Appendix A.

3.1 PREVIOUS ENVIRONMENTAL INVESTIGATIONS

Multiple environmental investigations have been completed by the Port and others to evaluate sediment conditions at the Site and/or surrounding area, including:

- Limited Environmental Due Diligence Investigation (Floyd|Snider 2004)
- Fidalgo Bay Sediment Investigation (SAIC 2008)
- Chemical and Biological Toxicity Investigation (GeoEngineers 2008)
- Supplemental Sediment Investigation (GeoEngineers 2010)
- Benthic Abundance Investigation (GeoEngineers 2011)
- Pier 2 Dredged Material Characterization (GeoEngineers 2013)
- Nearshore Sediment Characterization (DOF 2021)

As required by the Agreed Order, investigation activities were completed by the Port to collect sufficient environmental data to define the nature and extent of Site contaminants (RI) and to develop and evaluate

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cleanup action alternatives for addressing the identified Site contamination resulting from historical land use (FS). To date, the Port has completed the following investigation activities as required to evaluate Site conditions and fill data gaps identified by Ecology to complete the characterization of the Site:

- Initial 2015 RI to characterize Site conditions in accordance with the RI/FS Work Plan.
- Additional investigation activities in 2021 under RI/FS Work Plan Addendum No. 1 (GeoEngineers 2021) to further evaluate the nature and extent of Site contaminants in portions of the Site that were not previously identified following sediment investigation activities by the City in 2020 as part of the Nearshore Sediment Characterization (DOF 2021) to support the City's WWTO Project.
- Additional investigation activities in 2023 under RI/FS Work Plan Addendum No. 2 (GeoEngineers 2022a) to define the northern boundary of the Site as required by Ecology based on their review of the sediment data collected under RI/FS Work Plan Addendum No. 1 and the City's WWTO Project[1].

Based on review of these sediment data and preliminary cleanup action alternatives developed (GeoEngineers 2023a), Ecology determined that bioassay analysis was required to evaluate potential impacts to the benthic community where monitored natural attenuation (MNA) was initially proposed in the eastern portion of the Site. Following this determination by Ecology, the City collected additional sediment samples as part of their outfall relocation project in 2024 (Geosyntec 2025). The new data collected by the City was co-located with previous sample locations where MNA was proposed and showed that benthic exceedances had attenuated since the initial investigation and were no longer present in this area. Ecology subsequently determined that the post construction sediment data collected by the City is suitable for use to characterize the current Site conditions and that bioassay sampling and analysis were no longer required to evaluate potential impacts to the benthic community.

Sediment investigations completed at the Site and surrounding area are shown in Figure 4. Sediment data collected by the Port as part of the Agreed Order as well as prior investigations are presented in Appendix A. Findings from these investigations identified surface sediment containing up to 75 percent wood debris by volume within a matrix of silt and fine sand. Chemical analyses and biological testing identified exceedances of PCULs for the protection of benthic organisms and human health and higher trophic level ecological receptors. Specific details of these investigations and their findings are summarized in the following sections.

3.2 SEDIMENT CONDITIONS

3.2.1 Conceptual Site Model

A preliminary conceptual site model (CSM) was developed for the Site as part of the RI/FS Work Plan. The preliminary CSM identifies potential contaminant sources, release mechanisms, transport processes, and exposure routes by which receptors may be affected by Site contaminants based on Site conditions. The

[1] Remedial actions were completed in conjunction with the City of Anacortes Wastewater Treatment Outfall Dredging Project to remove previously identified contaminated sediment for permitted upland landfill disposal. A summary of cleanup actions completed as part of the City's Wastewater Treatment Outfall Dredging Project is presented in the Pre/Post-Construction Perimeter Sampling Report (Geosyntec 2025) and resulted in the full removal of previously identified sediment contamination within the sediment compliance interval established for the Site (see Appendix A).

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CSM for the Site presented in Appendix A has been revised from the version included in the RI/FS Work Plan to incorporate the results of the Agreed Order investigation and environmental investigations completed by others. The revised CSM serves as the basis for the development of the preliminary cleanup levels and point of compliance for which the cleanup levels must be met.

3.2.2 Sediment Stratigraphy

The sediment stratigraphy is based on the information provided by sediment cores collected as part of the Agreed Order RI and Nearshore Sediment Characterization study completed by the City. The sediment stratigraphy generally consists of recent sediment deposits overlying native glacially consolidated sediment deposits. Accumulations of wood and wood waste from historical log handling operations are visible in the intertidal area between Pier 2 and Pier 61 during low tides. An underwater video survey conducted as part of the RI identified accumulations of wood debris in the lower intertidal and shallow subtidal zones.

Sediment stratigraphy within the proposed Interim Action Area cross-section is shown in Figures 5 through 9. A description of the recent deposits and underlying native glacially consolidated sediment deposits is presented below.

3.2.2.1 RECENT (NON-NATIVE) DEPOSITS

The recent deposits are comprised of silts, sand, and wood debris to a maximum depth of 6½ feet below the mudline surface. In the upper intertidal zone, the recent deposits consist of fine to coarse gravel with varying sand and silt content. In the lower intertidal/shallow subtidal zone, the recent deposits consist of silts and fine-grained sands. In the northern portion of the Site near Guemes Channel, the recent deposits consist of sandy silts and gravelly sands. Within the nearshore area between Pier 2 and Pier 61, accumulations of wood and wood waste, comprising up to 75 percent of the sediment volume, are present as the result of historical log handling operations. The wood debris generally consists of varying amounts of chips, fibers, bark, and various wood chunks.

3.2.2.2 NATIVE (GLACIALLY DEPOSITED) SEDIMENT AND BEDROCK

Native sediment underlying the recent deposits generally consists of very stiff/medium dense to hard/very dense silt and silty sand. Native sediment is classified as recessional marine (glaciomarine) drift from the Everson interstade of the Fraser glaciation.

Bedrock outcroppings from the Lummi Formation are present along the shoreline to the south and east of the Site. Based on the close proximity of the outcrop, bedrock likely extends into the area underlying the recently deposited sediment and/or native sediment deposits (see Figures 6 through 8).

3.2.3 Contaminants of Concern

Preliminary screening levels (PSLs) developed during preparation of the RI/FS Work Plan were revised to meet current standards published in Ecology's Sediment Cleanup Users' Manual (SCUM; Ecology 2025) and Ecology's February 2025 Cleanup Levels and Risk Calculation (CLARC) data tables. Screening levels for the protection of the benthic community (Benthic PCULs) are the numeric SCOs from the SMS (WAC 173-204-562) that correspond to sediment quality that will result in no adverse effects to the benthic community. Screening levels for the protection of human health and higher trophic ecological receptors (Human Health PCULs) are for human health exposure to sediment via ingestion (primarily though consumption of fish/shellfish) and dermal contact utilizing equations and parameter values from Ecology's

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SCUM guidance and CLARC data tables assuming beach play, clam digging and net fishing exposure pathways.

Sediment data from the Site were compared to the Benthic and Human Health PCULs to identify Site COCs. For this evaluation, a contaminant was retained as a COC if the detected concentration of the contaminant exceeded the PCUL. In addition, the surface area weighted average concentration (SWAC) for human health bioaccumulative compounds was also evaluated. For this evaluation, a human health bioaccumulative COC was retained if the exceedance ratio (contaminant concentration divided by the Human Health PCUL) for the SWAC was greater than 1.

The following COCs are identified within the sediment compliance interval based on exceedance of the Benthic and Human Health PCULs:

- **Benthic COCs** – Zinc, low molecular weight polycyclic aromatic hydrocarbons (LPAHs) including acenaphthene, fluorene and phenanthrene, high molecular weight polycyclic aromatic hydrocarbons (HPAHs) including total benzofluoranthenes, chrysene, fluoranthene, pyrene and sum of HPAHs, bis(2-ethylhexyl) phthalate, and 4-methyphenol are identified as benthic COCs because one or more of these contaminants were detected at a concentration exceeding the Benthic PCUL.
- **Human Health COCs** – Copper, total cPAHs calculated using the toxicity equivalency quotient (TEQ) methodology relative to benzo(a)pyrene, PCBs, total dioxin-like PCB TEQ, and total dioxin and furan TEQ.

Additionally, wood debris which may cause or contribute to sediment impacts is managed by Ecology as a deleterious substance under SMS. Based on bioassay test data, visual wood debris greater than approximately 10 percent by volume is identified as a substance of concern (SOC) requiring cleanup evaluation.

Summary statistics for Benthic and Human Health COCs used to identify Site COCs and a description of the evaluation process are presented in Appendix A.

3.2.4 Nature and Extent of Contamination

The spatial distribution of wood debris and contaminants screened for the protection of benthic organisms and for the protection of human health for the sediment compliance interval are presented in Figures 10 and 11 utilizing inverse distance weighting (IDW) on a point-by-point basis in accordance with SCUM. In coordination with Ecology, previously collected sediment data that are co-located with the recent sediment data collected by the City as part of the WWTO Project are not used as part of the RI data set to define contaminant nature and extent. Figures 5 through 9 show the estimated contact between the contaminated recent sediment deposits and underlying native layer based on observed sediment conditions and a summary of the chemical results screened against the Benthic and Human Health PCULs.

A detailed evaluation of Site COCs and their nature and extent are presented in Appendix A.

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4.0 Pre-Remedial Design Investigation and Dredged Material Characterization

4.1 OVERVIEW

A Pre-Remedial Design Investigation (PRDI) will be completed in advance of the Interim Action to support the engineering analysis and permitting requirements, verify the base of the recent contaminated deposits and characterize the underlying clean native materials for open-water suitability determination in accordance with the Dredged Material Management Program (DMMP). Specifically, the Pre-Remedial Design Investigation and Dredged Material Characterization will include the following:

- **Bathymetric and Topographic Survey** – Bathymetric and topographic surveys are required to establish pre-construction conditions for design and volumetric calculations and to provide comparative data for the evaluation of pre-/post-dredge conditions. The bathymetric and topographic surveys will encompass the entirety of the Site with an approximate 50- to 100-foot buffer surrounding the Site to ensure preconstruction conditions are sufficiently documented and create an up-to-date bathymetric surface. The bathymetric survey will use a multibeam echosounder (MBE). The MBE will be supplemented where necessary with a single-beam echosounder (SBE) and a Terrestrial Laser Scanner (TLS) with real-time kinematic (RTK) positioning derived from satellite-based positioning systems (global navigation satellite systems [GNSS]).
- **Nearshore and Subtidal Aquatic Habitat Assessment** – The habitat assessment will be completed to document the extent and location of existing habitat features along the nearshore, intertidal and subtidal zones of the Site and will be required to assess the impact of the proposed Interim Action on existing habitats. Based on a previous habitat survey completed at the Site in 2015 (GeoEngineers 2015c), substrates within the upper drift lines contained suitable size and configuration for forage fish spawning. Additionally, there is known eelgrass habitat within the subtidal portion of the project area. Therefore, a formal forage fish spawning survey following Washington Department of Fish and Wildlife (WDFW) protocols and a high-resolution eelgrass survey are necessary to support permitting of the cleanup action.
- **Revetment Probe Survey** – The thickness of sediment located on top of the armored Pier 2 revetment and the revetment east of the Former Log Haul Out near the toe of the slope is currently not fully delineated. To determine the thickness of sediment on top of the armoring in these areas, a survey will be completed using a probe rod. In general, the sediment thickness will be measured along transects spaced approximately 100 feet apart along the face of the revetment. Each transect will start at the approximate interface between the armor rock and fine-grained mudline surface and extend waterward until armor rock is no longer encountered. Along each transect, the sediment thickness will be measured using a push probe inserted to detect the underlying armoring at approximately 3- to 5-foot intervals. Each transect will be referenced relative to the existing piling for mapping purposes.
- **Subsurface Sediment Environmental Characterization** – Subsurface sediment samples will be collected to confirm the elevation of the base of contaminated sediment within the Interim Action area to support dredge design and refine dredge volume estimates for bidding purposes. Subsurface sediment samples will be submitted to Ecology-accredited laboratories for chemical analysis of the Site COCs.

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- **Open-Water Dredged Material Characterization** – Sediment sampling and analysis will be completed to characterize dredged material for the purposes of determining the suitability of the clean native material that will be generated below the recent contaminated sediment deposits for open-water disposal to meet the Port's navigational berth depth needs. Evaluation of the material from the planned subsurface Dredged Material Management Unit (DMMU) and surface exposed by dredging (i.e., Z-layer) will be based on the observed sediment stratigraphy, grain size and sampling and analysis completed to verify the base of the contaminated sediment layer discussed above. Specifically, the objectives of the open-water dredged material characterization are:
  - Characterize proposed dredged material below the contaminated sediment deposits within the future Pier 61/Wyman's Ramp operational area to determine its suitability for unconfined, aquatic disposal.
  - Characterize underlying post-dredge surface material to determine compliance with the state of Washington antidegradation policy based on the result of the subsurface DMMU sampling and analysis.
- **Survey of Potential Mitigation Site** – The Port is currently evaluating potential mitigation sites to address the anticipated loss of habitat as a result of the Interim Action and future cleanup actions at the Site to address sediment contamination. Potential mitigation sites identified by the Port will be further evaluated in coordination with the permitting agencies to ensure that compulsory requirements for addressing loss of habitat as a result of the Interim Action are met. Data necessary to evaluate the quality and viability of potential mitigation opportunities includes bathymetry, topography, inventory of existing site structures, off-site Port-owned structures, and associated habitat. Although the specific scope of these activities is unknown at this time, the Port will coordinate with the permitting agencies to identify the location and scope of work required to fully evaluate these sites as a component of the overall Site cleanup action.

Details of the Pre-Remedial Design Investigation including methods and procedures for implementation as well as quality assurance (QA) and quality control (QC) measures are presented in Attachment 1.

4.2 REPORTING

Following completion of the Pre-Remedial Design Investigation activities, a Data Report will be prepared to document the findings and identify data gaps, if any, requiring additional evaluation prior to implementation of the Interim Action. Environmental laboratory data obtained as part of the PRDI and Dredged Material Characterization will be reported via electronic media using the tabular output capabilities of standard software formats and uploaded to Ecology's Electronic Information Management (EIM) system.

4.3 SCHEDULE

PRDI and Dredged Material Characterization activities will occur within the permitted, allowed in-water work windows and will utilize existing in-water work permits previously established for Site investigation activities. The field sampling activities are currently scheduled to be initiated fall 2026/winter 2027; however, it is subject to Ecology/DMMP and public review of this Interim Action Work Plan and contractor availability to complete the scope of work described above.

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5.0 Interim Action

This section provides an overview of the Interim Action including the objective, cleanup requirements, remedial actions considered and coordination with the final cleanup. An overview of the proposed Interim Action is shown in Figure 12.

5.1 OVERVIEW

The Interim Action will expedite part of the environmental cleanup at the Site addressing previously identified sediment contamination within the current and planned future operational area encompassing Pier 61 and Wyman's Ramp, as well as the Former Log Haul Out area containing elevated levels of wood waste resulting from former log haul out operations. To assist in the development and evaluation of remedial alternatives, the Interim Action area has been divided into two separate sediment management areas (SMAs) based on environmental conditions and other factors that could affect the applicability of specific remedial technologies and the feasibility of their implementation and include:

- **Wood Waste Area** – Within the Former Log Haul Out area of the proposed Interim Action (SMA-1; Figure 12) an estimated 10,500 bank cubic yards (BCY) of contaminated sediment will be removed with a 1-foot over-dredge allowance followed by the placement of imported material to stabilize the Pier 2 revetment side slope. Based on the existing Pier 2 revetment side slope, a 2H:1V (horizontal to vertical) transitional slope is anticipated in the armored portion of the intertidal zone. Based on stable side slopes within the other portions of the Site, a 5H:1V slope (minimum) is anticipated to meet the future navigational draft depths.
- **Pier 61/Wyman's Ramp Operational Area** – Within the operational area portion of the proposed Interim Action (SMA-2; Figure 12), an estimated 12,400 BCY of contaminated and 6,130 BCY of underlying clean sediment (sediment suitable for open-water disposal) will be removed to meet a navigation depth of -12 feet MLLW with a 1-foot over-dredge allowance. Based on stable side slopes within the other portions of the Site, a 5H:1V transitional slope (minimum) extending up from the proposed navigation dredge base elevation is anticipated.

The resulting Interim Action and subsequent navigational depth dredging will result in full contaminant removal within this portion of the Site, as well as the removal of approximately 1 acre of eelgrass habitat based on the results of a 2015 habitat assessment (GeoEngineers 2015c). Habitat mitigation is further discussed in Section 5.6.

5.2 CLEANUP ACTION OBJECTIVES

The cleanup action objective (CAO) for the Interim Action is to clear environmental encumbrances to facilitate the replacement and redevelopment of Pier 61 to meet commercial demands. As discussed above, a recent survey of the pier structure by PND concluded that the current condition of the timber piles supporting the pier structure is generally poor with significant section loss visible from deterioration and marine borer damage. Based on this evaluation, dredging to remove contaminated sediment beneath or surrounding the pier would likely cause irreversible damage to the structure necessitating its removal as a component of the proposed Interim Action. Additionally, shallow mudline elevations, access limitations and the potential to destabilize the structural stability of other pilings within and adjacent to the proposed Interim Action area also necessitate their removal. The Interim Action also includes removal of contaminated sediment and sediment containing wood debris greater than 10 percent by volume observed

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in the Former Log Haul Out Area due to potential future access restrictions that would result following replacement and redevelopment of Pier 61, and the limited draft currently observed in this area.

An overview of the proposed Interim Action is presented in Figure 12. Restoration and future land use are shown in Figure 13. Overall, the Interim Action area encompasses approximately 51 percent of the Site and would result in the full removal of Benthic PCUL exceedances and wood waste identified as a SOC.

5.2.1 Sediment Management Standard-Based Screening Criteria

To meet the CAO while supporting implementation of the final site-wide cleanup action, the SCO will serve as the screening level for the Interim Action consistent with the SMS and SCUM. For chemicals that are not bioaccumulative, the cleanup objective is the applicable benthic SCO established under the SMS. For sediment with total organic carbon (TOC) of 0.5 percent to 3.5 percent, the organic-carbon normalized concentrations are used as the benthic SCO. If the TOC is less than 0.5 percent or greater than 3.5 percent then the dry-weight Apparent Effects Threshold (AET) criteria will be used as the benthic SCO. These criteria are intended to protect the benthic community from adverse biological effects (WAC 173-204-562) and will serve as the target concentrations for evaluating the completeness of the Interim Action. For bioaccumulative chemicals, the cleanup objective is the natural background concentration (adjusted for practical quantitation limit [PQL] as appropriate), consistent with the SMS and Ecology guidance. Because naturally occurring concentrations cannot reasonably be reduced through a cleanup action, natural background (adjusted for PQL as applicable) represents the achievable and protective cleanup objective for these constituents.

In addition to the SCO-based screening criteria, visual wood debris greater than approximately 10 percent by volume has been identified as a SOC based on site-specific bioassay data. The removal of visual wood debris greater than 10 percent by volume will be used as an additional criterion for evaluating the completeness of the Interim Action.

5.2.2 Dredge Material Management Screening Criteria

In addition to the SMS-based screening criteria, sediment at the base of the Interim Action area deepening of the navigational berth area to facilitate future Port operations will be evaluated against the DMMP marine guideline chemistry values. This evaluation will be performed independently of the SMS-based screening and is intended to verify that the material underlying the contaminated sediment layer is suitable for unconfined open-water disposal. The DMMP guideline chemistry values are disposal acceptance criteria and are not remedial cleanup levels; therefore, comparison to these values will be used to support dredged material characterization, management and disposal planning and will not establish the remedial endpoint for the Interim Action.

As discussed in Section 4.0, a PRDI will be completed in advance of the Interim Action to support the remedial design and permitting requirements, verify the base of the recent contaminated deposits and characterize the underlying clean native materials for open-water suitability determination in accordance with the DMMP. Additional verification samples may be collected during implementation of the Interim Action to confirm that the target concentration for evaluating the completeness of the Interim Action has been achieved prior to dredging of the underlying native material anticipated to be suitable for open-water disposal.

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5.3 PERMITTING AND SUBSTANTIVE REQUIREMENTS

The Interim Action will be conducted pursuant to Revised Code of Washington (RCW) 70A.305.090. Accordingly, remedial actions conducted under an interim action are exempt from the procedural requirements associated with otherwise applicable state and local permits and approvals. However, the Interim Action must comply with the substantive requirements of those laws, as applicable. The following sections identify the substantive regulatory requirements applicable to the Interim Action. Ecology's approval of this Interim Action Work Plan constitutes concurrence with the substantive requirements identified herein and incorporated into the design and implementation of the Interim Action.

5.3.1 Washington State Environmental Policy Act

The Washington State Environmental Policy Act (SEPA) provides a way to identify possible environmental impacts that may result from governmental decisions. Information provided during the SEPA review process helps agency decision-makers, applicants, and the public understand how a project will affect the environment. SEPA is intended to ensure that state and local government officials consider environmental values when making decisions or taking official action. To meet this requirement, the Port (SEPA lead agency for the project) will complete a SEPA determination prior to implementation of the project.

5.3.2 Historic and Cultural Resources

The National Historic Preservation Act (Section 106) and the Federal Archaeological and Historical Preservation Act (16 USCA 496a-1) will be applicable if any materials of archaeological interest are discovered during dredging activities. However, potentially significant archaeological materials are not anticipated at the Site based on prior cultural assessments completed and consultations with the Department of Archaeology and Historical Preservation (DAHP). Ecology's preliminary determination regarding the potential to encounter archaeological resources is presented in Appendix D.

5.3.3 U.S. Army Corps of Engineers Individual Permit

Section 404 of the Clean Water Act, 33 U.S.C. § 1344, requires a permit prior to discharging dredged or fill material into the waters of the United States. The type of permit under which a specific project is completed is selected by the USACE. The Port will obtain and comply with the conditions of the Individual Permit for the activities to be completed as part of the Interim Action.

To support acquisition of an Individual Permit, a Joint Aquatic Resources Permit Application (JARPA) will be prepared and submitted to the USACE prior to implementation of the Interim Action.

5.3.4 Ecology Water Quality Certification

Projects applying for a federal Individual Permit to conduct any activity that results in a discharge of dredge or fill material into water are required to acquire a Section 401 Water Quality Certification (WQC). In Washington State, Ecology is the agency that provides this certification. The WQC includes requirements that are intended to provide assurance that the project will comply with state water quality standards and other aquatic resources protection requirements under Ecology's authority. The Port will obtain and comply with the conditions of a WQC for the activities to be performed as part of the Interim Action.

To support acquisition of a WQC, a JARPA and additional supporting documentation will be prepared and submitted to Ecology with the request for the WQC. Additional documentation will include development of

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a Water Quality Monitoring Plan for use during construction of the activities to be performed as part of the Interim Action.

5.3.5 Washington State Department of Natural Resources Site Use Authorization

A portion of the sediment to be dredged from the Interim Action area, that is deemed to be suitable, is to be disposed of at an unconfined open-water disposal site located on State-owned land managed by the DNR. Prior to using any of DNR's dredged material disposal sites, the dredger must apply for and receive permission from DNR. DNR manages use of the disposal sites through a Site Use Authorization (SUA). The SUA is an agreement between DNR and the dredger that specifies the disposal requirements. The Port will prepare and submit an application for an SUA to utilize an open water disposal site. The Port will obtain and comply with the conditions of the SUA for disposal of dredge material from the Interim Action area that is deemed to be suitable for disposal at an unconfined open-water disposal site.

Additionally, portions of the Interim Action will be conducted within state-owned aquatic lands managed by the Port under a Port Management Agreement (PMA) with the DNR. The Port's management authority under the PMA will be used for activities conducted within the designated management area, subject to the terms and conditions of the Agreement and applicable state aquatic-land laws and regulations. The Port will coordinate with DNR, as appropriate, regarding implementation of the Interim Action and any activities requiring DNR review or written concurrence under the PMA.

5.3.6 Washington Department of Fish and Wildlife Hydraulic Project Approval

Chapter 220-110 WAC (Hydraulic Code Rules) and Chapter 77.55 of the Revised Code of Washington (RCW; Construction Projects in State Waters) regulate work that uses, diverts, obstructs, or changes the natural flow or bed of any salt or fresh waters of the state and includes bed reconfiguration, all construction, or other work within the mean higher high water (MHHW) line in marine waters. WDFW oversees the implementation of these laws and issues Hydraulic Project Approvals (HPAs) for protection of fish life. For projects being performed under Chapter 70.105D.090 of the RCW, WDFW reviews project submittals to identify whether a project meets the substantive requirements of the laws and HPAs.

An application will be prepared prior to implementation of the Interim Action and submitted to the WDFW for review to ensure that the project meets the substantive requirements of the laws and an HPA.

5.3.7 City of Anacortes Shoreline Substantial Development Permit

The Washington Shoreline Management Act (RCW 90.58) and its implementing regulations establish requirements for substantial developments occurring within water areas of the state or within 200 feet of the shoreline. According to Shoreline Management Act regulations, local shoreline management plans and requirements are adopted under the State regulations, creating an enforceable State law. Therefore, a shoreline permit is not required for the Interim Action. However, the Interim Action must meet the substantive requirements of the City's Shoreline Master Program.

An application will be prepared prior to implementation of the Interim Action and submitted to the City for review to ensure that the project meets the substantive requirements of the City's Shoreline Master Program.

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5.3.8 Other City of Anacortes Permit(s)

Other City permits or ordinances (e.g., City of Anacortes Noise Ordinance [Ordinance 2316 (part), 1994]) will be followed during implementation of the Interim Action. The Port will coordinate with the City prior to implementation of the Interim Action to identify and ensure that the project meets these substantive requirements.

5.4 CLEANUP ALTERNATIVES CONSIDERED

Potentially applicable remediation technologies and associated cleanup actions were evaluated based on the CAOs, cleanup requirements, future land use assumptions and potential impacts to habitat resources. Physical conditions of the Site that may limit or support remedial technologies and contaminant characteristics that may limit the effectiveness or feasibility of a technology were also considered. Potentially applicable remediation technologies and associated cleanup actions to address contaminated sediment generally include the following:

- Recovery through natural deposition or placement of additional clean sediment to enhance recovery in addition to natural biological processes to reduce contaminant concentrations.
- Capping or containment of contaminated sediment.
- Dredging to remove contaminated sediment and off-site disposal followed by backfill placement.

As the contaminated sediment in the Interim Action area is located in an area that requires deepening for vessel navigation and berthing, natural/enhanced recovery and capping were not considered applicable remedial actions for the Interim Action because removal of the contaminated sediment is required to meet the future navigation depth (i.e., -12 feet MLLW navigation draft depth) within the Pier 61/Wyman's Ramp operational area. Based on the nature and extent of sediment contamination, future land use considerations, the Port's future operational needs, full contaminated sediment removal within the planned interim action area followed by partial backfilling was identified as the most appropriate remedial alternative. Additionally, partial backfill placement following dredging allows for the creation of a habitat bench and limits the need for over-steepened transitional slopes extending up from the base navigational area. Based on contaminant concentrations observed, off-site disposal at an Ecology-approved disposal facility or facilities was also selected as the applicable remedial action approach for the Interim Action.

5.5 COORDINATION WITH THE FINAL CLEANUP ACTION

The Port is required to complete an RI/FS and DCAP in accordance with the Agreed Order to identify the appropriate cleanup action for the Site. This Interim Action cleanup is being presented to support the Port's replacement and redevelopment of Pier 61 to meet commercial demands for drop-framed transit vessel moorage and navigational drafts. The Agreed Order specifies that with concurrence with Ecology, the Port may complete an Interim Action to reduce the potential threat to human health and the environment. The Interim Action will be implemented in advance of selecting the final cleanup action for the Site and will not preclude reasonable alternatives for the final cleanup action (WAC 173-340-430(3)(b)). The action is interim or temporary and will be in place until the final cleanup action is implemented for the Site.

The RI/FS for the Site will identify the completion of the Interim Action as part of the Site conditions. The RI/FS will also identify appropriate alternatives for the final cleanup of the Site. The final cleanup action will include integration of the cleanup remedy for the Interim Action area.

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5.6 INTERIM ACTION COMPONENTS

The following sections provide a description of the main Interim Action components.

5.6.1 Demolition

Demolition of existing marine structures (Figure 12) will include the removal of 54 mooring/creosote-treated timber piles existing as a single pile or as pairs, and Pier 61 structure including float, gangway ramp, and over water trestle. Removal of these structures is required to provide barge access to implement remedial dredging and to prevent destabilization or other adverse effects to the structural integrity of the remaining piles and associated marine infrastructure within and adjacent to the proposed Interim Action area.

Timber/mooring piles will be removed using a vibratory hammer where feasible to reduce sediment disturbance, with direct pull methods preferred over cutting. If piles must be cut, cuts will be made at or below the final planned backfill mudline elevation to avoid creating navigational hazards or obstructions. Steel and timber pier components will be dismantled systematically and lifted out of the water to the extent practicable, rather than allowed to fall or break apart in place. Removal of piling and pier structures will be conducted to minimize impacts to aquatic habitat and water quality. Debris containment measures, such as turbidity curtains or debris booms, will be installed as appropriate to prevent the migration of sediments and floating materials. In-water work will be scheduled within approved fish windows to protect sensitive species, and all activities will comply with permit conditions and Best Management Practices (BMPs). All removed materials will be placed on barges, characterized as needed, and transported offsite for proper disposal or recycling in accordance with state and federal regulations.

5.6.2 Dredging

Dredging within the Interim Action area shown in plan view in Figure 12 will be completed using barge-based clamshell and/or fixed-arm excavation equipment as required to effectively remove the contaminated sediment and wood debris as well as dredging of the navigational materials required to deepen the Pier 61/Wyman's Ramp operational area. Hydraulic dredging is not anticipated. Barges will utilize spuds or other typical anchoring methods. The use of spuds or anchor during dredging will not be allowed in sensitive habitat areas other than those otherwise impacted by the remedial action. Additionally, the use of spuds or anchors during dredging will be situated as to avoiding damage to the City's newly constructed a WWTP outfall located north of the U Avenue ROW terminus. The dredged material generated during implementation of the Interim Action and subsequent deepening of the navigational berth area will be placed on barges for dewatering within the project work area as allowed by the agency-approved permit conditions for the project.

5.6.3 Dredged Material Handling, Transport and Disposal at Upland Facility

Contaminated dredged material that is unsuitable for open water disposal will be placed on a barge and transported to an upland transload facility using land-based excavation equipment. The dredged material will be offloaded at an appropriate transload facility. The dredged material that is offloaded to a transload facility will be transported via trucks and/or train for disposal at an appropriate permitted upland landfill.

Based on the site characterization completed to date and proposed Interim Action dredge area, the total estimated dredge volume is 29,030 BCY. Of this total estimated volume, approximately 22,900 BCY is contaminated and will be disposed of at an upland landfill. The remaining dredge material is considered to

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be clean native sediment that will be removed to meet navigation requirements. These materials will be disposed at an approved open-water disposal site following characterization and suitability. determination under the DMMP. As discussed in Section 4.0, pre-remedial design sampling and analysis is proposed to verify the base of the sediment contamination layer and characterize the underlying clean native material for open-water disposal.

5.6.4 Dredged Material Handling, Transport and Disposal at In-Water Facility

It is assumed that dredged material underlying the contaminated sediment layer (6,130 BCY) will be suitable for open water disposal. Upon verification that the contaminated sediment has been successfully removed from the Site, the material suitable for open-water disposal will be dredged and placed on a disposal barge (dump scow). The dump scow will be towed to the open water disposal site. Once the dump scow reaches the open water disposal site and is positioned over the site, the bottom of the dump scow will be opened, and the dredged material will be released in accordance with the approved aquatic use authorization. Dredged material that is suitable for open water disposal is expected to be disposed at the Rosario Strait open-water dispersive site. Additional sampling and analysis of the underlying clean native material (see Section 4.0) will be used to support DMMP open-water suitability determination.

5.6.5 Backfill Placement and Armoring of the Transition Slopes

In areas where existing revetment slopes are over-steepened or otherwise unstable, armor rock will be placed to improve structural integrity and prevent erosion. Armor rock may consist of appropriately sized quarry spall, riprap, or other engineered materials placed over a prepared subgrade and, where necessary, underlain by filter fabric or granular bedding to prevent migration of fines. The armored slopes will be keyed into existing grades and constructed to tie seamlessly into adjacent shoreline features. In total, an estimated 350 CY of new armor rock will be placed over 4,600 square feet (0.1 acre) along the eastern toe of Pier 2 revetment and western bank of the Former Log Haul Out area.

In other areas, transitional slopes will be constructed to achieve stable slopes that minimize erosion potential while maintaining navigational clearances within the Pier 61 berthing area (estimated total of 5,300 CY). A slope angle of approximately 5H:1V is anticipated to meet project needs and is expected to be stable based on observed slope angles in other portions of the Site. The final slope geometry and material type will be confirmed in accordance with geotechnical recommendations and hydraulic considerations, ensuring long-term stability under tidal and vessel-induced loading conditions.

Preliminary design grades for armor rock and other materials used to backfill the Site are shown in Figure 13. It is anticipated that these materials will be placed using a barge-mounted excavator/crane and bucket. The imported materials will be sourced from a quarry. Fine-grained materials (i.e., sand size fraction and smaller) will be subject to chemical analysis prior to use to confirm that the material does not contain unacceptable chemical concentrations greater than the SCO-based screening levels discussed above. Sampling and analysis of these materials is further discussed in Section 5.7.2.

5.6.6 Environmental Protection During Construction

Proposed Interim Action activities will be performed in compliance with regulatory and permit requirements including implementation of BMPs to protect the environment during construction. The following regulatory and permit requirements are anticipated for Proposed Interim Action construction activities:

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- Dredging and other marine work will occur within the permitted, allowed in-water work windows.
- The Contractor will be required to prepare a construction Spill Prevention, Control and Countermeasures (SPCC) Plan for the project and will establish temporary erosion and sediment control measures prior to construction.
- Work will be performed in accordance with Ecology WQC requirements.
- Water quality monitoring will be performed during demolition, dredging and the placement of backfill material to ensure compliance with the WQC requirements.
  - Exceedances of water quality criteria will be managed according to Ecology's requirements and may include the following:
    - Modifying the dredging or armoring/habitat mix placement operations;
    - Modifying the BMPs for the specific activity;
    - Implementation of additional BMPs; and/or
    - Temporary suspension of dredging or armoring/habitat mix placement in order to allow the exceedance to pass.
  - Ecology will be notified of exceedances of water quality criteria in accordance with the requirements of the 401 WQC.
- Work will be performed in compliance with all applicable local, state and federal regulations and restrictions (e.g., WDFW HPA, Department of Ecology Section 401 Clean Water Certification, local Critical Areas Ordinance and land use regulations, Shoreline Master Program, SEPA and USACE Section 10 [Rivers and Harbors Act]).

The following BMPs are anticipated for construction. Additional BMPs may be required by regulatory agencies and stakeholders during the permitting process.

- All equipment used for construction activities will be cleaned and inspected prior to arriving at the project site to ensure that no potentially hazardous materials or leaks are present and the equipment is functioning properly.
- Spill prevention and response equipment will be stored and used on all project vessels/barges to prevent the release of petroleum products and other hazardous substances to surface water.
- The contractor will perform daily inspection of construction equipment to ensure there are no leaks of hydraulic fluids, fuel, lubricants or other petroleum products.
- Corrective actions will be taken in the event of any discharge of oil, fuel, or chemicals into the water, including:
  - In the event of a spill, containment and cleanup efforts will begin immediately and be completed as soon as possible, taking precedence over normal work. Cleanup will include proper disposal of any spilled material and used cleanup material.
  - The cause of the spill will be assessed, and appropriate action will be taken to prevent further incidents or environmental damage.
  - Spills will be reported immediately to Ecology's Northwest Regional Spill Response Office at 425.649.7000 (a 24-hour phone number). Spills of oil or hazardous materials will also be reported immediately to the National Response Center at 1.800.424.8802 and the Washington Emergency Management Division at 1.800.258.5990 or 1.800.OILS.911.

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- Operations will be stopped temporarily if listed species are observed as injured, sick or dead in the project area to evaluate whether additional listed species are present and to assess whether operations may continue without further impact. National Marine Fisheries Service law enforcement will be notified, and fish will be handled with care to ensure effective treatment or analysis of cause of death or injury.
- A floating surface debris boom will be deployed around the perimeter of the work area in the event that floatable debris appears as a result of the demolition or dredging of wood debris layer (saw dust, dimensional lumber, etc.).
- All construction-related debris will be cleaned up on a daily basis and proper containment measures will be taken to ensure that debris will not contaminate the marine shoreline or marine waters.
- Debris and waste materials, including miscellaneous garbage and/or other debris removed from the shoreline environment, will be transported off site for disposal in accordance with applicable regulations.
- Barges and support vessels will be positioned and navigated in a manner that will avoid grounding.
- Dredging and placement of armor rock and fill material will be conducted in a controlled manner that limits turbidity and dispersal of material in the water, maintains surface water quality at the mixing zone boundary and prevents the spread of contaminated sediments to uncontaminated areas or areas that have already been dredged.
- The rate of ascent of the clamshell bucket will be controlled in a manner to limit sediment loss during ascent through the water column and while swinging the bucket to the barge.
- During dredging, each cycle of the bucket will be complete; partial loads of dredged material will not be dumped back into the water and stockpiling dredged material below the ordinary high-water line will be prohibited.
- Leveling of the completed dredging surface by dragging a beam or the dredge bucket will not be permitted.
- If dredging operations and material handling methods are not sufficient to maintain surface water quality at the mixing zone boundary, a turbidity curtain will be deployed around the active dredging work area.
- Prior to dredging and disposal of the suitable open water material, the extent of non-suitable material dredging will be confirmed using bathymetric survey and/or confirmational sampling.
  - The bathymetric survey will be used to confirm that dredging has been performed to the elevation comprising the base of the contaminated material as verified by the PRDI (see Section 4.0).
  - If required, confirmational sampling will be completed at the base of the contaminated dredge prism to verify that the SCO-based screening levels have been met and that the underlying material meets the DMMP's marine guideline values for open-water disposal.
- Dredged material unsuitable for open water disposal will be loaded into a barge, transported to and offloaded at an upland transload facility. Transloading activities will be completed in accordance with project permits. BMPs will be in place to prevent spillage of dredged sediments to adjacent water bodies.
- Dredged material suitable for open-water disposal will be loaded into a barge for transport and disposal. The dredged sediments are expected to be disposed of at the Rosario Strait dispersive open-water

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disposal site. As discussed above, additional sampling and analysis is proposed to characterize the clean native material below the contamination layer to support DMMP open-water suitability determination.

- Return water draining from receiving barges will be treated by a filter media such as straw bales or geotextile fabric before returning to surface water. Filter fabric will be cleaned and changed regularly to ensure effective filtration.
- Imported materials will be inspected and tested prior to placement to ensure materials are free of contaminants at concentrations greater than the SCO-based screening levels.

5.6.7 Habitat Mitigation

The dredging activity will result in the permanent loss of approximately 1.7 acres of shallow-water habitat (area shallower than -10 feet MLLW) and potentially up to approximately 0.95 acres of eelgrass habitat based on the 2015 habitat assessment. Mitigation for the loss of the eelgrass habitat and loss of shallow-water habitat will be evaluated by the Port either through the purchase of habitat credits through the Puget Sound Partnership and/or potential habitat restoration opportunities in conjunction with the remaining portion of the Site cleanup action, at the nearby Quiet Cove Site (Facility Site ID 20859; Cleanup Site ID 12482) or other potential surrounding sites. At this time, preliminary mitigation coordination has been initiated with National Marine Fisheries Service (NMFS) and United States Fish and Wildlife Service (USFWS) to identify which components of the cleanup may be subject to mitigation and discuss potential mitigation scenarios for the project based on the proposed project impacts and long-term site goals. Further discussions related to mitigation are proposed once an updated habitat survey, including eelgrass delineation, is complete in accordance with the PRDI (see Attachment 1).

Habitat mitigation, restoration and monitoring requirements will be further characterized as part of the project permitting process and coordination with the regulatory agencies.

5.6.8 Interim Action Compliance Monitoring

In accordance with WAC 173-340-410, compliance monitoring for a cleanup action includes the following elements:

- **Protection Monitoring** confirms that human health and the environment are adequately protected during the cleanup action.
- **Performance Monitoring** confirms that the cleanup action has been completed in areas exceeding SMS-based and Dredged Material Management screening levels (see Sections 5.2.1 and 5.2.2) and meets other performance standards, such as permit requirements.
- **Confirmation Monitoring** confirms the long-term effectiveness of the cleanup action once proposed cleanup levels and other performance standards have been reached.

For this Interim Action, protection and performance monitoring will be conducted during construction. Confirmation monitoring will be conducted after the final cleanup action has been implemented at the Site. Compliance monitoring for the Interim Action is described in the following sections. Protection and performance monitoring are detailed in the Compliance Monitoring Plan (CMP) presented in Attachment 2 and are further summarized in the following sections.

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5.6.9 Protection Monitoring

Protection monitoring will be implemented during the Interim Action by requiring that construction activities be performed in accordance with health and safety regulations and that on-site workers be appropriately trained in hazardous waste operations as well as follow a site-specific Health and Safety Plan (HASP) prepared specifically for the Interim Action project. Interim Action construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA; RCW 49.17) and the Federal Occupational Safety and Health Act (OSHA; 29 Code of Federal Regulations [CFR] 1910, 1926). Personnel engaged in work that involves hazardous material dredging and handling shall comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and will be Hazardous Waste Operations and Emergency Response (HAZWOPER) certified.

GeoEngineers personnel performing observation of Interim Action construction activities for the Port will adhere to the requirements of the HASP included as an appendix to the CMP presented in Attachment 2. The Contractor(s) that are selected to perform the Interim Action construction will be required to develop separate HASPs for their employees.

5.6.10 Performance Monitoring

Performance monitoring during the Interim Action will include the following:

- Review of contractor submittals required by the contract documents.
- Inspection of the sources of armoring and fill material, gradation and chemical analytical results representative of the quarry source(s).
- Verifying elevations to confirm that the wood debris and sediment with chemical concentrations greater than SCO-based and DMMP screening criteria as determined by the dredging plan elevations and/or verification sampling. Sampling and analysis data (see Section 4.0) will be initially used as a basis to confirm that the exposed surfaces at the design target elevations meet the SCO-based and DMMP screening criteria. Additional sampling and analysis will be completed within the proposed navigation dredge area in accordance with the CMP (Attachment 2) following contaminated sediment dredging to verify its removal and quality of the underlying native sediment layer for open-water disposal prior to dredging. The Port will coordinate these results with the DMMP to verify open-water disposal acceptance. In addition, sampling and analysis will also be completed following backfill placement within the interim action area as well as outside the perimeter to evaluate the potential impact of dredge residuals (see Attachment 2).
- Confirmation of the placement of armor rock and fill material meets the design requirements. Placement of the armoring and backfill material will be monitored by a representative of the Port to confirm that materials have been correctly placed in accordance with the design contract documents. Armor and fill placement will be confirmed based on comparison of a hydrographic survey of the post-dredge surface and survey performed after armoring and fill material has been placed. In instances where the armor rock or fill material thickness is observed to be less than specified in the design contract document, the contractor will be required to place additional material to achieve the desired thicknesses. The details of the procedures for armoring and fill placement confirmation will be developed as part of the project contractor bid package preparation.

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5.6.11 Compliance Monitoring

Physical and biological monitoring may be required to support habitat mitigation. These monitoring activities, if required, will be further coordinated with the permitting agencies following completion of the habitat survey including eelgrass delineation, in accordance with the PRDI (see Attachment 1). Chemical monitoring will be performed as part of the final cleanup for the Site.

5.7 CULTURAL RESOURCES

As discussed in Section 5.3.3.2, potentially significant archaeological materials are not anticipated at the Site based on prior cultural assessments completed and consultations with DAHP. However, it is possible that archaeological materials may be encountered during the PRDI or construction. Procedures for the inadvertent discovery of cultural resources that will be followed as part of the PRDI and Interim Action dredging are described in the Inadvertent Discovery Plan (IDP) presented in Attachment 3.

5.8 CONSTRUCTION QUALITY CONTROL

QA and QC procedures that will be implemented during the Interim Action, including contractor quality control, construction monitoring and field documentation, are discussed in the following sections.

5.8.1 Contractor Quality Control

The Contractor will prepare a Construction Quality Assurance Plan before commencing work. This plan will be subject to review and approval by the Port to ensure that the planned actions are implemented in general accordance with the project contract and Interim Action Work Plan requirements. The Construction Quality Assurance Plan will include construction plans for each of the primary elements of work, as well as a quality control plan for each relevant construction element. The quality control plan will address the following:

- General requirements;
- Quality control organization;
- Documentation of methods and procedures;
- Requirements for corrective action when QC and/or acceptance criteria are not met; and
- Any additional elements that the Contractor deems necessary to adequately control construction processes required by the contract.

The Contractor will maintain QC records and provide them to the Port as required by the contract. These records will include evidence that the required inspections or tests have been performed, including the type and number of inspections or tests involved; results of inspections or tests; nature of defects, deviations, causes for rejection, proposed corrective action, and corrective actions taken.

5.8.2 Construction Monitoring and Field Documentation

In addition to the Contractor's Construction Quality Assurance Plan, the Port will perform oversight of the Contractor's field activities and maintain a record of field activities for the project. Field documentation will include field notes, field forms, field reports, and chain-of-custody forms for samples submitted for analytical testing. The field documentation will record construction, sampling, and monitoring activities, sampling personnel, and weather conditions, as well as decisions, corrective actions, and/or modifications to the project plans and procedures discussed in this report.

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5.9 INTERIM ACTION COMPLETION REPORT

Upon completion of the construction activities, an Interim Action Completion Report that describes the construction of the Interim Action will be prepared and submitted to Ecology for review and approval in accordance with the requirements of the Agreed Order. Additionally, the results of the Interim Action, as described in the final Interim Action Completion Report, will be incorporated into the RI/FS for the Site.

5.10 INTERIM ACTION CONSTRUCTION SCHEDULE

Dredging and other Interim Action activities will occur within the permitted, allowed in-water work windows. The Interim Action is currently scheduled to be completed during the 2028/2029 in-water work window, however, is subject to permit review/approval, coordination with City for substantive requirements and selection of the most responsive and responsible contractor to complete the Interim Action scope of work. The Port will coordinate with Ecology and permitting agencies regarding major milestones in the project, including the PRDI, Dredged Material Characterization, and planned construction activities.

6.0 Limitations

We have prepared this Interim Action Work Plan for the Anacortes Port Log Yard Site located in the nearshore area northwest of 718 4th Street in Anacortes, Washington for use by the Port of Anacortes, regulatory agencies and their authorized agents. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

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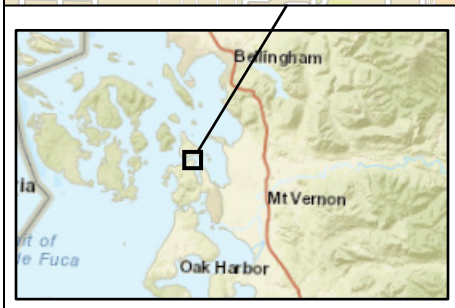
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Figures

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Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

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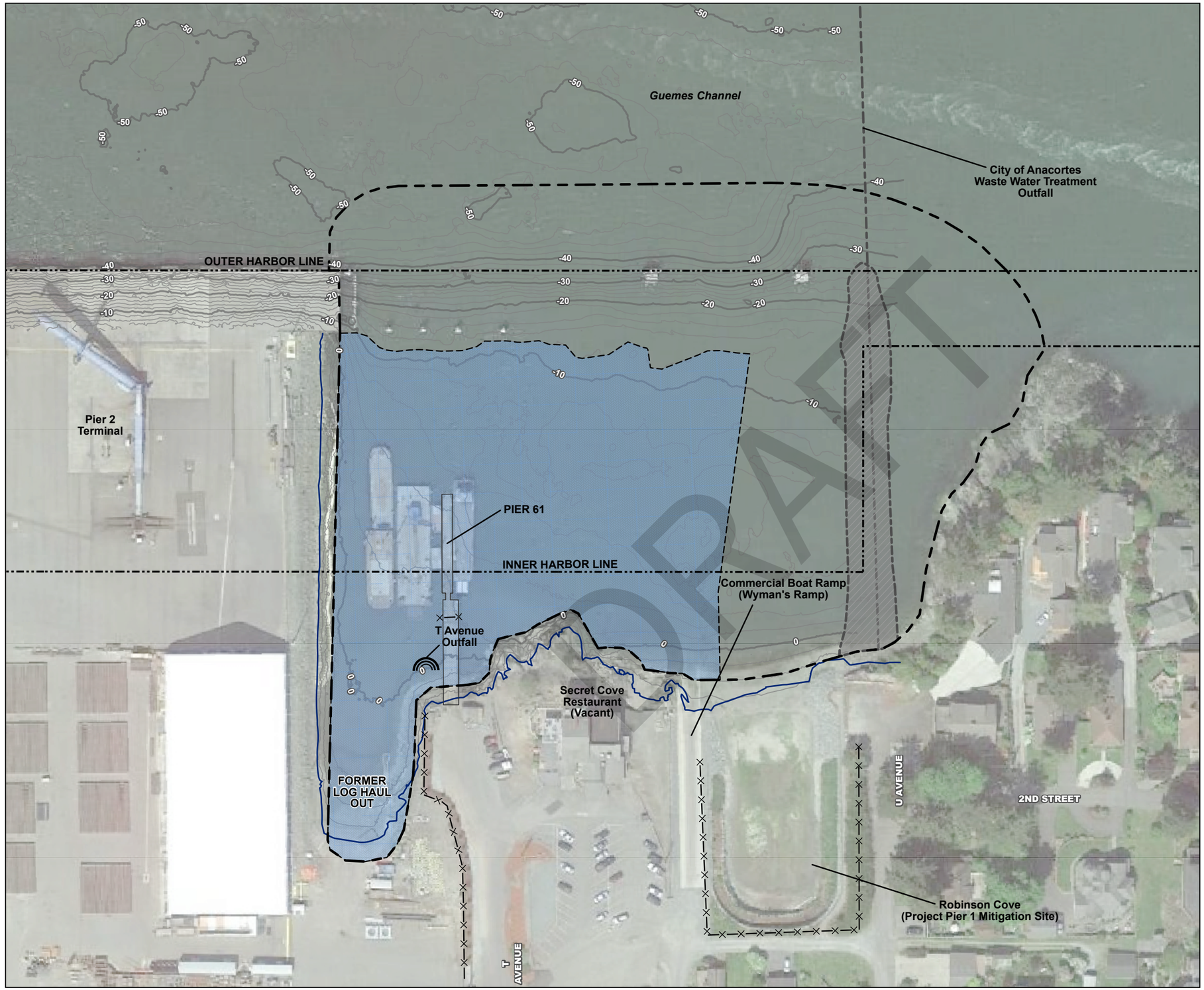
Vicinity Map

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 1

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Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area
- Outfall

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Remedial actions were completed in conjunction with the City of Anacortes Waste Water Treatment Outfall Dredging Project to remove previously identified contaminated sediment for permitted upland landfill disposal.

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Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

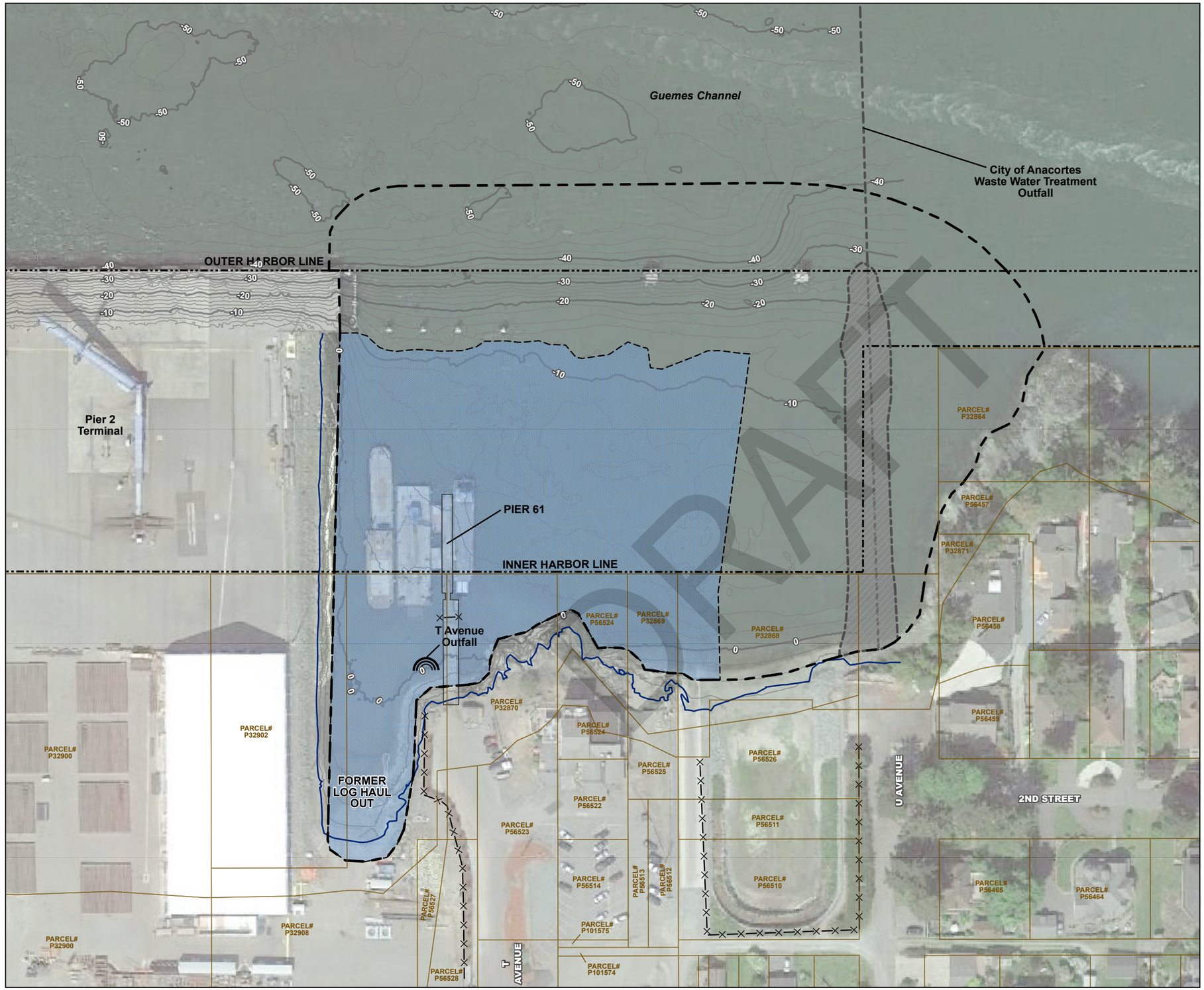
Current Property Layout and Proposed Interim Action Area

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 2

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Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area
- City of Anacortes Outfall

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Remedial actions were completed in conjunction with the City of Anacortes Waste Water Treatment Outfall Dredging Project to remove previously identified contaminated sediment for permitted upland landfill disposal.

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Notes:

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Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

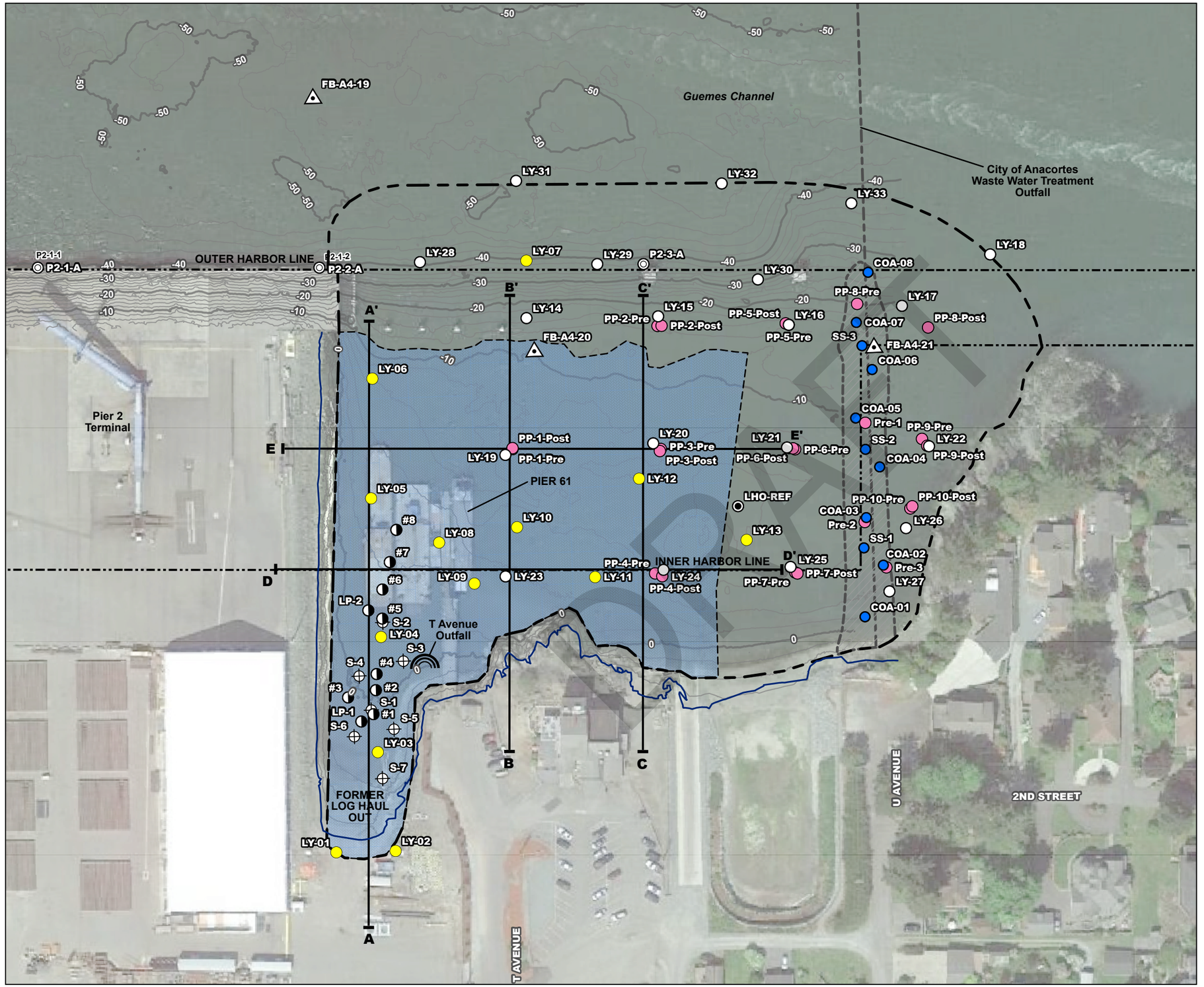
Parcel Boundaries

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 3

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Legend

- Anacortes Log Yard Site
- Mean Higher High Water (MHHW)
- Harbor Line
- City of Anacortes Outfall
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area
- Proposed Interim Action Area
- Cross Section (See Figures 5 through 9)
- Pre- and Post-Construction Characterization (Geosyntec 2025)
- Supplemental Sediment Investigation (GeoEngineers 2021-23)
- Nearshore Sediment Characterization Study (DOF 2020)
- RI/FS Investigation (GeoEngineers 2016)
- Dredged Material Characterization Study (GeoEngineers 2012)
- Supplemental Sediment Characterization Study (GeoEngineers 2012)
- Sediment Characterization Study (GeoEngineers 2010)
- Fidalgo Bay Sediment Investigation (SAIC 2008)
- Pier 2 Log Haul Out Facility Due Diligence Study (Floyd|Snyder 2004)

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

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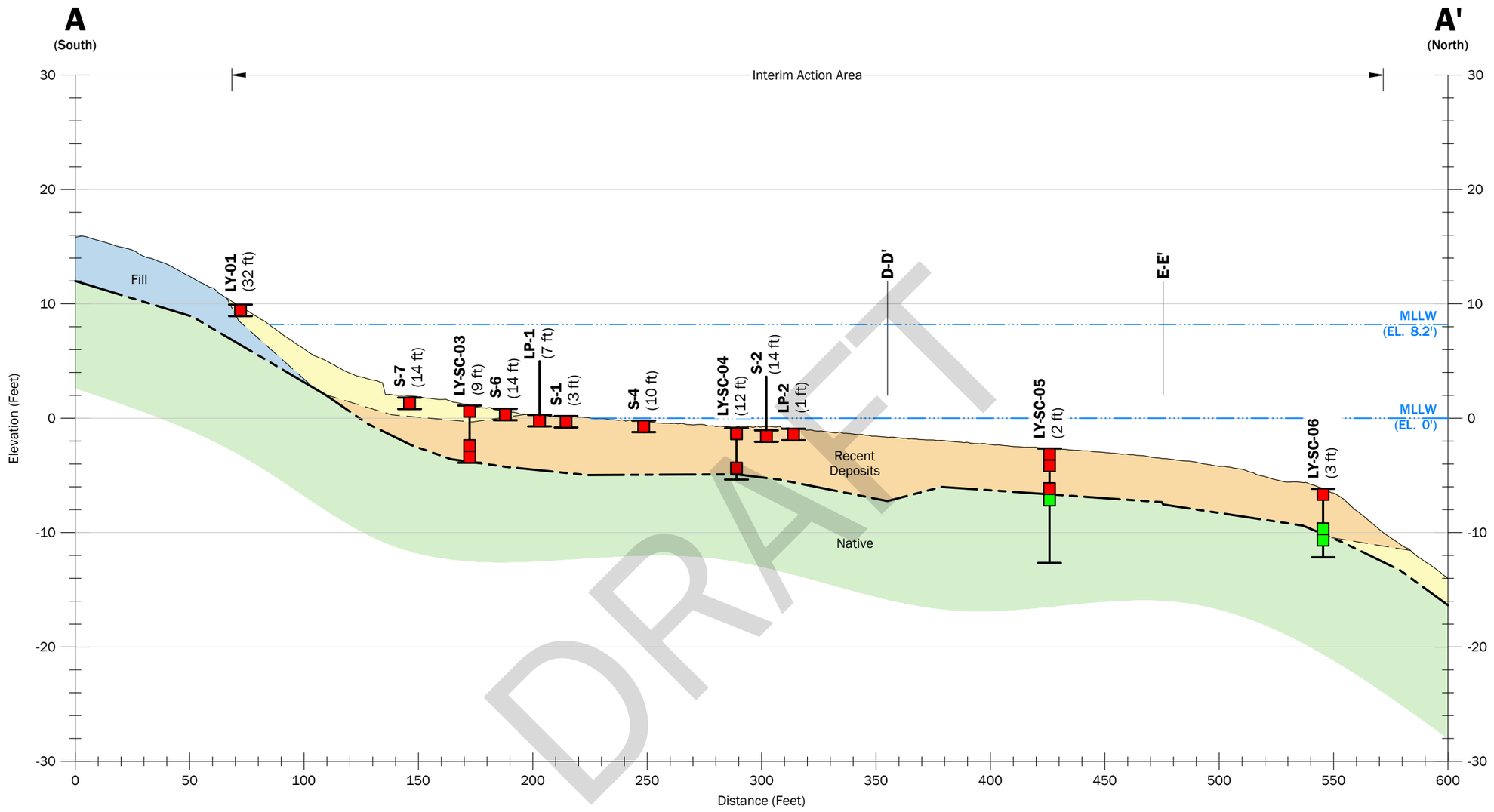
Sediment Investigation Sampling Locations

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 4

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Vertical Exaggeration = 5X

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Abbreviations

COC	Contaminant of Concern
EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
PCUL	Proposed Cleanup Level

Recent Deposits

- Unconsolidated Sand and Silt with Wood Debris (>10%)
- Unconsolidated Sand and Silt (<10% Wood Debris)

Native Deposits

- Glacialmarine Drift (Native)

Other Materials

- Upland Fill

Sample ID (Offset)

Sediment Core

- Sample Core Location/ Identification and Offset
- Existing Mudline
- Inferred Stratigraphic Contact
- Inferred Recent/Native Contact
- Sediment Sample

Sediment Sample Result Summary (See Appendix A)

- One or More COCs Detected Greater than the PCUL
- COCs Not Detected Greater than the PCUL
- No Sample Data

Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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Sediment Stratigraphy Cross Section A-A'

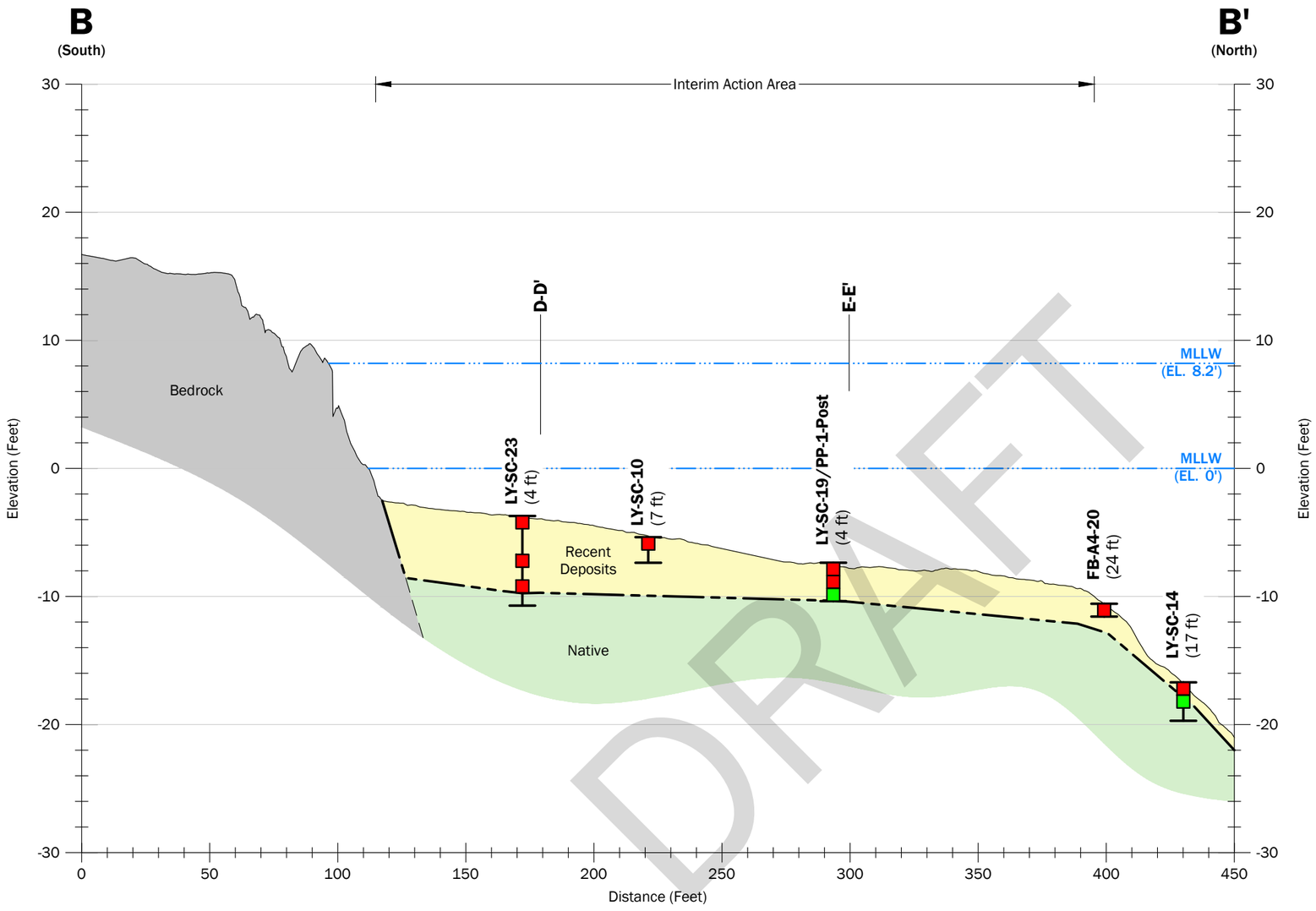
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 5

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Legend

Sediment Core

Sample ID (Offset)

Sample Core Location/ Identification and Offset

Existing Mudline

Inferred Stratigraphic Contact

Inferred Recent/Native Contact

Sediment Sample

Sediment Sample Result Summary (See Appendix A)

One or More COCs Detected Greater than the PCUL

COCs Not Detected Greater than the PCUL

No Sample Data

Abbreviations

COC	Contaminant of Concern
EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
PCUL	Proposed Cleanup Level

Recent Deposits

Unconsolidated Sand and Silt (<10% Wood Debris)

Native Deposits

Glacialmarine Drift (Native)

Other Materials

Bedrock

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Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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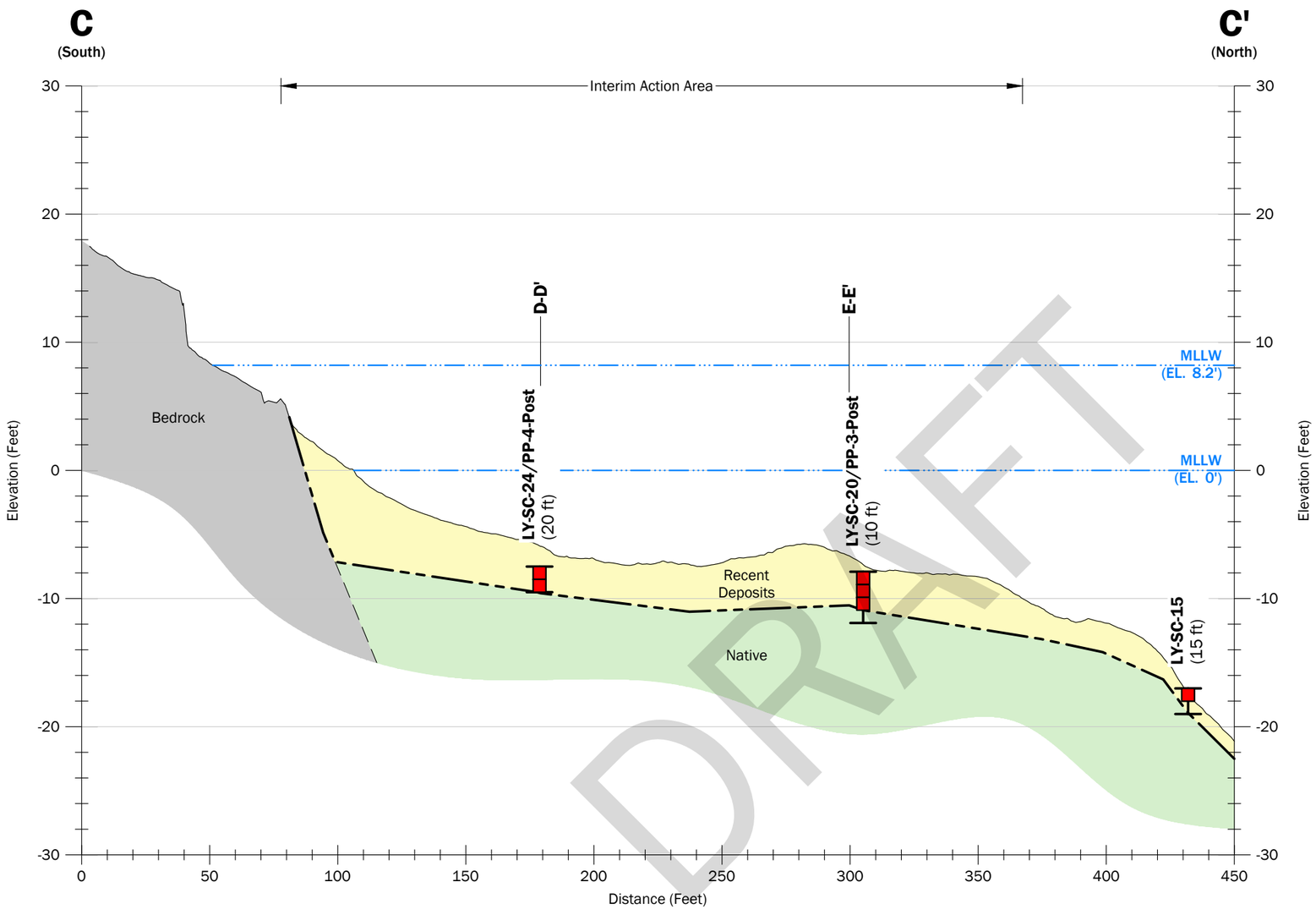
Sediment Stratigraphy Cross Section B-B'

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 6

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Legend

Sediment Core

Sample ID (Offset)

Sample Core Location/ Identification and Offset

Existing Mudline

Inferred Stratigraphic Contact

Inferred Recent/Native Contact

Sediment Sample

Sediment Sample Result Summary (See Appendix A)

One or More COCs Detected Greater than the PCUL

COCs Not Detected Greater than the PCUL

No Sample Data

Abbreviations

COC	Contaminant of Concern
EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
PCUL	Proposed Cleanup Level

Recent Deposits

Unconsolidated Sand and Silt (<10% Wood Debris)

Native Deposits

Glacialmarine Drift (Native)

Other Materials

Bedrock

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Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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Vertical Feet
Vertical Exaggeration = 5X

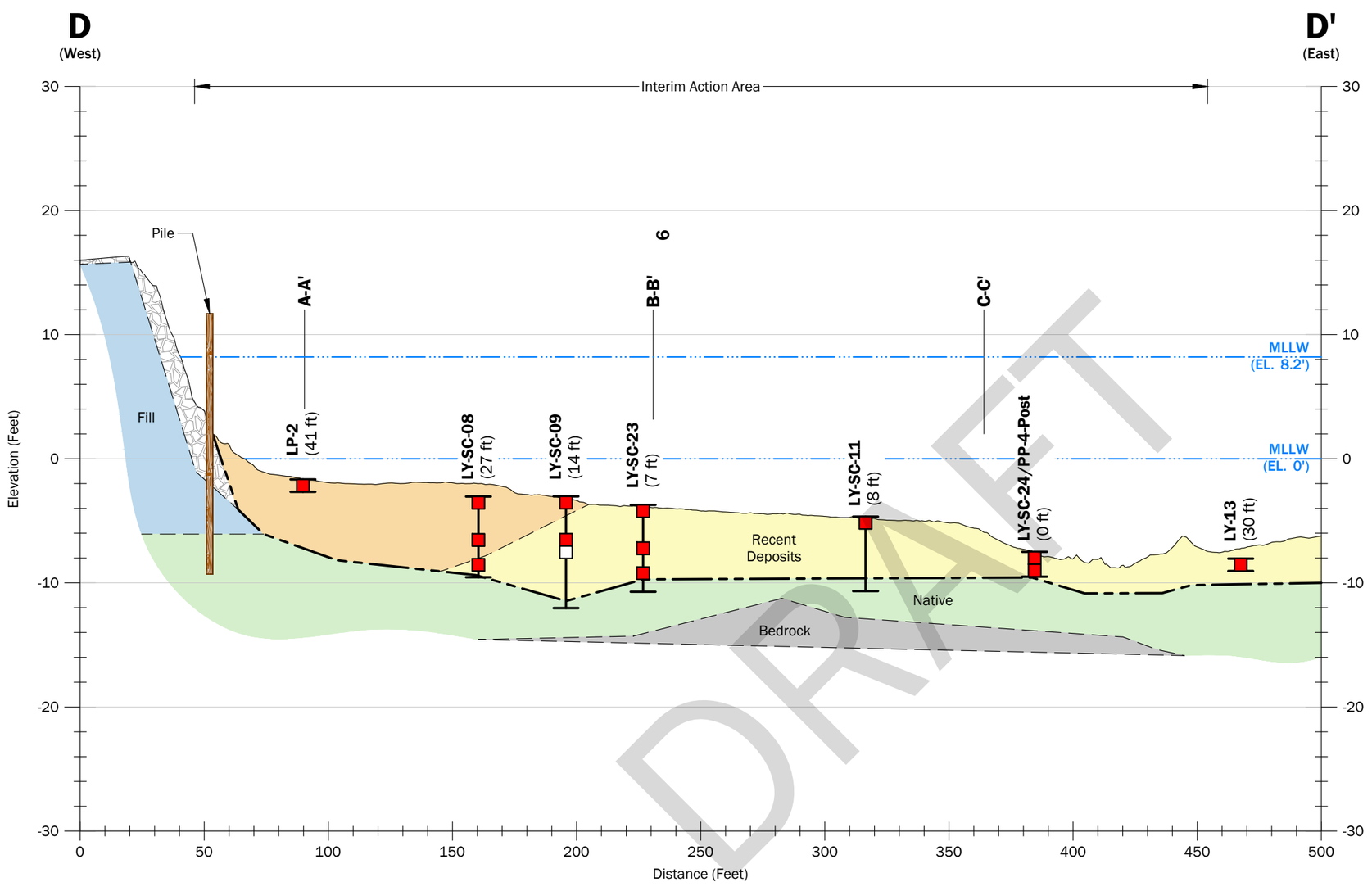
Sediment Stratigraphy Cross Section C-C'

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 7

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Legend

Sediment Core

Sample ID (Offset)

Sample Core Location/ Identification and Offset

Existing Mudline

Inferred Stratigraphic Contact

Inferred Recent/Native Contact

Sediment Sample

Sediment Sample Result Summary (See Appendix A)

One or More COCs Detected Greater than the PCUL

COCs Not Detected Greater than the PCUL

No Sample Data

Abbreviations

COC	Contaminant of Concern
EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
PCUL	Proposed Cleanup Level

Recent Deposits

Unconsolidated Sand and Silt with Wood Debris (>10%)

Unconsolidated Sand and Silt (<10% Wood Debris)

Native Deposits

Glacialmarine Drift (Native)

Other Materials

Upland Fill

Revetment Armor (Rip Rap)

Bedrock

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Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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0 50
Horizontal Feet

0 10
Vertical Feet
Vertical Exaggeration = 5X

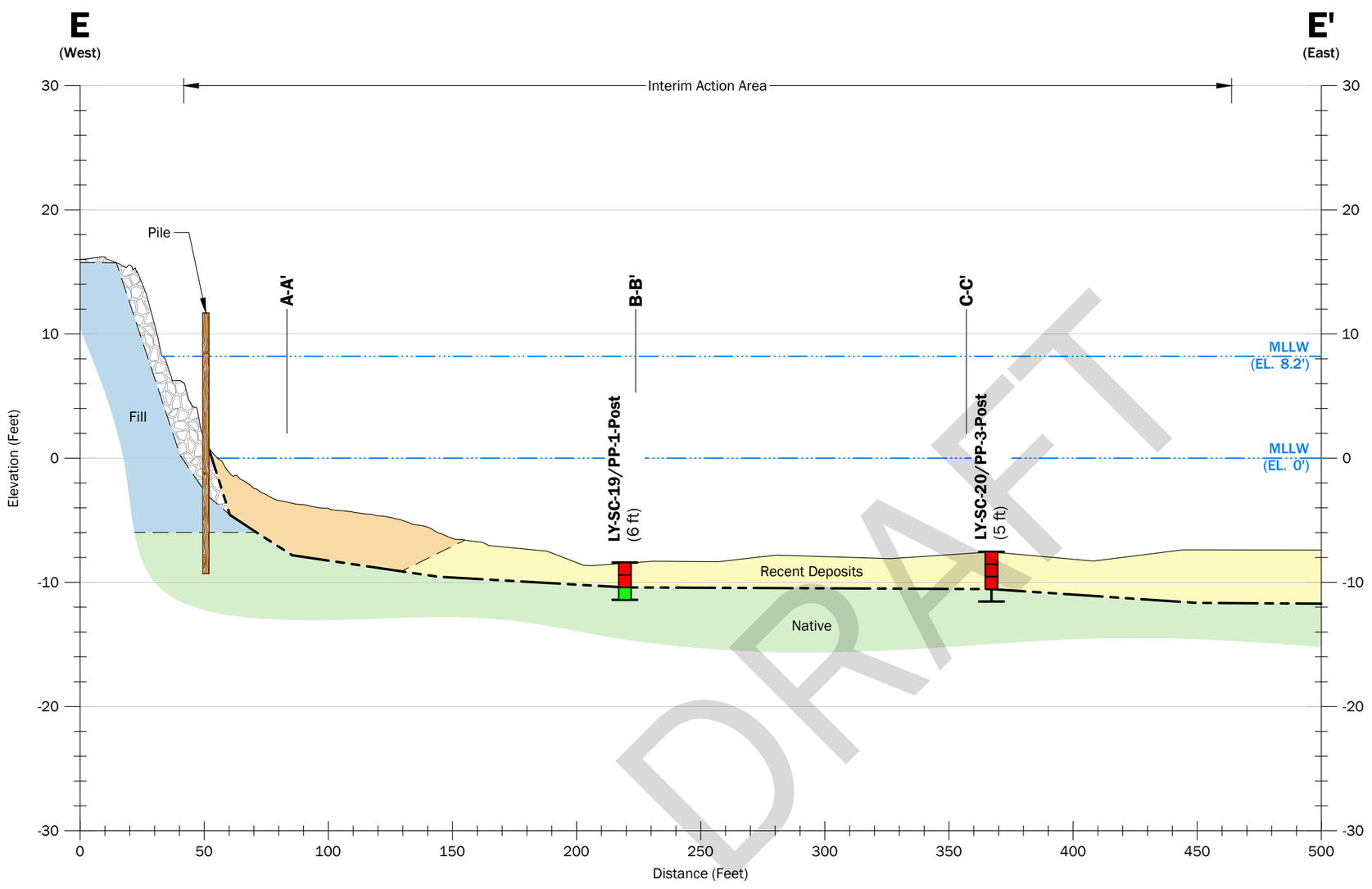
Sediment Stratigraphy Cross Section D-D'

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 8

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Legend

Sediment Core

Sample ID (Offset)

Sample Core Location/ Identification and Offset

Existing Mudline

Inferred Stratigraphic Contact

Inferred Recent/Native Contact

Sediment Sample

Sediment Sample Result Summary (See Appendix A)

One or More COCs Detected Greater than the PCUL

COCs Not Detected Greater than the PCUL

No Sample Data

Abbreviations

COC	Contaminant of Concern
EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water
PCUL	Proposed Cleanup Level

Recent Deposits

Unconsolidated Sand and Silt with Wood Debris (>10%)

Unconsolidated Sand and Silt (<10% Wood Debris)

Native Deposits

Glacialmarine Drift (Native)

Other Materials

Upland Fill

Revetment Armor (Rip Rap)

DRAFT

Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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0 50
Horizontal Feet

0 10
Vertical Feet
Vertical Exaggeration = 5X

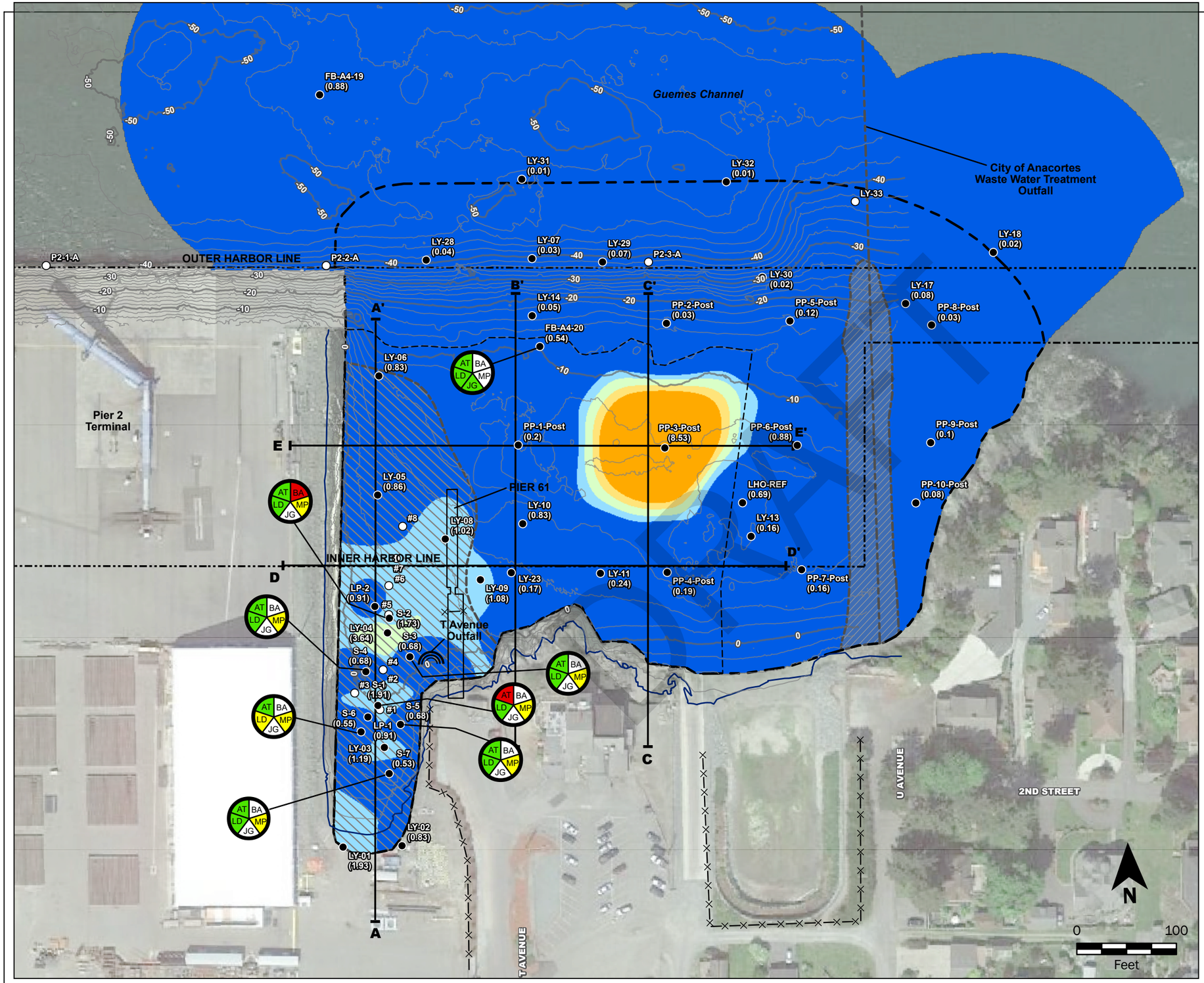
Sediment Stratigraphy Cross Section E-E'

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 9

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- Cross Section (See Figures 5 through 9)
- Extent of Wood Debris (Greater Than 10 Percent by Volume)
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

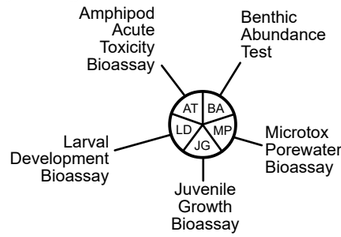
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SCO and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SCO = Sediment Cleanup Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

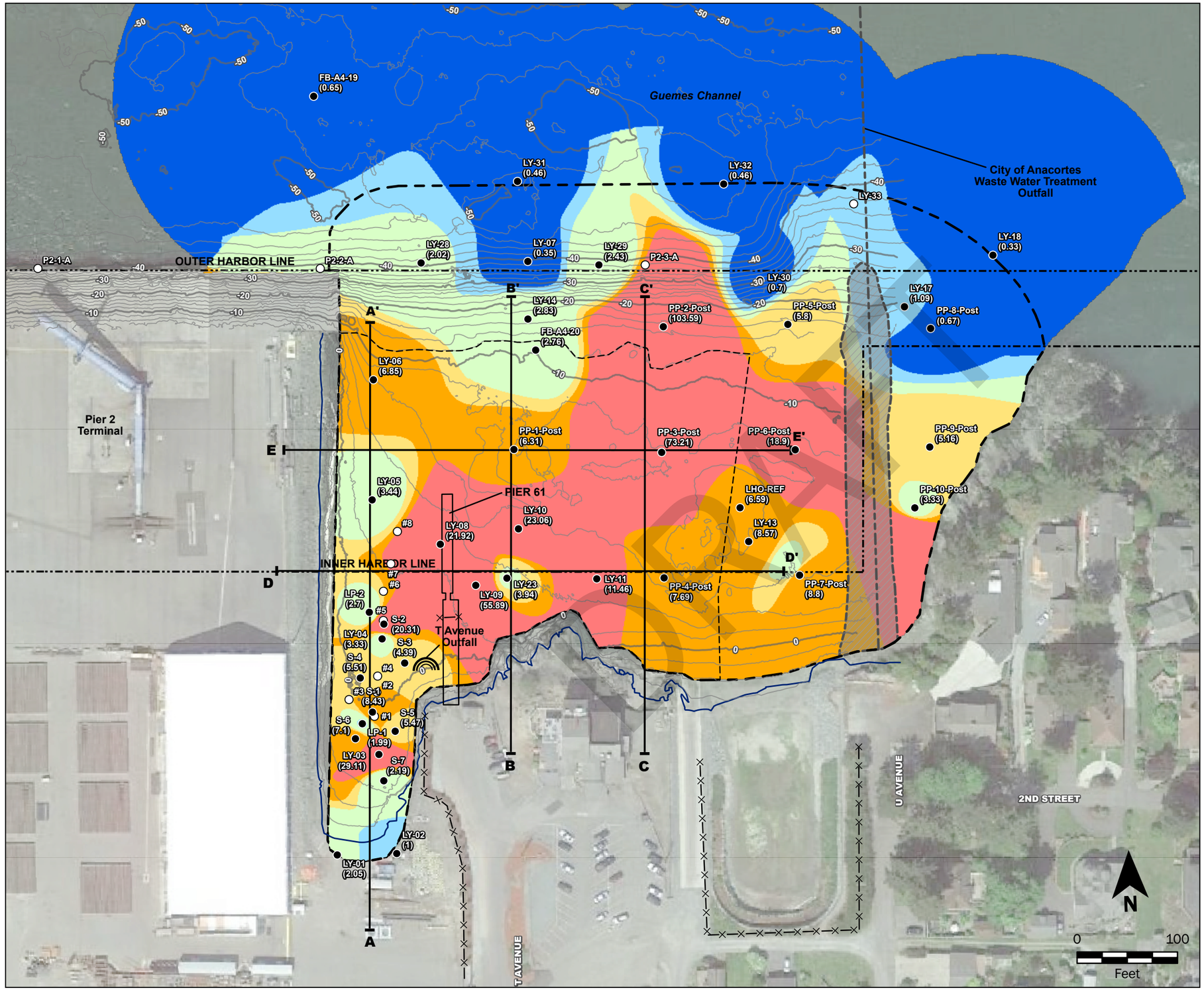
Compliance Interval Benthic PCUL Exceedance Summary

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 10

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F10_ComplianceIntervalBenthicPCULExceedanceSummary Date Exported: 05/13/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- Cross Section (See Figures 7 through 11)
- Extent of Wood Debris (Greater Than 10 Percent by Volume)
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet
PCUL = Proposed Cleanup Level
SMA = Sediment Management Area

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Compliance Interval Human Health PCUL Exceedance Summary

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 11

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Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line
- City of Anacortes Waste Water Treatment Plant Outfall
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area - Full Contaminant Removal
- Outfall
- Eelgrass Boundary (2015 Habitat Survey)
- Eelgrass Protected/Maintained
- Piling Symbol (Remove)
- Piling Symbol (Protect in Place)

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)
- Sediment Management Area 1 (SMA-1) - Full Removal of Contaminated Sediment and Partial Backfill Within Former Log Haul Out Area
- Sediment Management Area 2 (SMA-2) - Full Removal of Contaminated Sediment and Partial Backfill Within Pier 2/Wyman's Ramp Operational Area

*Remedial actions were completed in conjunction with the City of Anacortes Waste Water Treatment Outfall Dredging Project to remove previously identified contaminated sediment for permitted upland landfill disposal.

SMA = Sediment Management Area

N

0 100

Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

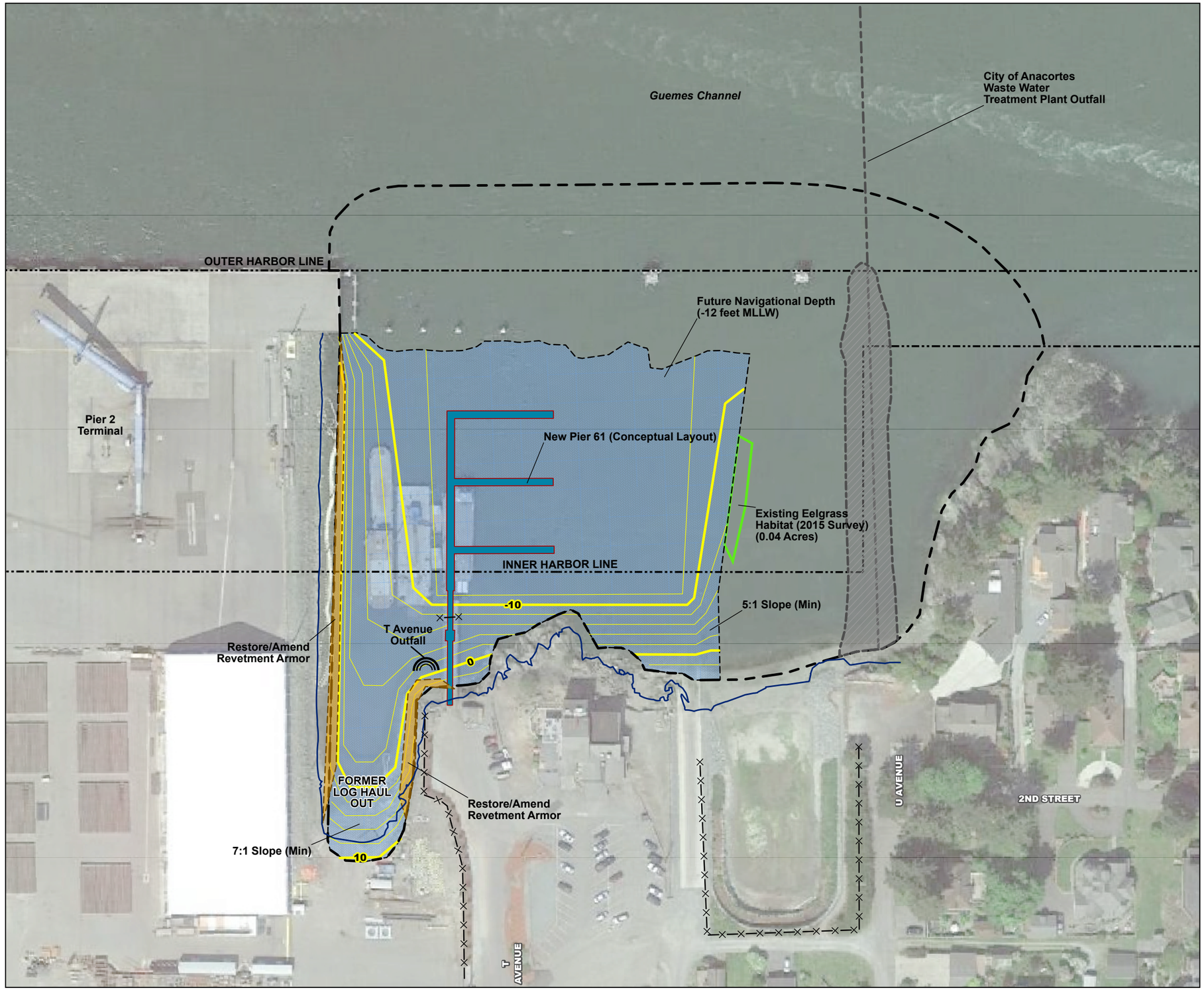
Proposed Interim Action

Anacortes Port Log Yard
Anacortes, Washington

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Figure 12

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Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line
- City of Anacortes Waste Water Treatment Plant Outfall
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area
- Outfall
- Eelgrass Boundary (2015 Habitat Survey)
- Proposed Backfill Contour (2 ft)
- Proposed Backfill Contour (10 ft)

*Remedial actions were completed in conjunction with the City of Anacortes Waste Water Treatment Outfall Dredging Project to remove previously identified contaminated sediment for permitted upland landfill disposal.

N

0 100

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Conceptual Future Land Use and Restoration

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 13

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Appendices

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Appendix A

Memorandum – Interim Action Proposal

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GeoEngineers

2101 4th Avenue, Suite 950, Seattle, Washington 98121, Telephone: 206.728.2674 www.geoengineers.com

Memorandum

To:	Corey King – Washington State Department of Ecology
From:	Robert Trahan on Behalf of Port of Anacortes
Cc:	Port of Anacortes – Jenkins Dossen Port of Anacortes – Kevin Anderson
Date:	March 23, 2026
Subject:	Proposal for Interim Action Cleanup at the Anacortes Port Log Yard Site Anacortes, Washington FSID No: 21898438 CSID No: 3604

Pursuant to Agreed Order No. DE 10630 (Agreed Order) issued by the Washington State Department of Ecology (Ecology) and in accordance with the Washington State Model Toxics Control Act (MTCA) cleanup regulations (Chapter 173-340 Washington Administrative Code [WAC]), the Port of Anacortes (Port) is proposing an Interim Action for the Anacortes Port Log Yard Site (Site) located along the shoreline of Guemes Channel at the northern terminus of T Avenue in Anacortes, Washington. The Site address is 718 4th Street, Anacortes, Washington 98221. The Interim Action will focus on implementing a partial cleanup of the Site to address sediment contamination within the current and planned future operational area and within areas containing elevated levels of wood waste resulting from historical log haul out operations (i.e., Former Log Haul Out).

The Site currently hosts Pier 61. Pier 61 is used for moorage of commercial drop-framed barges that facilitates daily transit of goods and services to and from the San Juan Islands seven (7) days a week. At present, additional moorage space and deeper navigational depths are required to support the commercial demand for Pier 61. Because of this demand, structural condition of the existing pier and presence of sediment contamination within the operational area surrounding the pier, the Port proposes an Interim Action to demolish Pier 61 and remediate the identified sediment contamination in this portion of the Site to clear environmental encumbrances for the replacement and redevelopment of Pier 61 to meet commercial demands.

The Site is shown relative to the surrounding area in Figure 1. The current Site layout, features and facilities are shown in Figures 2 through 5. Investigation activities completed to date and their results as well as an overview of the proposed Interim Action are discussed below.

PROJECT BACKGROUND

Location and Description

The Site comprises the intertidal and subtidal marine areas within an embayment along Guemes Channel at the northern terminus of T Avenue in the nearshore area northwest of 718 4th Street (Figure 2). The Site is bounded to the west by the Port's Pier 2 Marine Terminal (Pier 2), which is an earth fill structure and pile-supported wharf along the northernmost portion of the facility. The shoreline south and east of the Site includes a mixture of riprap, remnant structures, rock outcroppings, and sand and gravel beaches. A wooden dock (Pier 61) used for commercial transient vessels extending into the marine area from the southern shoreline is located within the Site. Public access to the Port's Pier 2 facility, including the beach

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area south of the Site between Pier 2 and Pier 61 (Former Log Haul Out), is currently restricted by fencing and signage that maintains security along the Port's marine terminal eastern flank.

Historically, the Site and surrounding area was used for lumber and wood milling and ship building operations from the early 1900s to 1965. In 1965, the Port purchased the Site and adjacent uplands (the "Property"). Between 1965 and 2004, the Port leased the Property to multiple tenants for log handling and loading operations. Log handling operations ceased after 2004, and the Site has remained largely unchanged since that time. The adjacent upland area is currently used for storing oil spill response booms, and Pier 61 is used for moorage of commercial vessels.

Regulatory Framework

Following the closure of log handling operations in 2004, the Port began working with Ecology to characterize sediment conditions at the Site due to evidence of degraded habitat resulting from wood debris. Initial investigations completed identified up to 75 percent wood waste by volume in shallow intertidal sediment. In addition to wood waste, the initial investigations also identified levels of organic carbon and volatile solids above recommended levels (Ecology 2013) and exceedances per Ecology's Sediment Cleanup Objective (SCO) and Cleanup Screening Level (CSL) criteria for benthic invertebrate community health (Chapter 173-204 WAC).

Based on the results of the initial and follow-up investigations, the Port entered into Agreed Order No. DE 10630 with Ecology on November 3, 2014, pursuant to MTCA. Under the Agreed Order, the Port is required to evaluate the nature and extent of contamination within affected media and develop and evaluate cleanup alternatives for addressing the identified contamination including preparation a Remedial Investigation/Feasibility Study (RI/FS) Report and Draft Cleanup Action Plan (DCAP). Provisions under the Agreed Order allow for completion of an Interim Action to facilitate cleanup activities in advance of the RI/FS and DCAP to address contamination that is an immediate threat to human health and the environment or substantially reduce one or more pathways for exposure.

AGREED ORDER REMEDIAL INVESTIGATION

As required by the Agreed Order, remedial investigation activities were completed by the Port to collect sufficient environmental data to define the nature and extent of Site contaminants (RI) and to develop and evaluate cleanup action alternatives for addressing the identified Site contamination resulting from historical land use (FS). To date, the Port has completed the following investigation activities as required by the Agreed Order and Ecology to evaluate Site conditions and fill data gaps identified by Ecology to complete the characterization of the Site:

- Initial 2015 RI to characterize Site conditions in accordance with the RI/FS Work Plan.
- Additional investigation activities in 2021 under RI/FS Work Plan Addendum No. 1 to further evaluate the nature and extent of Site contaminants in portions of the Site that were not previously identified following sediment investigation activities by the City of Anacortes (City) in 2020 as part of the Nearshore Sediment Investigation to support the City's Wastewater Treatment Outfall Project. The sediment investigation completed by the City was to inform construction decisions within the proposed outfall alignment. As part of the City's investigation, concentrations of carcinogenic polycyclic aromatic hydrocarbons (cPAHs), tributyltins (TBT), polychlorinated biphenyls (PCBs), and dioxins and furans were

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found to exceed preliminary cleanup levels (PCULs) in portions of the Site where contamination had not been previously identified.

- Additional investigation activities in 2023 under RI/FS Work Plan Addendum No. 2 to define the northern boundary of the Site as required by Ecology based on their review of the sediment data collected under RI/FS Work Plan Addendum No. 1 and the City's Wastewater Treatment Outfall Project.

Based on review of these sediment data and preliminary cleanup action alternatives developed (GeoEngineers 2023a), Ecology determined that bioassay analysis was required to evaluate potential impacts to the benthic community where monitored natural attenuation (MNA) was proposed in the eastern portion of the Site. Following this determination by Ecology, the City collected additional sediment samples as part of their outfall relocation project in 2024. The new data collected by the City was co-located with previous sample locations where MNR was proposed as a remedial alternative in the eastern portion of the Site and showed that benthic exceedances were no longer present in this area. In recent meetings, Ecology determined that the post-construction sediment data collected by the City is suitable for use to characterize the current Site conditions and that bioassay sampling and analysis was no longer required to evaluate potential impacts to the benthic community.

Sediment investigations completed at the Site and surrounding area are shown in Figure 6. A schedule of analysis for sediment samples collected by the Port and others to characterize Site conditions is presented in Table 1. Sediment data collected by the Port as part of the Agreed Order as well as prior investigations are presented in Data Report Technical Memoranda (GeoEngineers 2017, GeoEngineers 2022 and GeoEngineers 2023b) prepared to document Site conditions as required by Ecology. Sediment investigation activities associated with the City's Wastewater Treatment Outfall Project are presented in the Pre/Post-Construction Perimeter Sampling Report (Geosyntec 2025).

Conceptual Site Model

A preliminary conceptual site model (CSM) was developed for the Site as part of the RI/FS Work Plan. The preliminary CSM summarized potential contaminant sources, release mechanisms, transport processes, and exposure routes by which receptors may be affected by Site contaminants based on existing information. The CSM serves as the basis for the development of the preliminary cleanup levels and point of compliance for which the cleanup levels must be met. The CSM for the Site is shown in Figure 7 and has been revised from the RI/FS Work Plan to incorporate the results of the Agreed Order investigation and environmental investigations completed by others. The CSM is represented as a generalized cross section of the Site to illustrate the range of physical conditions and potential contaminant transport and exposure pathways present.

Preliminary Cleanup Levels

Preliminary screening levels developed during preparation of the RI/FS Work Plan were revised to meet current standards published in Ecology's Sediment Cleanup Users' Manual (SCUM; Ecology 2021) and Ecology's February 2025 Cleanup Levels and Risk Calculation (CLARC) data tables to evaluate contaminant nature and extent. Screening levels for the protection of the benthic community (Benthic PCULs) presented in Table 2 are numeric SCOs from the Sediment Management Standards (SMS; WAC 173-204-562) that correspond to sediment quality that will result in no adverse effects to the benthic community. Screening levels for the protection of human health and higher trophic ecological receptors (Human Health PCULs)

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presented in Table 3 are for human health exposure to sediment via ingestion and dermal contact utilizing equations and parameter values from Ecology's SCUM guidance and CLARC data tables. The PCULs based on sediment ingestion and dermal contact were developed for the following potential receptors:

- A child exposed during beach play.
- An adult exposed during clam digging (subsistence harvesting).
- An adult exposed during net fishing (subsistence harvesting).

For evaluating exposure scenarios, the intertidal area is defined as beach above -3 feet mean lower low water (MLLW) and the subtidal area as below -3 feet MLLW. Children exposed to sediment during beach play and adults exposed to sediment during clam digging are assumed to be exposed primarily to intertidal sediment (at elevations greater than -3 feet MLLW). The potential exposure scenario for net fishing relates to both intertidal and subtidal sediment. In accordance with SCUM, area weighted average concentrations within the sediment compliance interval were used to screen bioaccumulative contaminants of potential concern.

Point of Compliance

In accordance with SMS requirements, the point of compliance for protection of benthic organisms and human health is represented by the biologically active zone (BAZ) in sediment. However, SCUM also requires that the point of compliance consider site-specific circumstances such as the potential to be disturbed by beach play and clam digging or by scour due to vessel activity, wave action, anchor drag, etc. which may be deeper than the typical depth for the exposure pathway and receptors of concern. A preliminary evaluation of Site conditions has identified the following sediment compliance intervals for the Site:

- **Intertidal Area** – The compliance interval for the intertidal area is 0 to 45 centimeters (cm). This compliance interval considers the following:
  - **BAZ** – In accordance with SCUM, the typical BAZ for Puget Sound is from 0 to 10 cm.
  - **Potential for Scour by Wave Action and Vessel Activity** – Based empirical evidence from bathymetric survey data (Attached), the depth of scour resulting from wave action and vessel activity is estimated to be up to 1-foot below mudline outside of the current/future operational area.
  - **Burrowing Depth of Potential Harvestable Resources** – A biological evaluation completed during the initial RI did not identify evidence of deep burrowing bivalve species (i.e., horse clams or geoduck) in the intertidal portion of the Site. As a result, a burrowing depth of up to approximately 1-foot is assumed for potential harvestable resources based on the typical burrowing depth of other common indicate bivalve species in Puget Sound (e.g., cockles, manilas and butter clams).
  - **Beach Play** – To ensure protection of human health, potential sediment disturbance up to 45 cm is assumed under the beach play scenario.
- **Subtidal Area** – The compliance interval for the subtidal area is 0 to 1-foot. This compliance interval considers the following:
  - **BAZ** – Assumed to be from 0 to 10 cm for typical Puget Sound sediment.
  - **Net Fishing** – Consistent with SCUM, the BAZ is assumed under the net fishing scenario.

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- **Potential for Scour from Anchor Drag and Vessel Activity** – Based empirical evidence from bathymetric survey data (Attached) and discussions with Ecology, a scour depth resulting from anchor drag and vessel activity it estimated to be up to 1-foot below mudline outside of the current/future operational area.

- **Operational Areas** – The compliance interval for the Pier 61 and Wyman's Ramp operational areas is 0 to 2 feet. This compliance interval considers the following:

  - **BAZ** – Assumed to be from 0 to 10 cm for typical Puget Sound sediment.
  - **Net Fishing (Subtidal Area Only)** – Assumed to be from 0 to 10 cm consistent with the BAZ.
  - **Potential for Scour by Wave Action and Vessel Activity** – The operational area includes both intertidal and subtidal areas of the Site that are subject to vessel scour resulting from commercial operations and is estimated to be up to 2 feet based empirical evidence from bathymetric survey data (Attached).
  - **Burrowing Depth of Potential Harvestable Resources (Intertidal Area Only)** – Assumed to be up to 1-foot based on a biological evaluation of the Site during the initial RI and typical burrowing depth of common bivalve species in Puget Sound.
  - **Beach Play (Intertidal Area Only)** – Up to 45 cm is assumed under a typical beach play scenario.

Sediment compliance intervals based on tidal zone and operational area are shown in Figure 8.

Contaminant Nature and Extent

The spatial distribution of wood debris, conventional parameters, and contaminants screened for the protection of benthic organisms and for the protection of human health for the sediment compliance interval and underlying recent sediment deposits are presented in Figures 9 through 86 utilizing inverse distance weighting (IDW) on a point-by-point basis in accordance with SCUM. Table 3 presents the summary statistics for sediment data compared to the Benthic PCULs. Table 4 presents the summary statistics for sediment data compared to the Human Health PCULs. Tables 5 and 6 present the RI data set which provides the basis for the statistical evaluation presented in Tables 3 and 4, respectively. In coordination with Ecology, previously collected sediment data that are co-located with the recent sediment data collected by the City as part of the Wastewater Treatment Outfall Project are not used as part of the RI data set to define contaminant nature and extent.

The estimated thickness of contamination based on observed sediment conditions is shown in Figure 87 and is used as the basis for developing preliminary Interim Action volume estimates further discussed below.

Contaminants of Concern

The following contaminants of concern (COCs) are identified within the sediment compliance interval based on exceedance of the Benthic and Human Health PCULs:

- **Benthic COCs** – Zinc, low molecular weight polycyclic aromatic hydrocarbons (LPAHs) including acenaphthene, fluorene and phenanthrene, high molecular weight polycyclic aromatic hydrocarbons (HPAHs) including total benzofluoranthenes, chrysene, fluoranthene, pyrene and sum of HPAHs, bis(2-ethylhexyl) phthalate and 4-methyphenol are identified as benthic COCs because one or more of these contaminants were detected at a concentration exceeding the Benthic PCUL.

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- **Human Health COCs** – Copper, total cPAHs calculated using the toxicity equivalency quotient (TEQ) methodology relative to benzo(a)pyrene, PCBs, total dioxin-like PCB TEQ and total dioxin and furan TEQ.

Additionally, wood debris which may cause or contribute to sediment impacts is managed by Ecology as a deleterious substance under SMS. Based on bioassay test data, visual wood debris greater than approximately 10 percent by volume is identified as a substance of concern (SOCs) requiring cleanup evaluation.

An overview of the Benthic and Human Health PCUL exceedances for the sediment compliance interval is shown in Figures 88 and 89, respectively.

PROPOSED INTERIM ACTION

Overview

Dredging is proposed for the Interim Action to remove identified contaminated sediment and increase navigational access for the replacement and redevelopment of Pier 61. The Interim Action also includes removal of contaminated sediment and sediment containing wood debris greater than 10 percent by volume observed in the Former Log Haul Out Area due to potential access restrictions that would result following replacement and redevelopment of Pier 61 and the limited draft currently observed in this area. Additionally, the Interim Action would include demolition and replacement of the existing Pier 61 structure. A recent survey of the pier structure by PND Engineers, Inc. (PND) concluded that the current condition of the timber piles supporting the pier structure is generally poor with significant section loss visible from deterioration and marine borer damage. Based on this evaluation, dredging to remove contaminated sediment beneath or surrounding the pier would likely cause irreversible damage to the structure necessitating its removal as a component of the proposed Interim Action. Overall, the Interim Action area encompasses approximately 51 percent of the Site and would result in the full removal of Benthic PCUL exceedances and wood waste identified as a SOC.

The conceptual layout for the new Pier 61 structure and operational area requiring deepening to support the future anticipated navigational draft depth is shown in Figure 90. The proposed Interim Action to support the Port's Pier 61 replacement and redevelopment project is shown in Figure 90.

Interim Action Dredging

To assist in the development and evaluation of remedial alternatives, the Site has been divided into six separate sediment management areas (SMA) based on environmental conditions and other factors that could affect the applicability of specific remedial technologies and the feasibility of their implementation. As discussed below, the proposed Interim Action considers the final overall cleanup action for the Site. SMAs developed as part of the preliminary evaluation of remedial technologies and cleanup alternatives for the Site are shown in Figure 91.

Within the operational area portion of the proposed Interim Action (SMA-1c, SMA-2c, SMA-2b, SMA-2d and SMA-2e; Figure 90), an estimated 10,500 cubic yards (CY) of contaminated and 17,800 CY of underlying clean sediment will be removed to meet a navigation depth of -12 feet MLLW with a 1-foot over-dredge allowance. The proposed dredge prism for this area is estimated to be approximately 2.3 acres (99,400 square feet). Based on stable side slopes within the other portions of the Site, a 3-foot horizontal

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to 1-foot vertical (3H:1V) slope is anticipated within the operational area to transition from the proposed navigation dredge base to existing mudline elevations east, west and south of the operational area to meet the future navigational draft depths (Figure 90).

Within the other portions of the proposed Interim Action including Former Log Haul Out and shoreline areas (SMA-1a, SMA-1b, SMA-1d and SMA-2a; Figure 91) an estimated 16,200 CY of contaminated sediment will be removed followed by the placement of imported material to resemble existing mudline elevations. Remedial technologies including partial sediment removal and capping in these areas were considered. However, due to the conceptual nature of the Pier 61 replacement and redevelopment design, additional information will be required to verify transitional slope gradients and the actual area requiring deepening to meet the future navigational draft depth needs. Additionally, because the future land use for the Former Log Haul Out area is unknown, full removal and backfill was the only technology considered to prevent limiting the future use of this area by the Port.

Dredged Material Handling, Transport and Disposal

Contaminated dredged material that is unsuitable for open water disposal will be placed on a barge and transported to an upland transload facility using land-based excavation equipment. The dredged material will be offloaded at an appropriate transload facility. The dredged material that is offloaded to a transload facility will be transported via trucks and/or train for disposal at an appropriate permitted upland landfill.

It is assumed that dredged material underlying the contaminated sediment layer will be suitable for open water disposal. Upon verification that the contaminated sediment has been successfully removed from the Site, the open water suitable material will be dredged and placed on a disposal barge (dump scow). The dump scow will be towed to the open water disposal site. Once the dump scow reaches the open water disposal site and is positioned over the site, the bottom of the dump scow will be opened, and the dredged material will be released in accordance with the approved aquatic use authorization. Dredge material that is suitable for open water disposal is expected to be disposed at the Rosario Strait open-water dispersive site.

Environmental Protection During Construction

Proposed Interim Action activities will be performed in compliance with regulatory and permit requirements including implementation of best management practices (BMPs) to protect the environment during construction. The following regulatory and permit requirements are anticipated for Proposed Interim Action construction activities:

- Dredging and other marine work will occur within the permitted, allowed in-water work windows.
- The contractor will be required to prepare a construction Spill Prevention, Control and Countermeasures (SPCC) Plan for the project.
- Work will be performed in accordance with Ecology Water Quality Certification (WQC) requirements.
- Water quality monitoring will be performed during dredging and placement of fill material to ensure compliance with the WQC requirements.
- Work will be performed in compliance with all applicable local, state and federal regulations and restrictions (e.g., Washington Department of Fish and Wildlife [WDFW] Hydraulic Project Approval [HPA],

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Department of Ecology Section 401 Clean Water Certification, local Critical Areas Ordinance and land use regulations, Shoreline Master Program, State Environmental Policy Act [SEPA] and U.S. Army Corps of Engineers [USACE] Section 10 [Rivers and Harbors Act]).

Cultural Resources

Potentially significant archaeological materials are not anticipated at the Site based on prior cultural assessments completed and consultations with the Department of Historical Preservation (DAHP). However, it is possible that archaeological materials may be encountered during construction. Procedures for the inadvertent discovery of cultural resources will be developed in consultation with Ecology prior to construction.

Interim Action Work Plan and Completion Reporting

In accordance with the Agreed Order, an Interim Action Work Plan describing the details of the proposed actions will be developed for Ecology acceptance and public review. It is anticipated that additional sampling and analysis will be required to further refine the vertical extent of contamination with the proposed Interim Action area and that the underlying material generated to meet the future navigational depths will be suitable for open-water disposal. Dredged material characterization will be required in accordance with the USACE Dredged Material Management Program (DMMP) to obtain an open-water disposal suitability determination. The details of the additional sampling and analysis, and quality assurance and quality control procedures be incorporated into the Interim Action Work Plan to meet the requirements of the Agreed Order.

Upon completion of the construction activities, an Interim Action Completion Report that describes the construction of the Interim Action will be prepared and submitted to Ecology for review and approval in accordance with the requirements of the Agreed Order. Additionally, the results of the Interim Action, as described in the final Interim Action Completion Report, will be incorporated into the RI/FS for the Site.

Habitat Mitigation

The dredging activity will result in the permanent loss of approximately 1.7 acres of shallow water habitat (area shallower than -10 feet MLLW) and up to approximately 1.1 acres of eelgrass habitat. The Port will evaluate options to mitigate for the loss of this habitat either through the application of habitat credits or potential habitat restoration opportunities in conjunction with the cleanup action on Site, at the nearby Quiet Cove Site (FSID 20859; CSID 12482) or other potential surrounding sites. Habitat mitigation will be further evaluated as part of the project permitting process.

Coordination with Final Cleanup Action

The Port is required to complete the RI/FS and DCAP in accordance with the Agreed Order to identify the appropriate cleanup action for the Site. This proposal for Interim Action cleanup is being presented to support the Port's replacement and redevelopment of Pier 61 to meet commercial demands for drop-framed transit vessels moorage and navigational drafts. The Agreed Order specifies that with congruence with Ecology, the Port may complete an Interim Action to reduce the potential threat to human health and the environment. The Interim Action will be implemented in advance of selecting the final cleanup action for the Site and will not preclude reasonable alternatives for the final cleanup action (WAC 173-340-

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430(3)(b)). The action is interim or temporary and will be in place until the final cleanup action is implemented for the Site.

The RI/FS for the Site will identify the completion of the Interim Action as part of the Site conditions. The RI/FS will identify appropriate alternatives for the final cleanup of the Site. The final cleanup action will include integration of the cleanup remedy for the Interim Action area.

SCHEDULE

Dredging and other Interim Action activities will occur within the permitted, allowable in-water work windows. The Port is currently in the preliminary planning stages and will continue to coordinate these efforts with Ecology for approval. It is currently anticipated that construction activities will be completed within the 2027/2028 in-water work window. Specific project milestones will be developed in concert with Ecology to prepare a detailed remedial design, Interim Action Work Plan and project required permits.

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Attachments:

Tables:

- Table 1. Schedule of Laboratory Analysis for Sediment Investigations
- Table 2. Sediment Cleanup Levels for the Protection of Benthic Organisms
- Table 3. Sediment Cleanup Levels for the Protection of Human Health and Higher Trophic Level Ecological Receptors
- Table 4. Summary Statistics and Evaluation of Contaminants of Concern for the Protection of Benthic Organisms
- Table 5. Summary Statistics and Evaluation of Contaminants of Concern for the Protection of Human Health and Higher Trophic Level Ecological Receptors
- Table 6. Summary of Sediment Analytical Results for the Protection of Benthic Organisms
- Table 7. Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Figures:

- Figure 1. Vicinity Map
- Figure 2. Site Plan
- Figure 3. Parcel Boundaries
- Figure 4. Stormwater Network and Outfalls
- Figure 5. Eelgrass and Macroalgae Habitat
- Figure 6. Sediment Investigations
- Figure 7. Conceptual Site Model
- Figure 8. Sediment Compliance Intervals
- Figure 9-18. Conventional Parameter Results Summary
- Figure 19-48. Benthic Results Summary
- Figure 49-86. Human Health Results Summary
- Figure 87. Contaminated Sediment Thickness
- Figure 88. Compliance Interval Benthic PCUL Exceedances
- Figure 89. Compliance Interval Human Health PCUL Exceedances
- Figure 90. Conceptual Pier 61 Redevelopment and Operations Area Layout
- Figure 91. Proposed Interim Action

Bathymetric Survey

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Tables

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Table 1

Schedule of Laboratory Analysis for Sediment Investigations

Anacortes Port Log Yard

Anacortes, Washington

Sample Location[1]	Sample Identification	Date Sampled	Sample Interval	Conventional Analyses[2]								Chemical Analyses[2]													
				TOC	TVS	TS	Porewater Ammonia	Total Ammonia	Porewater Sulfide	Total Sulfide	Grain Size	TBT	Metals	LPAHs	HPAHs	cPAHs	Chlorinated Hydrocarbons	Phthalates	Miscellaneous Extractables	Phenols	Pesticides	PCB Aroclors	PCB Congeners	Dioxins and Furans	Bioassay
2004 Sediment Investigation (Floyd|Snider 2004)																									
LP-1	LP-1	07/13/04	0-10 cm	●	●	●		●		●	●		●	●	●	●	●	●	●	●		●			
LP-2	LP-2	07/13/04	0-10 cm	●	●	●		●		●	●		●	●	●	●	●	●	●	●		●			
2007 Sediment Investigation (SAIC 2008)																									
FB-A4-19	FB-A4-19	09/05/07	0-10 cm	●	●			●		●	●		●	●	●	●	●	●	●	●		●			
FB-A4-20	FB-A4-20	09/05/07	0-10 cm	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	●
FB-A4-21	FB-A4-21	09/05/07	0-10 cm	●	●	●		●		●	●		●	●	●	●	●	●	●	●		●			
2008 Sediment Investigation (GeoEngineers 2008)																									
S-1	S-1	08/28/08	0-10 cm	●		●		●		●			●	●	●	●	●	●	●	●		●			●
S-2	S-2	08/28/08	0-10 cm	●		●		●		●			●	●	●	●	●	●	●	●		●			●
2009 Sediment Investigation (GeoEngineers 2010)																									
S-3	S-3	09/01/09	0-10 cm	●	●	●		●		●			●	●	●	●	●	●	●	●		●		●	●
S-4	S-4	09/01/09	0-10 cm	●	●	●		●		●			●	●	●	●	●	●	●	●		●			●
S-5	S-5	09/01/09	0-10 cm	●	●			●		●			●	●	●	●	●	●	●	●		●			●
S-6	S-6	09/01/09	0-10 cm	●	●	●		●		●			●	●	●	●	●	●	●	●		●			●
S-7	S-7	09/01/09	0-10 cm	●	●	●		●		●			●	●	●	●	●	●	●	●		●			●
2010 Sediment Investigation (GeoEngineers 2011)																									
LHO-REF	LHO-REF	10/14/10	0-10 cm	●		●							●	●	●	●	●	●	●	●		●			
	DUP(LHO-REF)	10/14/10	0-10 cm	●		●							●	●	●	●	●	●	●	●		●			
2012 Pier 2 DMMP Sediment Investigation (GeoEngineers 2013)																									
P2-1/P2-2/ P2-3	P2-1-A-COMP (P2-1/P2-2/P2-3)	11/16/12	0-4 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	
	P2-1-B-COMP (P2-1/P2-2/P2-3)	11/16/12	0-4 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	
	P2-1-Z-COMP (P2-1/P2-2/P2-3)	11/16/12	0-4 ft	●	●			●		●	●	●	●	●	●	●	●	●	●	●	●	●		●	
P2-1	P2-1-A	11/14/12	0-4 ft			●						●													
P2-2	P2-2-A	11/15/12	0-4 ft			●						●													
P2-3	P2-3-A	11/16/12	0-4 ft			●						●													
2015 Sediment Investigation (GeoEngineers 2015)																									
LY-01	LY-SS-01_0-10	11/17/15	0-10 cm	●	●	●					●		●	●	●	●	●	●	●	●				●	
LY-02	LY-SS-02_0-10	11/17/15	0-10 cm	●	●	●					●		●	●	●	●	●	●	●	●					
LY-03	LY-SS-03_0-10	11/17/15	0-10 cm	●	●		●		●		●		●	●	●	●	●	●	●	●			●	●	
	LY-SS-Dup-01 (LY-SS-03_0-10)	11/17/15	0-10 cm	●	●	●	●		●		●		●	●	●	●	●	●	●	●			●	●	
	LY-SC-03_3-4	11/18/15	3-4 ft	●	●	●	●		●		●		●	●	●	●	●	●	●	●			●		
	LY-SC-03_4-5	11/18/15	4-5 ft	●		●									●	●			●	●					
LY-04	LY-SS-04_0-10	11/17/15	0-10 cm	●	●	●	●		●		●		●	●	●	●	●	●	●	●			●		
	LY-SC-04_3-4	11/18/15	3-4 ft	●	●	●					●		●	●	●	●	●	●	●	●					
	LY-SC-Dup-02 (LY-SC-04_3-4)	11/18/15	3-4 ft	●	●		●				●		●	●	●	●	●	●	●	●					
LY-05	LY-SS-05_0-10	11/17/15	0-10 cm	●	●	●	●		●		●		●	●	●	●	●	●	●	●			●		
	LY-SC-05_1-2	11/19/15	1-2 ft	●		●							●	●	●	●									
	LY-SC-05_3-4	11/19/15	3-4 ft			●	●						●												
	LY-SC-05_4-5	11/19/15	4-5 ft			●							●												
LY-06	LY-SS-06_0-10	11/17/15	0-10 cm	●	●	●	●		●		●	●	●	●	●	●	●	●	●	●			●	●	
	LY-SS-Dup-02 (LY-SS-06_0-10)	11/17/15	0-10 cm	●	●	●	●		●		●	●	●	●	●	●	●	●	●	●			●	●	
	LY-SC-06_3-4	11/19/15	3-4 ft			●	●		●			●													
	LY-SC-06_4-5	11/19/15	4-5 ft	●		●							●		●	●				●			●		
LY-07	LY-SS-07_0-10	11/17/15	0-10 cm	●		●					●	●											●		
	LY-SC-07_0-1	11/20/15	0-1 ft	●		●									●	●									
	LY-SC-07_3-4	11/20/15	3-4 ft			●						●													
LY-08	LY-SS-08_0-10	11/17/15	0-10 cm	●	●	●	●		●		●	●	●	●	●	●	●	●	●	●			●	●	
	LY-SC-08_3-4	11/20/15	3-4 ft	●	●		●		●		●	●	●	●	●	●	●	●	●	●					
	LY-SC-08_5-6	11/20/15	5-6 ft	●		●								●	●	●								●	
LY-09	LY-SS-09_0-10	11/17/15	0-10 cm	●	●	●	●		●		●		●	●	●	●	●	●	●	●					
	LY-SC-09_2-3	11/18/15	2-3 ft	●		●							●	●	●	●									
	LY-SC-09_3-4	11/18/15	3-4 ft			●	●		●																
LY-10	LY-SS-10_0-10	11/17/15	0-10 cm	●	●	●	●		●		●		●	●	●	●	●	●	●	●			●	●	
	LY-SC-10_0-1	11/18/15	0-1 ft	●		●									●	●									
LY-11	LY-SS-11_0-10	11/17/15	0-10 cm	●											●	●							●		
	LY-SC-11_0-1	11/19/15	0-1 ft	●		●									●	●									
LY-13	LY-SS-13_0-10	11/17/15	0-10 cm	●											●	●							●		

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Sample Location[1]	Sample Identification	Date Sampled	Sample Interval	Conventional Analyses[2]								Chemical Analyses[2]												
				TOC	TVS	TS	Porewater Ammonia	Total Ammonia	Porewater Sulfide	Total Sulfide	Grain Size	TBT	Metals	LPAHs	HPAHs	cPAHs	Chlorinated Hydrocarbons	Phthalates	Miscellaneous Extractables	Phenols	Pesticides	PCB Aroclors	PCB Congeners	Dioxins and Furans	Bioassay
2020 Nearshore Sediment Characterization (DOF 2021)																								
COA-01	COA_01_G_20201120	11/20/20	0-10 cm	●	●			●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-02	COA_02_G_20201119	11/19/20	0-10 cm	●	●			●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-03	COA_03_G_20201118	11/18/20	0-10 cm	●	●			●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-04	COA_04_G_20201118	11/18/20	0-10 cm	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-05	COA_05_G_20201119	11/19/20	0-10 cm	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA_05-D_G_20201119	11/19/20	0-10 cm	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-06	COA_06_G_20201120	11/20/20	0-10 cm	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
	COA_06-D_G_20201120	11/20/20	0-10 cm	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-07	COA_07_G_20201118	11/18/20	0-10 cm	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-08	COA_08_G_20201119	11/19/20	0-10 cm	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
COA-SS-1	COA-SS-1-1-3-20201116	11/16/20	1-3 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-1-3-5-20201116	11/16/20	3-5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-1-6.5-8.5-20201116	11/16/20	6.5-8.5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
COA-SS-2	COA-SS-2-1.5-3.5-20201118	11/18/20	1.5-3.5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-2-3.5-5.5-20201118	11/18/20	3.5-5.5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-2-5.5-7.5-20201118	11/18/20	5.5-7.5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-2-7.5-9.5-20201118	11/18/20	7.5-9.5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
COA-SS-3	COA-SS-3-1-3-20201118	11/18/20	1-3 ft	●	●	●		●		●		●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-3-3-5-20201118	11/18/20	3-5 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-3-5-7-20201118	11/18/20	5-7 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
	COA-SS-3-7-9-20201118	11/18/20	7-9 ft	●	●	●		●		●	●	●	●	●	●	●	●	●	●	●		●		●	
2021 Supplemental Sediment Investigation (GeoEngineers 2021)																								
LY-14	LY-SS-14_0-10	08/30/21	0-10 cm	●		●									●	●						●			
	LY-SC-14_0-1	08/31/21	0-1 ft	●		●									●	●						●			
	LY-SC-14_1-2	08/31/21	1-2 ft	●																		●			
LY-15	LY-SS-15_0-10	08/30/21	0-10 cm	●											●	●						●			
	LY-SC-15_0-1	09/02/21	0-1 ft	●											●	●						●			
LY-16	LY-SS-16_0-10	08/30/21	0-10 cm	●								●			●	●						●			
	LY-SC-16_1-2	09/02/21	1-2 ft	●								●			●	●						●			
LY-17	LY-SS-17_0-10	08/31/21	0-10 cm	●								●			●	●						●			
	LY-SC-17_1-2	09/01/21	1-2 ft	●		●						●			●	●						●			
LY-18	LY-SS-18_0-10	08/30/21	0-10 cm			●									●	●									
	LY-SC-18_0-1	09/01/21	0-1 ft			●									●	●									
LY-19	LY-SS-19_0-10	08/30/21	0-10 cm	●		●						●			●	●						●			
	LY-SC-19_1-2	08/31/21	1-2 ft	●											●	●						●			
	LY-SC-19_2-3	08/31/21	2-3 ft	●																		●			
LY-20	LY-SS-20_0-10	08/30/21	0-10 cm	●		●						●			●	●						●		●	
	LY-SC-20_1-2	08/31/21	1-2 ft												●	●								●	
	LY-SC-20_2-3	08/31/21	2-3 ft	●											●	●						●			
LY-21	LY-SS-21_0-10	08/30/21	0-10 cm	●		●						●			●	●						●			
	LY-SC-21_1-2	09/02/21	1-2 ft	●								●			●	●						●			
LY-22	LY-SS-22_0-10	08/31/21	0-10 cm	●								●			●	●						●			
	LY-SS-22_Dup-1 (LY-SS-22_0-10)	08/31/21	0-10 cm	●		●						●			●	●						●			
	LY-SC-22_1-2	09/01/21	1-2 ft	●		●						●			●	●						●			
LY-23	LY-SS-23_0-10	08/30/21	0-10 cm			●									●	●									
	LY-SC-23_2-3	08/31/21	2-3 ft	●		●									●	●						●			
	LY-SC-23_5-6	08/31/21	5-6 ft			●									●	●									
LY-24	LY-SS-24_0-10	08/30/21	0-10 cm												●	●									
	LY-SC-24_0-1	08/30/21	0-1 ft	●								●										●			
	LY-SC-24_1-2	09/01/21	1-2 ft												●	●									
LY-25	LY-SS-25_0-10	08/30/21	0-10 cm	●								●			●	●						●		●	
	LY-SC-25_1-2	09/02/21	1-2 ft	●		●						●			●	●						●		●	
	LY-SC-25_3-4	09/02/21	3-4 ft									●			●	●									
LY-26	LY-SS-26_0-10	08/31/21	0-10 cm	●		●						●			●	●						●		●	
	LY-SS-26_Dup-1 (LY-SS-26_0-10)	08/31/21	0-10 cm	●		●						●			●	●						●		●	

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Sample Location[1]	Sample Identification	Date Sampled	Sample Interval	Conventional Analyses[2]								Chemical Analyses[2]													
				TOC	TVS	TS	Porewater Ammonia	Total Ammonia	Porewater Sulfide	Total Sulfide	Grain Size	TBT	Metals	LPAHs	HPAHs	cPAHs	Chlorinated Hydrocarbons	Phthalates	Miscellaneous Extractables	Phenols	Pesticides	PCB Aroclors	PCB Congeners	Dioxins and Furans	Bioassay
LY-27	LY-SS-27_0-10	08/31/21	0-10 cm	●		●						●			●	●						●		●	
	LY-SC-27_1-2	09/01/21	1-2 ft			●						●													
2023 Supplemental Sediment Investigation (GeoEngineers 2023)																									
LY-28	LY-28_0-10	01/26/23	0-10 cm			●									●	●						●			
	Dup (LY-28_0-10)	01/26/23	0-10 cm			●									●	●						●			
	LY-28_1-2	01/27/23	1-2 ft												●	●						●			
	LY-28_2-3	01/27/23	2-3 ft												●	●						●			
LY-29	LY-29_0-10	01/26/23	0-10 cm																			●			
	LY-29_1-2	01/27/23	1-2 ft																			●			
LY-30	LY-30_0-10	01/26/23	0-10 cm												●	●						●			
	LY-30_1-2	01/27/23	1-2 ft												●	●									
LY-31	LY-31_0-10	01/26/23	0-10 cm												●	●						●			
	LY-31_1-2	01/27/23	1-2 ft												●	●						●			
LY-32	LY-32_0-10	01/26/23	0-10 cm																			●			
2024 City of Anacortes Pre-Dredge Characterization (DOF 2024)																									
Pre-1	COA_NS-01-PRE-20240730	07/30/24	0-10 cm	●							●	●		●	●	●			●			●		●	
Pre-2	COA_NS-02-PRE-20240730	07/30/24	0-10 cm	●							●	●		●	●	●			●			●		●	
Pre-3	COA_NS-03-PRE-20240730	07/30/24	0-10 cm	●							●	●		●	●	●			●			●		●	
PP-1-Pre	COA_PP-01-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-2-Pre	COA_PP-02-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
	COA_PP-02-PRE_20240730DUP	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-3-Pre	COA_PP-03-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-4-Pre	COA_PP-04-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-5-Pre	COA_PP-05-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-6-Pre	COA_PP-06-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-7-Pre	COA_PP-07-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-8-Pre	COA_PP-08-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-9-Pre	COA_PP-09-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-10-Pre	COA_PP-10-PRE_20240730	07/30/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
2024 City of Anacortes Post-Dredge Characterization (Geosyntec 2024)																									
PP-1-Post	COA_PP-01-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-1-Post	COA_PP-01-POST_20241002DUP	10/02/24	0-10 cm	●		●						●		●	●	●			●			●		●	
PP-2-Post	COA_PP-02-POST_20241002	10/02/24	0-10 cm	●							●	●		●	●	●			●			●		●	
PP-3-Post	COA_PP-03-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-4-Post	COA_PP-04-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-5-Post	COA_PP-05-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-6-Post	COA_PP-06-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-7-Post	COA_PP-07-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-8-Post	COA_PP-08-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-9-Post	COA_PP-09-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	
PP-10-Post	COA_PP-10-POST_20241002	10/02/24	0-10 cm	●		●					●	●		●	●	●			●			●		●	

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Notes:

[1] Sediment sampling locations are shown in Figure 6.

[2] Laboratory results are summarized in Tables 6 and 7.

cm = centimeters

cPAHs = carcinogenic polycyclic aromatic hydrocarbons

ft = feet

HPAHs = high molecular weight polycyclic aromatic hydrocarbons

LPAHs = low molecular weight polycyclic aromatic hydrocarbons

PCBs = polychlorinated biphenyls

TBT = tributyltin

TOC = total organic carbon

TS = total solids

TVS = total volatile solids

● = selected sample submitted for chemical analysis.

Table 2

Sediment Cleanup Levels for the Protection of Benthic Organisms

Anacortes Port Log Yard

Anacortes, Washington

Analyte	CAS Number	Units	Criteria for the Protection of Benthic Organisms				Proposed Sediment Cleanup Level[3]
			Sediment Management Standard[1] (SMS)		Apparent Effects Threshold (AET) Criteria[2]		
			Sediment Cleanup Objective (SCO)	Cleanup Screening Level (CSL)	Lowest AET (LAET)	Second Lowest AET (2LAET)	SCO/ LAET
Metals							
Arsenic	7440-38-2	mg/kg	57	93	57	93	57
Cadmium	7440-43-9a	mg/kg	5.1	6.7	5.1	6.7	5.1
Chromium	16065-83-1	mg/kg	260	270	260	270	260
Copper	7440-50-8	mg/kg	390	390	390	390	390
Lead	7439-92-1	mg/kg	450	530	450	530	450
Mercury	7439-97-6	mg/kg	0.41	0.59	0.41	0.59	0.41
Silver	7440-22-4	mg/kg	6.1	6.1	6.1	6.1	6.1
Zinc	7440-66-6	mg/kg	410	960	410	960	410
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (OC Normalized)							
Sum of LPAHs[4]	n/a	mg/kg OC	370	780	--	--	370
2-Methylnaphthalene	91-57-6	mg/kg OC	38	64	--	--	38
Acenaphthene	83-32-9	mg/kg OC	16	57	--	--	16
Acenaphthylene	208-96-8	mg/kg OC	66	66	--	--	66
Anthracene	120-12-7	mg/kg OC	220	1,200	--	--	220
Fluorene	86-73-7	mg/kg OC	23	79	--	--	23
Naphthalene	91-20-3	mg/kg OC	99	170	--	--	99
Phenanthrene	85-01-8	mg/kg OC	100	480	--	--	100
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (Dry Weight)							
Sum of LPAHs[4]	n/a	µg/kg	--	--	5,200	5,200	5,200
2-Methylnaphthalene	91-57-6	µg/kg	--	--	670	670	670
Acenaphthene	83-32-9	µg/kg	--	--	500	500	500
Acenaphthylene	208-96-8	µg/kg	--	--	1,300	1,300	1,300
Anthracene	120-12-7	µg/kg	--	--	960	960	960
Fluorene	86-73-7	µg/kg	--	--	540	540	540
Naphthalene	91-20-3	µg/kg	--	--	2,100	2,100	2,100
Phenanthrene	85-01-8	µg/kg	--	--	1,500	1,500	1,500
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) (OC Normalized)							
Sum of HPAHs[5]	n/a	mg/kg OC	960	5,300	--	--	960
Benzo(a)anthracene	56-55-3	mg/kg OC	110	270	--	--	110
Benzo(a)pyrene	50-32-8	mg/kg OC	99	210	--	--	99
Benzo[b]fluoranthene	205-99-2	mg/kg OC	--	--	--	--	NE
Benzo[k]fluoranthene	207-08-9	mg/kg OC	--	--	--	--	NE
Benzofluoranthenes[6] (Total)	n/a	mg/kg OC	230	450	--	--	230
Benzo(g,h,i)perylene	191-24-2	mg/kg OC	31	78	--	--	31
Chrysene	218-01-9	mg/kg OC	110	460	--	--	110
Dibenzo(a,h)anthracene	53-70-3	mg/kg OC	12	33	--	--	12
Fluoranthene	206-44-0	mg/kg OC	160	1,200	--	--	160
Indeno(1,2,3-c,d)pyrene	193-39-5	mg/kg OC	34	88	--	--	34
Pyrene	129-00-0	mg/kg OC	1,000	1,400	--	--	1,000
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) (Dry Weight)							
Sum of HPAHs[5]	n/a	µg/kg	--	--	12,000	17,000	12,000
Benzo(a)anthracene	56-55-3	µg/kg	--	--	1,300	1,600	1,300
Benzo(a)pyrene	50-32-8	µg/kg	--	--	1,600	1,600	1,600
Benzo[b]fluoranthene	205-99-2	µg/kg	--	--	--	--	NE
Benzo[k]fluoranthene	207-08-9	µg/kg	--	--	--	--	NE
Benzofluoranthenes[6] (Total)	n/a	µg/kg	--	--	3,200	3,600	3,200
Benzo(g,h,i)perylene	191-24-2	µg/kg	--	--	670	720	670
Chrysene	218-01-9	µg/kg	--	--	1,400	2,800	1,400
Dibenzo(a,h)anthracene	53-70-3	µg/kg	--	--	230	230	230
Fluoranthene	206-44-0	µg/kg	--	--	1,700	2,500	1,700
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/kg	--	--	600	690	600
Pyrene	129-00-0	µg/kg	--	--	2,600	3,300	2,600
Chlorinated Hydrocarbons (OC Normalized)							
1,2,4-Trichlorobenzene	120-82-1	mg/kg OC	0.81	1.8	--	--	0.81
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	mg/kg OC	2.3	2.3	--	--	2.3
1,3-Dichlorobenzene	541-73-1	mg/kg OC	--	--	--	--	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	mg/kg OC	3.1	9.0	--	--	3.1
Hexachlorobenzene	118-74-1	mg/kg OC	0.38	2.3	--	--	0.38
Chlorinated Hydrocarbons (Dry Weight)							
1,2,4-Trichlorobenzene	120-82-1	µg/kg	--	--	31	51	31
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	µg/kg	--	--	35	50	35
1,3-Dichlorobenzene	541-73-1	µg/kg	--	--	--	--	NE
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	µg/kg	--	--	110	110	110
Hexachlorobenzene	118-74-1	µg/kg	--	--	22	70	22

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Analyte	CAS Number	Units	Criteria for the Protection of Benthic Organisms				Proposed Sediment Cleanup Level[3]
			Sediment Management Standard[1] (SMS)		Apparent Effects Threshold (AET) Criteria[2]		
			Sediment Cleanup Objective (SCO)	Cleanup Screening Level (CSL)	Lowest AET (LAET)	Second Lowest AET (2LAET)	SCO/ LAET
Phthalates (OC Normalized)							
Bis(2-Ethylhexyl) Phthalate	117-81-7	mg/kg OC	47	78	--	--	47
Butyl benzyl Phthalate	85-68-7	mg/kg OC	4.9	64	--	--	4.9
Dibutyl Phthalate	84-74-2	mg/kg OC	220	1,700	--	--	220
Diethyl Phthalate	84-66-2	mg/kg OC	61	110	--	--	61
Dimethyl Phthalate	131-11-3	mg/kg OC	53	53	--	--	53
Di-N-Octyl Phthalate	117-84-0	mg/kg OC	58	4,500	--	--	58
Phthalates (Dry Weight)							
Bis(2-Ethylhexyl) Phthalate	117-81-7	µg/kg	--	--	1,300	1,900	1,300
Butyl benzyl Phthalate	85-68-7	µg/kg	--	--	63	900	63
Dibutyl Phthalate	84-74-2	µg/kg	--	--	1,400	1,400	1,400
Diethyl Phthalate	84-66-2	µg/kg	--	--	200	1,200	200
Dimethyl Phthalate	131-11-3	µg/kg	--	--	71	160	71
Di-N-Octyl Phthalate	117-84-0	µg/kg	--	--	6,200	6,200	6,200
Phenols (Dry Weight)							
2,4-Dimethylphenol	105-67-9	µg/kg	29	29	29	29	29
2-methylphenol (o-Cresol)	95-48-7	µg/kg	63	63	63	63	63
4-methylphenol (p-Cresol)	106-44-5	µg/kg	670	670	670	670	670
Pentachlorophenol	87-86-5	µg/kg	360	690	360	690	360
Phenol	108-95-2	µg/kg	420	1,200	420	1,200	420
Miscellaneous Extractables (OC Normalized)							
Dibenzofuran	132-64-9	mg/kg OC	15	58	--	--	15
Hexachlorobutadiene	87-68-3	mg/kg OC	3.9	6.2	--	--	3.9
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	mg/kg OC	11	11	--	--	11
Miscellaneous Extractables (Dry Weight)							
Dibenzofuran	132-64-9	µg/kg	--	--	540	540	540
Hexachlorobutadiene	87-68-3	µg/kg	--	--	11	120	11
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	µg/kg	--	--	28	40	28
Benzoic Acid	65-85-0	µg/kg	--	--	650	650	650
Benzyl Alcohol	100-51-6	µg/kg	--	--	57	73	57
Polychlorinated Biphenyls (PCBs) (OC Normalized)							
Total PCBs (Total for Aroclors or Congeners)	1336-36-3	mg/kg OC	12	65	--	--	12
Polychlorinated Biphenyls (PCBs) (Dry Weight)							
Total PCBs (Total for Aroclors or Congeners)	1336-36-3	µg/kg	--	--	130	1,000	130

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Notes:

[1] Sediment Management Standards (SMS; Washington Administrative Code [WAC] Chapter 173-204).

[2] Apparent Effects Threshold (AET) Criteria from Ecology's SCUM guidance (Table 8-1; Ecology 2021).

[3] The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA 1988).

[4] Total LPAHs are the total of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene and anthracene. The concentraion of 2-methylnapthalene is not included in the sum of LPAHs.

[5] Total HPAHs are the total of fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene.

SCO = Sediment Cleanup Objective

CSL = Cleanup Screening Level

LAET = lowest Apparent Effects Threshold

2LAET = second lowest Apparent Effects Threshold

LPAHs = low molecular weight polycyclic aromatic hydrocarbons

HPAHs = high molecular weight polycyclic aromatic hydrocarbons

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

-- = criterion not applicable or not available

n/a = not available

NE = not established

Table 3

Sediment Cleanup Levels for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Analyte	CAS Number	Units	Criteria for the Protection of Human Health								PQL[5]	Proposed Sediment Cleanup Level[6,7,8]	
			Direct Contact via Beach Play[1]		Direct Contact via Clamming[1]		Direct Contact via Net Fishing[1]		Bioaccumulation via Consumption of Aquatic Organisms[2]				
			Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Natural Background[3]	Regional Background[4]		Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)
Metals													
Arsenic	7440-38-2	mg/kg	0.09	16	0.040	72	0.090	170	11	--	5.0	11	11
Cadmium	7440-43-9a	mg/kg	--	220	--	1,100	--	2,500	0.8	--	0.2	0.8	0.8
Chromium (as Chromium III)	16065-83-1	mg/kg	--	25,000	--	150,000	--	400,000	62	--	0.5	62	62
Copper	7440-50-8	mg/kg	--	7,600	--	38,000	--	89,000	45	--	0.2	45	45
Lead	7439-92-1	mg/kg	--	--	--	--	--	--	21	--	2.0	21	21
Mercury (as Mercuric Chloride)	7487-94-7	mg/kg	--	--	--	--	--	--	0.2	--	0.05	0.2	0.2
Silver	7440-22-4	mg/kg	--	250	--	1,400	--	3,600	0.24	--	0.3	0.3	0.3
Zinc	7440-66-6	mg/kg	--	57,000	--	280,000	--	670,000	93	--	1.0	93	93
Organometallic Compounds													
Tributyltin Ion (Bulk Sediment)	56-35-9	µg/kg	--	18,000	--	100,000	--	260,000	73[9]	--	3.9	73	73
Tributyltin Ion (Interstitial Water)	56-35-9a	µg/L	--	--	--	--	--	--	0.15[9]	--	0.0052	0.15	0.15
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)													
2-Methylnaphthalene	91-57-6	µg/kg	--	320,000	--	1,800,000	--	4,500,000	--	--	5.0	320,000	4,500,000
Acenaphthene	83-32-9	µg/kg	--	4,800,000	--	27,000,000	--	67,000,000	--	--	5.0	4,800,000	67,000,000
Acenaphthylene	208-96-8	µg/kg	--	4,800,000	--	27,000,000	--	67,000,000	--	--	5.0	4,800,000	67,000,000
Anthracene	120-12-7	µg/kg	--	4,800,000	--	27,000,000	--	67,000,000	--	--	5.0	4,800,000	67,000,000
Fluorene	86-73-7	µg/kg	--	3,200,000	--	18,000,000	--	45,000,000	--	--	5.0	3,200,000	45,000,000
Naphthalene	91-20-3	µg/kg	--	1,600,000	--	8,900,000	--	22,000,000	--	--	5.0	1,600,000	22,000,000
Phenanthrene	85-01-8	µg/kg	--	4,800,000	--	27,000,000	--	67,000,000	--	--	5.0	4,800,000	67,000,000
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)													
Benzo(a)anthracene	56-55-3	µg/kg	--	--	--	--	--	--	--	--	5.0	See cPAH TEQ	See cPAH TEQ
Benzo(a)pyrene	50-32-8	µg/kg	940	24,000	440	130,000	1,100.00	340,000	21	--	5.0	See cPAH TEQ	See cPAH TEQ
Benzofluoranthenes (Total)	n/a	µg/kg	--	--	--	--	--	--	--	--	5.0	See cPAH TEQ	See cPAH TEQ
Benzo(g,h,i)perylene	191-24-2	µg/kg	--	--	--	--	--	--	--	--	5.0	See cPAH TEQ	See cPAH TEQ
Chrysene	218-01-9	µg/kg	--	--	--	--	--	--	--	--	5.0	See cPAH TEQ	See cPAH TEQ
Dibenzo(a,h)anthracene	53-70-3	µg/kg	--	--	--	--	--	--	--	--	5.0	See cPAH TEQ	See cPAH TEQ
Fluoranthene	206-44-0	µg/kg	--	3,200,000	--	18,000,000	--	45,000,000	--	--	5.0	3,200,000	45,000,000
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/kg	--	--	--	--	--	--	--	--	5.0	See cPAH TEQ	See cPAH TEQ
Pyrene	129-00-0	µg/kg	--	2,400,000	--	13,000,000	--	34,000,000	--	--	5.0	2,400,000	34,000,000
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)													
Total cPAHs - TEQ	see Benzo(a)pyrene	µg/kg	--	--	--	--	--	--	21	--	5.0	21	21

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Analyte	CAS Number	Units	Criteria for the Protection of Human Health								PQL[5]	Proposed Sediment Cleanup Level[6,7,8]	
			Direct Contact via Beach Play[1]		Direct Contact via Clamming[1]		Direct Contact via Net Fishing[1]		Bioaccumulation via Consumption of Aquatic Organisms[2]				
			Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Carcinogenic (at 10^{-6} risk)	Non-Carcinogenic	Natural Background[3]	Regional Background[4]		Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)
Chlorinated Hydrocarbons													
1,2,4-Trichlorobenzene	120-82-1	µg/kg	94,000	2,300,000	38,000	11,000,000	88,000	26,000,000	--	--	20	38,000	88,000
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	µg/kg	--	21,000,000	--	100,000,000	--	230,000,000	--	--	20	21,000,000	230,000,000
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	µg/kg	500,000	16,000,000	200,000	77,000,000	470,000	180,000,000	--	--	20	200,000	470,000
Hexachlorobenzene	118-74-1	µg/kg	1,700	190,000	690	880,000	1,600	2,000,000	--	--	1.0	690	1,600
Phthalates													
Bis(2-Ethylhexyl) Phthalate	117-81-7	µg/kg	51,000	1,200,000	24,000	7,000,000	63,000	18,000,000	--	--	50	24,000	63,000
Butyl benzyl Phthalate	85-68-7	µg/kg	370,000	12,200,000	180,000	68,000,000	460,000	180,000,000	--	--	20	180,000	460,000
Dibutyl Phthalate	84-74-2	µg/kg	--	6,100,000	--	34,000,000	--	88,000,000	--	--	20	6,100,000	88,000,000
Diethyl Phthalate	84-66-2	µg/kg	--	49,000,000	--	270,000,000	--	700,000,000	--	--	20	49,000,000	700,000,000
Dimethyl Phthalate	131-11-3	µg/kg	--	--	--	--	--	--	--	--	20	NE	NE
Di-N-Octyl Phthalate	117-84-0	µg/kg	--	610,000	--	3,400,000	--	8,800,000	--	--	20	610,000	8,800,000
Phenols													
2,4-Dimethylphenol	105-67-9	µg/kg	--	1,200,000	--	6,800,000	--	18,000,000	--	--	25	1,200,000	18,000,000
2-methylphenol (o-Cresol)	95-48-7	µg/kg	--	3,000,000	--	17,000,000	--	44,000,000	--	--	20	3,000,000	44,000,000
4-methylphenol (p-Cresol)	106-44-5	µg/kg	--	6,100,000	--	34,000,000	--	88,000,000	--	--	20	6,100,000	88,000,000
Pentachlorophenol	87-86-5	µg/kg	1,100	190,000	550	1,100,000	1,400	2,900,000	--	--	100	550.00	1,400
Phenol	108-95-2	µg/kg	--	18,000,000	--	100,000,000	--	260,000,000	--	--	100	18,000,000	260,000,000
Miscellaneous Extractables													
Dibenzofuran	132-64-9	µg/kg	--	170,000	--	840,000	--	2,000,000	--	--	20	170,000	2,000,000
Hexachlorobutadiene	87-68-3	µg/kg	35,000	230,000	14,000	1,100,000	33,000	2,600,000	--	--	1.0	14,000	33,000
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	µg/kg	140,000	--	70,000	--	180,000	--	--	--	20	70,000	180,000
Benzoic Acid	65-85-0	µg/kg	--	240,000,000	--	1,400,000,000	--	3,500,000,000	--	--	20	240,000,000	3,500,000,000
Benzyl Alcohol	100-51-6	µg/kg	--	6,100,000	--	34,000,000	--	88,000,000	--	--	2.0	6,100,000	88,000,000
Polychlorinated Biphenyls (PCBs)													
Total PCBs (Aroclors or Congeners)	1336-36-3	µg/kg	400	--	190	--	490	--	3.5	--	2.0	3.5	3.5
Total Dioxin-Like PCB Congeners TEQ	see Total Dioxins/Furans	ng/kg	21	160	9.0	770	20	1,800	0.20	--	0.20	0.20	0.20
Dioxins and Furans													
Total Dioxin/Furan TEQ	1746-01-6	ng/kg	24	190	11.0	960	25	2,300	4.0	--	5[10]	5	5

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Notes:

[1] Sediment screening levels for the protection of human health via direct contact are calculated using equations and input parameters provided in Ecology's SCUM guidance (Ecology 2021). The toxicity equivalency factors (TEFs) used to calculate the screening levels are from Table 708-1 (chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans congeners) and Table 708-2 (cPAHs) of the Model Toxics Control Act (MTCA) Cleanup regulation (Chapter 173-340 WAC).

[2] Bioaccumulative chemicals include metals (arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc), cPAHs, PCBs, dioxin-like PCBs and dioxins/furans. Currently site-specific human health and ecological risk-based sediment screening levels have not been developed for bioaccumulative chemicals. Therefore, sediment screening levels for these chemicals are based on the natural background, regional background or the practical quantification limit (PQL), whichever is higher.

[3] Natural background values referenced from Tabel 10-1 of Ecology's SCUM guidance (Ecology 2021).

[4] Regional background values referenced from Tabel 10-2 of Ecology's SCUM guidance (Ecology 2021).

[5] PQL values are from Analytical Resources, Inc. of Tukwila, Washington.

[6] The screening levels presented in this table are to provide a preliminary evaluation of human health and ecological risk for higher trophic level ecological receptors. Human health and higher trophic level ecological receptor screening levels are chosen from lowest of bioaccumulative and direct contact pathways. The risk-based value adjusted for the higher of natural background and PQL is the SCO. The risk-based value adjusted for the higher of regional background and PQL is the CSL. The human health screening level for intertidal areas includes marine areas at elevations higher than -3 feet mean lower low water (MLLW) and the applicable direct contact pathways include beach play, clamming and net fishing. The human health screening levels for subtidal areas include marine areas at elevations below -3 feet MLLW and the applicable direct contact pathway is net fishing.

[7] Natural and regional background (natural background/regional background) concentrations are being applied as preliminary cleanup levels. The SCO is the risk-based value adjusted for natural background and PQL, whichever is higher. The CSL is the risk-based value adjusted for regional background and PQL, whichever is higher. Final cleanup levels will be established in the Cleanup Action Plan.

[8] When natural background is greater than the regional background, the natural background concentration is being applied as the proposed cleanup level. Final cleanup levels will be established in the Cleanup Action Plan.

[9] Dredged Material Management Program (DMMP) Marine Guidelines Bioaccumulation Trigger value; from Dredged Material Evaluation and Disposal Procedures User Manual (DMMP User Manual; Table 8-3; USACE 2021).

[10] PQL for total dioxin/furan TEQ is the programmatic PQL value from Ecology's SCUM guidance (Table 11-1; Ecology 2021).

PQL = practical quantitation limit

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

TEQ = toxic equivalent quotient

-- = Criterion not applicable or not available

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Table 4

Summary Statistics and Evaluation of Contaminants of Concern for the Protection of Benthic Organisms

Anacortes Port Log Yard

Anacortes, Washington

Contaminant of Potential Concern[1] (COPC)	CAS Number	Proposed Sediment Cleanup Level[2]	Units	Evaluation of RI Data Results[3]												Contaminant of Concern[7] (COC) (Yes/No)	Comments/Rationale
									Non-Detect PCUL Exceedance Evaluation			PCUL Exceedance Evaluation[6]					
				Number of Samples	Number of Detections	Detection Frequency (%)	Maximum Non-Detect Concentration	Maximum Detected Concentration	Number of Non-detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)	Number of detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)		
Metals																	
Arsenic	7440-38-2	57	mg/kg	39	26	67%	11	14	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Cadmium	7440-43-9a	5.1	mg/kg	41	34	83%	1.1	1.6	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Chromium	16065-83-1	260	mg/kg	36	36	100%	n/a	100	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Copper	7440-50-8	390	mg/kg	36	36	100%	n/a	248	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Lead	7439-92-1	450	mg/kg	36	35	97%	5	23	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Mercury	7439-97-6	0.41	mg/kg	36	29	81%	0.11	0.15	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Silver	7440-22-4	6.1	mg/kg	36	9	25%	1.1	0.50	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No	
Zinc	7440-66-6	410	mg/kg	36	36	100%	n/a	784	0	No Exceedance	No Exceedance	**2**	**5.6%**	**1.9**	**Yes**	Retained as a COC
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																	
Total LPAHs[8]	n/a	370	mg/kg OC	50	45	90%	n/a	164	0	No Exceedance	<0.1	0	No Exceedance	<0.1	**Yes**	LPAHs are retained as a COC based on one or more contaminants detected greater than the PCUL.
	n/a	5,200	µg/kg				32	4,230								
2-Methylnaphthalene	91-57-6	38	mg/kg OC	50	32	64%	1.02	5	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	91-57-6	670	µg/kg				32	140								
Acenaphthene	83-32-9	16	mg/kg OC	50	32	64%	1.02	58	0	No Exceedance	<0.1	**2**	**4.0%**	**3.6**		
	83-32-9	500	µg/kg				32	620								
Acenaphthylene	208-96-8	66	mg/kg OC	50	32	64%	0.85	5	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	208-96-8	1,300	µg/kg				32	100								
Anthracene	120-12-7	220	mg/kg OC	50	36	72%	1.02	86	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	120-12-7	960	µg/kg				32	800								
Fluorene	86-73-7	23	mg/kg OC	50	36	72%	1.02	16	0	No Exceedance	<0.1	**1**	**2.0%**	**1.4**		
	86-73-7	540	µg/kg				32	750								
Naphthalene	91-20-3	99	mg/kg OC	50	32	64%	1.02	25	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	91-20-3	2,100	µg/kg				32	860								
Phenanthrene	85-01-8	100	mg/kg OC	50	45	90%	n/a	102	0	No Exceedance	<0.1	**1**	**2.0%**	**1.0**		
	85-01-8	1,500	µg/kg				32	1,130								
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																	
Sum of HPAHs[9]	n/a	960	mg/kg OC	52	50	96%	n/a	619.5	0	No Exceedance	<0.1	**1**	**1.9%**	**2.97**	**Yes**	HPAHs are retained as a COC based on one or more contaminants detected greater than the PCUL.
	n/a	12,000	µg/kg				40	35,687								
Benzo(a)anthracene	56-55-3	110	mg/kg OC	86	75	87%	0.84	72.4	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	56-55-3	1,300	µg/kg				32	1,030								
Benzo(a)pyrene	50-32-8	99	mg/kg OC	86	77	90%	n/a	55.26	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	50-32-8	1,600	µg/kg				20	933								
Benzofluoranthenes[10] (Total)	n/a	230	mg/kg OC	88	78	89%	n/a	111.84	0	No Exceedance	<0.1	**1**	**1.1%**	**1.31**		
	n/a	3,200	µg/kg				82	4,200								
Benzo(g,h,i)perylene	193-39-5	34	mg/kg OC	86	72	84%	0.54	17.8	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	193-39-5	600	µg/kg				32	444								
Chrysene	218-01-9	110	mg/kg OC	86	77	90%	n/a	118.4	0	No Exceedance	<0.1	**2**	**2.3%**	**1.9**		
	218-01-9	1,400	µg/kg				20	2,670								
Dibenzo(a,h)anthracene	53-70-3	12	mg/kg OC	86	52	60%	5.54	5.72	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	53-70-3	230	µg/kg				32	103.0								
Fluoranthene	206-44-0	160	mg/kg OC	52	47	90%	n/a	161	0	No Exceedance	<0.1	**3**	**5.8%**	**8.5**		
	206-44-0	1,700	µg/kg				20	14,500								
Indeno(1,2,3-c,d)pyrene	193-39-5	34	mg/kg OC	86	72	84%	0.54	17.8	0	No Exceedance	<0.1	0	No Exceedance	<0.1		
	193-39-5	600	µg/kg				32	444								
Pyrene	129-00-0	1,000	mg/kg OC	52	48	92%	n/a	108	0	No Exceedance	<0.1	**1**	**1.9%**	**4.38**		
	129-00-0	2,600	µg/kg				20	11,400								

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Contaminant of Potential Concern[1] (COPC)	CAS Number	Proposed Sediment Cleanup Level[2]	Units	Evaluation of RI Data Results[3]												Contaminant of Concern[7] (COC) (Yes/No)	Comments/Rationale
									Non-Detect PCUL Exceedance Evaluation			PCUL Exceedance Evaluation[6]					
				Number of Samples	Number of Detections	Detection Frequency (%)	Maximum Non-Detect Concentration	Maximum Detected Concentration	Number of Non-detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)	Number of detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)		
Chlorinated Hydrocarbons																	
1,2,4-Trichlorobenzene	120-82-1	0.81	mg/kg OC	36	1	3%	1.59	n/a	**5**	**13.9%**	**2.0**	0	n/a	<0.1	No	Not retained as a COC. Dry wieght non-detect exceedance of the PCUL is less than 10% of the samples analyzed, generally less than 2 times the PCUL and/or are colocated in area generally containing elevated wood debris which may be affecting the OC normalized concentration.
	120-82-1	31	µg/kg				32	3.2									
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	2.3	mg/kg OC	36	3	8%	1.59	0.17	0	No Exceedance	<0.1	0	n/a	<0.1	No		
	95-50-1	35	µg/kg				32	3.5									
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	3.1	mg/kg OC	36	2	6%	1.59	0.11	0	No Exceedance	<0.1	0	n/a	<0.1	No		
	106-46-7	110	µg/kg				32	11									
Hexachlorobenzene	118-74-1	0.38	mg/kg OC	36	0	0%	1.59	n/a	**6**	**16.7%**	**4.2**	0	n/a	<0.1	No		
	118-74-1	22	µg/kg				32	n/a									
Phthalates																	
Bis(2-Ethylhexyl) Phthalate	117-81-7	47	mg/kg OC	36	25	69%	10.21	91	0	No Exceedance	<0.1	**1**	**2.8%**	**1.9**	**Yes**	Retained as a COC	
	117-81-7	1,300	µg/kg				250	160									
Butyl benzyl Phthalate	85-68-7	4.9	mg/kg OC	36	9	25%	1.59	1.3	0	No Exceedance	<0.1	0	No Exceedance	No Exceedance	No		
	85-68-7	63	µg/kg				32	20									
Dibutyl Phthalate	84-74-2	220	mg/kg OC	36	6	17%	3.39	0.97	0	No Exceedance	<0.1	0	No Exceedance	No Exceedance	No		
	84-74-2	1,400	µg/kg				32	35									
Diethyl Phthalate	84-66-2	61	mg/kg OC	36	3	8%	7.73	0.26	0	No Exceedance	<0.1	0	No Exceedance	No Exceedance	No		
	84-66-2	200	µg/kg				9.44	36.08									
Dimethyl Phthalate	131-11-3	53	mg/kg OC	36	4	11%	3.39	2.85	0	No Exceedance	<0.1	0	No Exceedance	No Exceedance	No		
	131-11-3	71	µg/kg				100	10									
Di-N-Octyl Phthalate	117-84-0	58	mg/kg OC	36	1	3%	3.39	4.39	0	No Exceedance	<0.1	0	No Exceedance	No Exceedance	No		
	117-84-0	6,200	µg/kg				100	n/a									
Phenols																	
2,4-Dimethylphenol	105-67-9	29	µg/kg	35	6	17%	880	17.0	**4**	**11.4%**	**30.3**	0	No Exceedance	No Exceedance	No	Not retained as a COC. Detected concentrations less than the PCUL.	
2-methylphenol (o-Cresol)	95-48-7	63	µg/kg	38	2	5%	100	15.0	**1**	**2.6%**	**1.6**	0	No Exceedance	No Exceedance	No		
4-methylphenol (p-Cresol)	106-44-5	670	µg/kg	38	23	61%	38	3,900	0	No Exceedance	No Exceedance	**4**	**10.5%**	**5.8**	**Yes**	Retained as a COC	
Pentachlorophenol	87-86-5	360	µg/kg	38	3	8%	180	480	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No		
Phenol	108-95-2	420	µg/kg	38	20	53%	49	560	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No		
Miscellaneous Extractables																	
Dibenzofuran	132-64-9	15	mg/kg OC	48	32	67%	2	12	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No		
	132-64-9	540	µg/kg				32	370									
Hexachlorobutadiene	87-68-3	3.9	mg/kg OC	37	0	0%	2	n/a	**2**	**5.4%**	**2.9**	0	No Exceedance	No Exceedance	No	Not retained as a COC. Non-detect exceedance of the PCUL is less than 10% of the samples analyzed, generally less than 2 times the PCUL and/or are colocated in area generally containing elevated wood debris.	
	87-68-3	11	µg/kg				32	n/a									
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	11	mg/kg OC	37	0	0%	2	n/a	**1**	**2.7%**	**1.1**	0	No Exceedance	No Exceedance	No		
	86-30-6	28	µg/kg				32	n/a									
Benzoic Acid	65-85-0	650	µg/kg	35	14	40%	380	4,300	0	No Exceedance	No Exceedance	**1**	**2.9%**	**6.6**	**Yes**	Retained as a COC	
Benzyl Alcohol	100-51-6	57	µg/kg	36	1	3%	100	6.2	**1**	**3%**	**1.8**	0	No Exceedance	No Exceedance	No	Not retained as a COC. Non-detect exceedance of the PCUL is less than 10% of the samples analyzed, generally less than 2 times the PCUL and/or are colocated in area generally containing elevated wood debris.	
Polychlorinated Biphenyls (PCBs)																	
Total PCBs (Aroclors or Congeners)	1336-36-3	130	µg/kg	68	36	53%	20	24.4	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	No		
	1336-36-3	12	mg/kg OC				n/a	3									

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Notes:

[1] Contaminants of potential concern (COPCs) were established for the marine area based on a review of sediment sample investigaiton resutls presented in Table 6.

[2] Proposed sediment cleanup levels (PCULs) for the protection of benthic organisms are the Sediment Cleanup Objective (SCO) / Lowest Apparent Effects Threshhold (LAET) values referenced from Table 2.

[3] The sediment data used consist of samples obtained by GeoEngineers in general accordance with the RI/FS Work Plan (GeoEngineers 2015) and subsequent Ecology-Approved Addenda, as well as data collected during previous environmenal studies (see Table 6).

[4] Number of samples with analyte detected or non-detect at a concentration greater than PCUL / total number of samples analyzed for analyte.

[5] Maximum Exceedance Ratio = ratio of maximum detected or non-detect concentration to the PCUL.

[6] Comparison of data results (Table 6) to the Sediment Cleanup Objective (SCO) / Lowest Apparent Effects Threshhold (LAET) values referenced from Table 2.

[7] Contaminant of concern (COC) selection criteria is met if a COPC was detected at a concentration greater than the PCUL. Non-detect results were not considered in the selection of proposed COCs (see comments/rationale).

[8] Total LPAHs are the total of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene and anthracene; 2-methylnapthalene is not included in the sum of LPAHs.

[9] Total HPAHs are the total of fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c-d)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene.

[10] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

PCUL = proposed cleanup level

NE = not established

mg/kg = milligrams per kilogram

µg/kg = micrograms per kilogram

OC = organic carbon normalized

n/a = not applicable

Bold indicates the value (detect or non-detect) exceeds the PCUL.

Yellow shading indicates analyte is identified as a COC based on PCUL exceedance.

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Table 5

Summary Statistics and Evaluation of Contaminants of Concern for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Contaminant of Potential Concern[1] (COPC)	CAS No.	Proposed Sediment Cleanup Level[2]		Units	Evaluation of RI Data Results[3]												Compliance Interval Area Weighted Average[7] (ER)	Contaminant of Concern[8] (COC) (Yes/No)	Comments
										Non-Detect PCUL Exceedance Evaluation			PCUL Exceedance Evaluation[6]					
		Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)		Number of Samples	Number of Detections	Detection Frequency (%)	Maximum Non-Detect Concentration	Maximum Detected Concentration	Number of Non-detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)	Number of detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)			
Metals																			
Arsenic	7440-38-2	11	11	mg/kg	39	26	67%	11	14	0	No Exceedance	No Exceedance	**2**	**5.1%**	**1.3**	0.84	No	Compliance interval SWAC for individual metals is less than PCUL. Therefore, not retained as a COC.
Cadmium	7440-43-9a	0.80	0.80	mg/kg	41	33	80%	1.1	2	**2**	**4.9%**	**2.0**	**8**	**19.5%**	**2.0**	0.84	No	
Chromium	16065-83-1	62	62	mg/kg	36	36	100%	n/a	100	0	No Exceedance	No Exceedance	**3**	**8.3%**	**1.6**	0.56	No	
Copper	7440-50-8	45	45	mg/kg	36	36	100%	n/a	248	0	No Exceedance	No Exceedance	**2**	**5.6%**	**5.5**	**1.29**	**Yes**	Retained as a COC
Lead	7439-92-1	21	21	mg/kg	36	34	94%	5	23	0	No Exceedance	No Exceedance	**1**	**2.8%**	**1.1**	0.52	No	Compliance interval SWAC is less than PCUL. Therefore, not retained as a COC.
Mercury	7487-94-7	0.20	0.20	mg/kg	36	29	81%	0.11	0.15	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	0.42	No	
Silver	7440-22-4	0.30	0.30	mg/kg	36	8	22%	1.1	0	**25**	**69%**	0.5	0	No Exceedance	No Exceedance	0.51	No	
Zinc	7440-66-6	93	93	mg/kg	36	36	100%	n/a	784	0	No Exceedance	No Exceedance	**6**	**16.7%**	**8.4**	0.82	No	
Organometallic Compounds																			
Tributyltin Ion (Bulk Sediment)	56-35-9	73	73	µg/kg	28	24	86%	3.81	291	0	No Exceedance	No Exceedance	**6**	**21%**	**4.0**	0.32	No	Compliance interval SWAC is less than PCUL. Therefore, not retained as a COC.
Tributyltin Ion (Interstitial Water)	56-35-9a	0.15	0.15	µg/L	11	9	82%	0.043	4.9	0	No Exceedance	No Exceedance	**3**	**27%**	**32.7**			
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	91-57-6	320,000	4,500,000	µg/kg	50	32	64%	32	160	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Acenaphthene	83-32-9	4,800,000	67,000,000	µg/kg	50	32	64%	32	1,600	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Acenaphthylene	208-96-8	4,800,000	67,000,000	µg/kg	50	32	64%	32	100	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Anthracene	120-12-7	4,800,000	67,000,000	µg/kg	50	38	76%	32	1,300	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Fluorene	86-73-7	3,200,000	45,000,000	µg/kg	50	36	72%	32	750	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Naphthalene	91-20-3	1,600,000	22,000,000	µg/kg	50	32	64%	32	860	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Phenanthrene	85-01-8	4,800,000	67,000,000	µg/kg	50	45	90%	32	1,900	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	56-55-3	See cPAH TEQ	See cPAH TEQ	µg/kg	83	72	87%	32	1,100	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	cPAH compounds are retained as COCs based on cPAH TEQ results.
Benzo(a)pyrene	50-32-8	See cPAH TEQ	See cPAH TEQ	µg/kg	83	74	89%	20	933	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Benzofluoranthenes[9] (Total)	n/a	See cPAH TEQ	See cPAH TEQ	µg/kg	83	74	89%	40	4,200	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Benzo(g,h,i)perylene	193-39-5	See cPAH TEQ	See cPAH TEQ	µg/kg	83	69	83%	32	444	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Chrysene	218-01-9	See cPAH TEQ	See cPAH TEQ	µg/kg	83	74	89%	20	2,670	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Dibenzo(a,h)anthracene	53-70-3	See cPAH TEQ	See cPAH TEQ	µg/kg	83	49	59%	32	103	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Fluoranthene	206-44-0	3,200,000	45,000,000	µg/kg	52	47	90%	20	14,500	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Indeno(1,2,3-c,d)pyrene	193-39-5	See cPAH TEQ	See cPAH TEQ	µg/kg	83	69	83%	32	444	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Pyrene	129-00-0	2,400,000	34,000,000	µg/kg	52	48	92%	20	11,400	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAH TEQ[10] (KM)	see Benzo(a)pyrene	21	21	mg/kg	83	83	100%	n/a	1537	0	No Exceedance	No Exceedance	**62**	**74.7%**	**73.2**	**8.99**	**Yes**	Retained as a COC
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	120-82-1	38,000	88,000	µg/kg	36	1	3%	35	3.20	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	21,000,000	230,000,000	µg/kg	36	3	8%	35	3.5	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	200,000	470,000	µg/kg	36	2	6%	35	11	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Hexachlorobenzene	118-74-1	690.00	1,600.0	µg/kg	36	0	0%	35	n/a	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	117-81-7	24,000	63,000	µg/kg	36	25	69%	250	1,100	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Butyl benzyl Phthalate	85-68-7	180,000	460,000	µg/kg	36	9	25%	35	31	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Dibutyl Phthalate	84-74-2	6,100,000	88,000,000	µg/kg	36	6	17%	35	35	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Diethyl Phthalate	84-66-2	49,000,000	700,000,000	µg/kg	36	3	8%	180.000	55	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	

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Contaminant of Potential Concern[1] (COPC)	CAS No.	Proposed Sediment Cleanup Level[2]		Units	Evaluation of RI Data Results[3]												Compliance Interval Area Weighted Average[7] (ER)	Contaminant of Concern[8] (COC) (Yes/No)	Comments
										Non-Detect PCUL Exceedance Evaluation			PCUL Exceedance Evaluation[6]						
		Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (below -3 ft MLLW)		Number of Samples	Number of Detections	Detection Frequency (%)	Maximum Non-Detect Concentration	Maximum Detected Concentration	Number of Non-detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)	Number of detections > PCUL	Frequency of PCUL Exceedance[4] (%)	Maximum Exceedance Ratio[5] (ER)			
Dimethyl Phthalate	131-11-3	NE	NE	µg/kg	36	4	11%	100.000	67	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Di-N-Octyl Phthalate	117-84-0	610,000	8,800,000	µg/kg	36	1	3%	100.000	130	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Phenols																		
2,4-Dimethylphenol	105-67-9	1,200,000	18,000,000	µg/kg	35	6	17%	880	17	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
2-methylphenol (o-Cresol)	95-48-7	3,000,000	44,000,000	µg/kg	38	2	5%	100	15	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
4-methylphenol (p-Cresol)	106-44-5	6,100,000	88,000,000	µg/kg	38	23	61%	38	3,900	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Pentachlorophenol	87-86-5	550.00	1,400.0	µg/kg	38	3	8%	180.000	480	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Phenol	108-95-2	18,000,000	260,000,000	µg/kg	38	20	53%	49	560	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Miscellaneous Extractables																		
Dibenzofuran	132-64-9	170,000	2,000,000	µg/kg	48	32	67%	35	370	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Hexachlorobutadiene	87-68-3	14,000	33,000	µg/kg	37	0	0%	35.0000	n/a	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	70,000	180,000	µg/kg	37	0	0%	35	n/a	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Benzoic Acid	65-85-0	240,000,000	3,500,000,000	µg/kg	35	14	40%	380.00	4,300	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Benzyl Alcohol	100-51-6	6,100,000	88,000,000	µg/kg	36	1	3%	100.00	6.2	0	No Exceedance	No Exceedance	0	No Exceedance	No Exceedance	n/a	No	
Polychlorinated Biphenyls (PCBs)																		
Total PCBs (Aroclors or Congeners)	1336-36-3	3.5	3.5	µg/kg	55	23	42%	110.00	54.8	**17**	**31%**	**15.7**	**19**	**34.5%**	**15.7**	**3.28**	**Yes**	Retained as a COC
Total Dioxin-Like PCB Congeners TEQ[11] (KM)	see Total Dioxins/Furans	0.20	0.20	ng/kg	13	13	100%	n/a	1	0	No Exceedance	No Exceedance	**4**	**30.8%**	**5.7**	**1.40**	**Yes**	Retained as a COC
Dioxins and Furans																		
Total Dioxin/Furan TEQ[12] (KM)	1746-01-6	5.0	5.0	ng/kg	29	29	100%	n/a	518	0	No Exceedance	No Exceedance	**10**	**34.5%**	**103.6**	**17.02**	**Yes**	Retained as a COC

Notes:

[1] Contaminants of potential concern (COPCs) were established for the marine area based on a review of sediment sample investigaiton resutls presented in Table 7.

[2] Proposed sediment cleanup levels for the protection of human health and higher trophic level ecological receptors are referenced from Table 3 and are based on the Sediment Cleanup Objective (SCO) except for arsenic, cPAHs and dioxin-like PCBs which are base on regional background which is the Cleanup Screening Level (CSL).

[3] The sediment data used consist of samples obtained by GeoEngineers in general accordance with the RI/FS Work Plan (GeoEngineers 2015) and subsequent Ecology-Approved Addenda, as well as data collected during previous environmenal studies (see Table 7).

[4] Number of samples with analyte detected or non-detect at a concentration greater than PCUL / total number of samples analyzed for analyte.

[5] Maximum Exceedance Ratio (ER) = ratio of maximum detected or non-detect concentration to the PCUL

[6] Comparison of data results (Table 7) to the Proposed Human Health PCUL intertidal and subtidal values referenced from Table 3.

[7] Surface Weighted Avereage Concentration (SWAC) evaluation presented in Figures 49 through 86.

[8] Contaminant of concern (COC) selection criteria is met if a COPC was detected at a concentration greater than the PCUL and the SWAC exceeded the PCUL. Non-detect results were not considered in the selection of proposed COCs (see comments/rationale).

[9] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[10] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[11] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al. 2006).

[12] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA 2003).

PCUL = proposed cleanup level

NE = not established

mg/kg = milligrams per kilogram

µg/kg = micrograms per kilogram

µg/L = micrograms per liter

ng/kg = nanograms per kilogram

n/a = not applicable

KM = Kaplan-Meier method for computing TEQ sums using EPA's Excel TEQ calculator (http://www.epa.gov/superfund/health/contaminants/dioxin/dioxinsoil.html)

Bold indicates the value (detect or non-detect) exceeds the PCUL.

Yellow shading indicates analyte is identified as a COC based on SCO PCUL exceedance.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF	P2-1-3
Sample Identification			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)	P2-1-A-COMP (P2-1/P2-2/P2-3)
Sample Date			07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10	11/16/12
Sample Interval (dbm)			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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	Surface Layer Composite (0-4ft)
Sample Type		Proposed	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core
Stratigraphic Unit		Sediment	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS
Visual Wood Content[3]	%	10	10	50	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conventionals																			
Total Organic Carbon (TOC)	%	NE	**15.00**	**10.30**	**0.95**	**0.26**	**0.29**	**2.25**	**0.89**	**4.47**	**6.64**	**2.35**	**2.36**	**2.33**	**4.35**	**2.96**	**2.20**	**2.40**	**0.21**
Total Volatile Solids (TVS)	%	NE	**10.10**	**28.70**	**2.46**	**2.35**	**2.40**	**5.16**	**3.35**	--	--	**15.15**	**16.01**	**17.35**	**17.78**	**14.29**	--	--	**1.83**
Total Solids (TS)	%	NE	**49.0**	**38.8**	**79.1**	**76.8**	**76.5**	**64.6**	**70.1**	**42.5**	**47.5**	**47.3**	**40.8**	**40.4**	**44.4**	**46.0**	--	--	**79.4**
Total Ammonia	mg-N/kg	NE	**47.9**	**22.5**	**5.9**	**5.9**	**12.3**	**6.3**	**7.2**	**53.4**	**14.4**	**11.8**	**24.2**	**61.3**	**29.6**	**67.3**	--	--	**2.2**
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	**520**	**1,900**	**6.7**	**6.7**	**6.7**	**224**	**2.3**	**3,210**	**1,890**	**2,320**	**1,720**	**2,370**	**3,440**	**3,340**	--	--	**94**
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	**53.9**	**28.8**	--	**59.9**	**35**	**4.44**	**6.82**	--	--	--	--	--	--	--	--	--	**1.2**
Very Coarse Sand	%	NE	**9**	**3.5**	--	**7.29**	**15.1**	**4.64**	**8.83**	--	--	--	--	--	--	--	--	--	**1.3**
Coarse Sand	%	NE	**7.5**	**4.6**	--					--	--	--	--	--	--	--	--	--	**1.6**
Medium Sand	%	NE	**6.5**	**6.2**	--					--	--	--	--	--	--	--	--	--	**9**
Fine Sand	%	NE	**6.2**	**9.6**	--					--	--	--	--	--	--	--	--	--	**15.3**
Very Fine Sand	%	NE	**4.3**	**13.6**	--					--	--	--	--	--	--	--	--	--	**12.6**
Coarse Silt	%	NE	**5**	**9.1**	--	**3.52**	**17.6**	**14.4**	**8.16**	--	--	--	--	--	--	--	--	--	**18.8**
Medium Silt	%	NE	**2.4**	**13.2**	--					--	--	--	--	--	--	--	--	--	**16.5**
Fine Silt	%	NE	**1.4**	**3.2**	--					--	--	--	--	--	--	--	--	--	**9.5**
Very Fine Silt	%	NE	**0.5**	**1.1**	--					--	--	--	--	--	--	--	--	--	**6.1**
Clay	%	NE	**3.3**	**7.1**	--	**1.25**	**3.62**	**5.57**	**3.67**	--	--	--	--	--	--	--	--	--	**8.3**
Metals																			
Arsenic	mg/kg	57	10 U	10 U	**2.37**	**2.1**	**3.2**	**5.6**	**4.3**	**4.52**	**5.3**	10 U	10 U	10 U	10 U	9 U	10 U	11 U	6 U
Cadmium	mg/kg	5.1	0.5 U	0.5 U	**0.09**	0.08 U	**0.12**	**0.41**	**0.39**	**0.698**	**0.642**	**0.6**	**0.7**	**1**	**1**	**0.9**	1 U	1.1 U	**0.3**
Chromium	mg/kg	260	**12**	**29**	**12.3**	**13.5**	**21.2**	**20.4**	**21.2**	**31.2**	**31.9**	**33**	**51**	**39**	**41**	**36.6**	**39**	**41**	**26.5 J**
Copper	mg/kg	390	**17.1**	**31.7**	**10.4**	**9.49**	**15.4**	**12.6**	**11.3**	**28.5**	**29.7**	**40.8**	**248**	**38.2**	**39.8**	**33.9**	**42**	**120**	**22.2**
Lead	mg/kg	450	5 U	**8**	**2.23**	**1.63**	**3.39**	**5.74**	**3.48**	**9.29**	**9.32**	**8**	**23**	**10**	**11**	**11**	**11**	**14**	**4**
Mercury	mg/kg	0.41	0.1 U	0.09 U	**0.01 J**	**0.01**	**0.01**	**0.04**	**0.03**	**0.033**	**0.037**	**0.07**	**0.06**	**0.08**	**0.08**	**0.07**	0.1 U	0.11 U	0.03 U
Silver	mg/kg	6.1	0.8 U	0.8 U	0.02 U	**0.03**	**0.043**	**0.07**	**0.06**	**0.15**	**0.1**	0.6 U	0.7 U	0.7 U	0.7 U	0.6 U	1 U	1.1 U	0.4 U
Zinc	mg/kg	410	**35**	**69**	**20.9**	**19.1**	**32.6**	**37.8**	**28.3**	**784**	**711**	**79**	**105**	**102**	**96**	**78**	**79**	**73**	**48**
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (OC Normalized)																			
Sum of LPAHs[4]	mg/kg OC	370	NA	NA	**1.01**	NA	NA	**6.37**	**7.51**	NA	NA	**8.13 J**	**9.11 J**	**11.93 J**	NA	**2.67 J**	**4.64**	**9.88**	NA
2-Methylnaphthalene	mg/kg OC	38	NA	NA	1.02 U	NA	NA	**0.39**	**0.55**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	0.64 U	0.58 U	NA
Acenaphthene	mg/kg OC	16	NA	NA	1.02 U	NA	NA	**0.25**	1.12 U	NA	NA	0.85 U	0.85 U	**0.52 J**	NA	0.68 U	0.64 U	0.58 U	NA
Acenaphthylene	mg/kg OC	66	NA	NA	**0.15**	NA	NA	**0.71**	**0.6**	NA	NA	**0.43 J**	0.85 U	**0.56 J**	NA	0.68 U	0.64 U	0.58 U	NA
Anthracene	mg/kg OC	220	NA	NA	1.02 U	NA	NA	**1.69**	**0.91**	NA	NA	**1.91**	**1.31**	**1.89**	NA	**0.57 J**	**1.82**	**3.38**	NA
Fluorene	mg/kg OC	23	NA	NA	1.02 U	NA	NA	**0.39**	**0.49**	NA	NA	**0.68 J**	**0.59 J**	**0.82 J**	NA	0.68 U	0.64 U	**0.67**	NA
Naphthalene	mg/kg OC	99	NA	NA	1.02 U	NA	NA	**1.47**	**2.92**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	0.64 U	0.58 U	NA
Phenanthrene	mg/kg OC	100	NA	NA	**0.86**	NA	NA	**1.87**	**2.58**	NA	NA	**5.11**	**7.2**	**8.15**	NA	**2.09**	**2.82**	**5.83**	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (Dry Weight)																			
Sum of LPAHs[4]	µg/kg	5,200	32 U	**204**	NA	9.1 U	**2.4**	NA	NA	**288.8 J**	**292 J**	NA	NA	NA	**283 J**	NA	NA	NA	**35 J**
2-Methylnaphthalene	µg/kg	670	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**13**	**10 J**	NA	NA	NA	**12**	NA	NA	NA	19 U
Acenaphthene	µg/kg	500	32 U	**28**	NA	9.1 U	9.7 U	NA	NA	**8.8 J**	**7 J**	NA	NA	NA	**14 J**	NA	NA	NA	19 U
Acenaphthylene	µg/kg	1,300	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**13**	**69**	NA	NA	NA	**15 J**	NA	NA	NA	19 U
Anthracene	µg/kg	960	32 U	**55**	NA	9.1 U	9.7 U	NA	NA	**73**	**47**	NA	NA	NA	**48**	NA	NA	NA	19 U
Fluorene	µg/kg	540	32 U	**27**	NA	9.1 U	9.7 U	NA	NA	**18**	**19**	NA	NA	NA	**26**	NA	NA	NA	19 U
Naphthalene	µg/kg	2,100	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**16**	**10**	NA	NA	NA	20 U	NA	NA	NA	**17 J**
Phenanthrene	µg/kg	1,500	32 U	**94**	NA	9.1 U	**2.4**	NA	NA	**160**	**140**	NA	NA	NA	**180**	NA	NA	NA	**18 J**

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Sample Location[1]			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF	P2-1-3
Sample Identification			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)	P2-1-A-COMP (P2-1/P2-2/P2-3)
Sample Date			07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10	11/16/12
Sample Interval (dbm)			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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	Surface Layer Composite (0-4ft)
Sample Type	Proposed Sediment Cleanup Level[2]		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) (OC Normalized)																			
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	**12.78**	NA	NA	**20.49**	**23.21**	NA	NA	**47.35 J**	**37.43**	**62.84**	NA	**18.36 J**	**51.23**	**56.04**	NA
Benzo(a)anthracene	mg/kg OC	110	NA	NA	**0.43**	NA	NA	**2.62**	**2.02**	NA	NA	**3.49**	**2.2**	**3.61**	NA	**1.62**	**3.59**	**4.17**	NA
Benzo(a)pyrene	mg/kg OC	99	NA	NA	**0.27**	NA	NA	**2**	**1.91**	NA	NA	**3.06**	**2.12**	**3.95**	NA	**1.18**	**4.45**	**3.71**	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	**1.04**	NA	NA	**1.11**	**4.22**	NA	NA	**2.2**	**1.8**	**2.8**	NA	**1**	**10.91**	**9.83**	NA
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	**0.21**	NA	NA	**1.2**	**1.24**	NA	NA	**1.87**	**1.36**	**2.06**	NA	**0.47 J**	**2.5**	**2.13**	NA
Chrysene	mg/kg OC	110	NA	NA	**1.89**	NA	NA	**3.69**	**2.92**	NA	NA	**6.38**	**4.24**	**6.44**	NA	**2.36**	**7.27**	**7.92**	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	**0.68 J**	0.85 U	**0.86**	NA	0.68 U	0.64 U	0.58 U	NA
Fluoranthene	mg/kg OC	160	NA	NA	**5.26**	NA	NA	**3.64**	**4.61**	NA	NA	**19.57**	**19.07**	**32.19**	NA	**8.78**	**9.09**	**13.75**	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	**0.19**	NA	NA	**1.33**	**1.35**	NA	NA	**1.57**	**1.14**	**1.93**	NA	**0.47 J**	**2.5**	**2.46**	NA
Pyrene	mg/kg OC	1,000	NA	NA	**3.47**	NA	NA	**4.89**	**4.94**	NA	NA	**8.51**	**5.51**	**9.01**	NA	**2.94**	**10.91**	**12.08**	NA
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs) (Dry Weight)																			
Sum of HPAHs[5]	µg/kg	12,000	**228**	**726**	NA	**2.2**	**5.8**	NA	NA	**1700**	**3182**	NA	NA	NA	**1562**	NA	NA	NA	**539**
Benzo(a)anthracene	µg/kg	1,300	32 U	**40**	NA	9.1 U	9.7 U	NA	NA	**140**	**320**	NA	NA	NA	**94**	NA	NA	NA	**15**
Benzo(a)pyrene	µg/kg	1,600	**32**	**38**	NA	9.1 U	9.7 U	NA	NA	**100**	**330**	NA	NA	NA	**100**	NA	NA	NA	**58**
Benzofluoranthenes[6] (Total)	µg/kg	3,200	**82 U**	125	NA	9.1 U	9.7 U	NA	NA	**241**	**398**	NA	NA	NA	**320**	NA	NA	NA	**100**
Benzo(g,h,i)perylene	µg/kg	670	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**54**	**150**	NA	NA	NA	**44**	NA	NA	NA	**26**
Chrysene	µg/kg	1,400	**38**	**73**	NA	9.1 U	9.7 U	NA	NA	**280**	**430**	NA	NA	NA	**160**	NA	NA	NA	**30**
Dibenzo(a,h)anthracene	µg/kg	230	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**19**	**44**	NA	NA	NA	20 U	NA	NA	NA	**15**
Fluoranthene	µg/kg	1,700	**110**	**320**	NA	**2.2**	**3.1**	NA	NA	**490**	**560**	NA	NA	NA	**630**	NA	NA	NA	**26**
Indeno(1,2,3-c,d)pyrene	µg/kg	600	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**66**	**160**	NA	NA	NA	**44**	NA	NA	NA	**19**
Pyrene	µg/kg	2,600	**48**	**130**	NA	9.1 U	**2.7**	NA	NA	**310**	**790**	NA	NA	NA	**170**	NA	NA	NA	**250**
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
Hexachlorobenzene	mg/kg OC	0.38	NA	NA	0.1 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.1 U	2.8 U	NA	NA	NA	6.1 U	NA	NA	NA	**3.2 J**
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.5 U	3.1 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.5 U	3.1 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
Hexachlorobenzene	µg/kg	22	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	1.5 U	1.3 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	NA	NA	10.21 U	NA	NA	**0.76**	**1.69**	NA	NA	**4.26**	**28.81**	**16.74**	NA	**3.72**	**2.23**	1.46 U	NA
Butyl benzyl Phthalate	mg/kg OC	4.9	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.64 U	0.68 U	0.64 U	NA	0.51 U	1.59 U	1.46 U	NA
Dibutyl Phthalate	mg/kg OC	220	NA	NA	**0.97**	NA	NA	**0.84**	**2.7**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	1.59 U	1.46 U	NA
Diethyl Phthalate	mg/kg OC	61	NA	NA	**0.2**	NA	NA	0.44 U	**0.22**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	7.73 U	7.5 U	NA
Dimethyl Phthalate	mg/kg OC	53	NA	NA	**0.11**	NA	NA	0.44 U	1.12 U	NA	NA	**2.85**	0.85 U	0.86 U	NA	0.68 U	1.59 U	1.46 U	NA
Di-N-Octyl Phthalate	mg/kg OC	58	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.85 U	0.85 U	0.86 U	NA	**4.39**	1.59 U	1.46 U	NA
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	32 U	**25**	NA	91 U	**11**	NA	NA	**75**	**44**	NA	NA	NA	**150**	NA	NA	NA	34 U
Butyl benzyl Phthalate	µg/kg	63	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.8 U	3.4 U	NA	NA	NA	**20**	NA	NA	NA	4.7 U
Dibutyl Phthalate	µg/kg	1,400	32 U	20 U	NA	**16**	**20**	NA	NA	**22**	26 U	NA	NA	NA	20 U	NA	NA	NA	19 U
Diethyl Phthalate	µg/kg	200	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**10 J**	1.4 U	NA	NA	NA	20 U	NA	NA	NA	47 U
Dimethyl Phthalate	µg/kg	71	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**5.9 J**	**10 J**	NA	NA	NA	20 U	NA	NA	NA	4.7 U
Di-N-Octyl Phthalate	µg/kg	6,200	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	2.0 U	1.8 U	NA	NA	NA	20 U	NA	NA	NA	19 U
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	32 U	20 U	20 U	46 R	49 R	50 R	50 R	6.5 U	5.8 U	**6.6**	6.2 U	6 U	6.1 U	6 U	870 U	880 U	19 U
2-methylphenol (o-Cresol)	µg/kg	63	32 U	20 U	20 U	9.1 U	**2.1**	10 U	10 U	1.8 U	1.6 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U	4.7 U
4-methylphenol (p-Cresol)	µg/kg	670	32 U	**70**	20 U	9.1 U	**65**	10 U	**4**	**130**	**26**	**48**	**47**	**82**	**66**	**55**	35 U	35 U	38 U
Pentachlorophenol	µg/kg	360	160 U	99 U	49 U	91 U	97 U	100 U	100 U	**32 J**	22 U	30 U	31 U	30 U	**71**	30 U	170 U	180 U	47 U
Phenol	µg/kg	420	32 U	20 U	49 U	13 U	**80**	16 U	17 U	**12**	2.2 U	20 U	20 U	**15**	20 U	20 U	**240**	35 U	19 U

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Sample Location[1]			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF	P2-1-3
Sample Identification			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)	P2-1-A-COMP (P2-1/P2-2/P2-3)
Sample Date			07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10	11/16/12
Sample Interval (dbm)			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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	Surface Layer Composite (0-4ft)
Sample Type	Proposed Sediment Cleanup Level[2]		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	NA	NA	1.02 U	NA	NA	**0.25**	**0.31**	NA	NA	0.85 U	**0.42 J**	**0.52 J**	NA	0.68 U	1.59 U	1.46 U	NA
Hexachlorobutadiene	mg/kg OC	3.9	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	**9.0 J**	**7.3 J**	NA	NA	NA	**20**	NA	NA	NA	19 U
Hexachlorobutadiene	µg/kg	11	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.0 U	2.7 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	1.9 U	1.7 U	NA	NA	NA	6.1 U	NA	NA	NA	19 U
Benzoic Acid	µg/kg	650	320 U	200 U	**200**	19 U	200 R	200 R	200 R	**120 J**	110 U	200 U	200 U	200 U	200 U	200 U	35 U	35 U	380 U
Benzyl Alcohol	µg/kg	57	32 U	20 U	**6.2**	190 R	20 U	20 U	10 U	2.5 U	2.3 U	30 U	31 U	30 U	30 U	30 U	35 U	35 U	19 U
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	NA	NA	2.11 U	NA	NA	0.71 U	1.69 U	NA	NA	0.17 U	0.17 U	0.17 U	NA	0.14 U	4.55 U	4.58 U	NA
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	16 U	16 U	NA	20 U	14 U	NA	NA	14 U	7.5 U	NA	NA	NA	**4.6 J**	NA	NA	NA	3.8 U
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	Pass	--	**Fail**	Pass	Pass	Pass	Pass	Pass	Pass	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	Pass	--	Pass	Pass	Pass	Pass	Pass	**Yes**	Pass	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	Pass	--	Pass	Pass	Pass	Pass	Pass	**Yes**	Pass	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	**Fail**	--	--	--	--	--	**--**	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05	LY-05	LY-05
Sample Identification			P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10	LY-SC-05_ 1-2	LY-SC-05_ 3-4
Sample Date			11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15	11/19/15	11/19/15
Sample Interval (dbm)			Subsurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm	1 - 2	3 - 4
Sample Type		Proposed	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit		Sediment	Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	--	--	--	--	--	<5	Absent	5	5	75	10	20	40	40	10	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	**0.13**	**0.15**	--	--	--	**1.21**	**0.56**	**5.56**	**2.95**	**8.74**	**9.29**	**2.75**	**1.21**	**0.905 J**	**21.50**	**0.55**	--
Total Volatile Solids (TVS)	%	NE	**1.37**	**1.14**	--	--	--	**1.69**	**0.98**	**13.75**	**11.81**	**28.21**	--	**10.10**	**2.34**	**2.01 J**	**8.23**	--	--
Total Solids (TS)	%	NE	**80.5**	**82.1**	--	--	--	**85.9**	**89.9**	**48.2**	**55.4**	**39.9**	**45.5**	**46.9**	**75.4**	**87.7 J**	**54.7**	**77.7**	--
Total Ammonia	mg-N/kg	NE	**0.9**	**0.9**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	**15.4**	**15.8**	**16.7**	--	**34.0**	--	**22.1**	**8.2**	--	**8.0**
Total Sulfide	mg/kg	NE	1.24 U	1.21 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	0.05 U	**37.5**	**44.0**	--	**161.0**	--	--	**7.2**	--	--
Grain Size																			
Gravel	%	NE	**0.3**	**0.2**	--	--	--	**60.2**	**63.3**	**1.7**	**1.2**	**18.1**	--	**0.6**	**26.6**	**35.4**	**3.3**	--	--
Very Coarse Sand	%	NE	**0.3**	**0.3**	--	--	--	**5.4**	**12.3**	**2.1**	**1.4**	**3.8**	--	**1.5**	**2.2**	**2.6**	**2.4**	--	--
Coarse Sand	%	NE	**0.5**	**0.6**	--	--	--	**7.3**	**12.9**	**3.2**	**2.7**	**4.8**	--	**1.4**	**2.6**	**2.7**	**2.7**	--	--
Medium Sand	%	NE	**7.2**	**8.4**	--	--	--	**13.2**	**8.7**	**4.8**	**4.6**	**7**	--	**2.4**	**11.1**	**10.9**	**4.6**	--	--
Fine Sand	%	NE	**21.8**	**31.3**	--	--	--	**8.1**	**1.6**	**6**	**8.4**	**7.9**	--	**3.3**	**26.2**	**24.8**	**13.5**	--	--
Very Fine Sand	%	NE	**20.9**	**12.8**	--	--	--	**0.6**	**0.4**	**10.4**	**12**	**8.4**	--	**7**	**15.7**	**13.8**	**18.9**	--	--
Coarse Silt	%	NE	**22.2**	**13.4**	--	--	--	**4.6**	0.7 U	**22.9**	**21.8**	**6.5**	--	**28**	**5.2**	**1.7**	**17.8**	--	--
Medium Silt	%	NE	**12.8**	**11.5**	--	--	--	**0.1**	0.7 U	**20.8**	**19.8**	**15**	--	**18**	**3.1**	**2.1**	**12.2**	--	--
Fine Silt	%	NE	**6.3**	**8.9**	--	--	--	**0.1**	0.7 U	**10**	**10.2**	**8**	--	**14.2**	**1.6**	**1.2**	**7.5**	--	--
Very Fine Silt	%	NE	**3.3**	**5.5**	--	--	--	**0.1**	0.7 U	**4.3**	**4.5**	**5.2**	--	**5.6**	**1.3**	**1**	**3.4**	--	--
Clay	%	NE	**4.5**	**7**	--	--	--	0.3 U	0.7 U	**13.8**	**13.6**	**15.2**	--	**17.9**	**4.4**	**3.7**	**13.5**	--	--
Metals																			
Arsenic	mg/kg	57	6 U	6 U	--	--	--	**5.6 J**	**5.15 J**	**9.7 J**	**8 J**	**8.6 J**	--	**8.3 J**	**11**	**14**	**10**	**11**	--
Cadmium	mg/kg	5.1	**0.3**	0.2	--	--	--	0.072 U	0.023 U	**1.1**	**1.2**	**0.8**	--	**1**	**0.5**	**0.5**	**0.6**	**1.6**	**1.1**
Chromium	mg/kg	260	**19 J**	**19.9 J**	--	--	--	**42.4**	**53.8**	**40**	**40**	**35**	--	**41**	**15.7**	**18.6**	**33.4**	--	--
Copper	mg/kg	390	**16.2**	**14.5**	--	--	--	**17.2**	**42.4**	**34.6**	**36.8**	**41.1**	--	**33.8**	**9.6**	**10.8**	**30**	--	--
Lead	mg/kg	450	2	**4**	--	--	--	**11**	**11**	**18**	**17**	**13**	--	**18**	**2.11 J**	**2.21 J**	**14**	--	--
Mercury	mg/kg	0.41	0.03 U	0.02 U	--	--	--	**0.0052 J**	**0.0026 JJ**	**0.08**	**0.08**	**0.08**	--	**0.06**	**0.0182 J**	**0.0141 J**	**0.05**	--	--
Silver	mg/kg	6.1	0.4 U	0.3 U	--	--	--	0.4 U	0.3 U	0.6 U	0.6 U	0.7 U	--	0.6 U	0.4 U	0.4 U	0.5 U	--	--
Zinc	mg/kg	410	**32**	**30**	--	--	--	**61**	**57**	**95**	**89**	**90**	--	**93**	**27**	**34**	**73**	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	NA	NA	--	--	--	**0.93 J**	**0.71**	NA	**11.49 J**	NA	--	**97.35**	**4.17 J**	**6.21 J**	**3.29**	**16.15 J**	--
2-Methylnaphthalene	mg/kg OC	38	NA	NA	--	--	--	0.39 U	**0.43 J**	NA	**2.17 J**	NA	--	**2.29**	**0.3 J**	**0.49 J**	**0.33**	**0.91**	--
Acenaphthene	mg/kg OC	16	NA	NA	--	--	--	0.39 U	0.84 U	NA	**0.78**	NA	--	**58.18**	0.4 U	**0.52 J**	**0.3**	**0.73 J**	--
Acenaphthylene	mg/kg OC	66	NA	NA	--	--	--	0.39 U	0.84 U	NA	**0.54**	NA	--	**0.98**	**0.2 J**	0.54 U	**0.14**	**0.65 J**	--
Anthracene	mg/kg OC	220	NA	NA	--	--	--	0.39 U	0.84 U	NA	**1.56 J**	NA	--	**7.27**	**0.45**	**0.9**	**0.33**	**1.45**	--
Fluorene	mg/kg OC	23	NA	NA	--	--	--	0.39 U	0.84 U	NA	**1.15 J**	NA	--	**10.18**	**0.38 J**	**0.71**	**0.34**	**1.34**	--
Naphthalene	mg/kg OC	99	NA	NA	--	--	--	**0.26 J**	0.84 U	NA	**3.39**	NA	--	**3.64**	**1.9**	**2.21**	**1.3**	**7.44**	--
Phenanthrene	mg/kg OC	100	NA	NA	--	--	--	**0.68 J**	**0.71 J**	NA	**4.07**	NA	--	**17.09**	**1.24**	**1.88**	**0.88**	**4.54**	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	18 U	19 U	--	--	--	NA	NA	**472 J**	NA	**1252**	--	NA	NA	NA	NA	NA	--
2-Methylnaphthalene	µg/kg	670	18 U	19 U	--	--	--	NA	NA	**140 J**	NA	**99**	--	NA	NA	NA	NA	NA	--
Acenaphthene	µg/kg	500	18 U	19 U	--	--	--	NA	NA	**25**	NA	**140**	--	NA	NA	NA	NA	NA	--
Acenaphthylene	µg/kg	1,300	18 U	19 U	--	--	--	NA	NA	**29**	NA	**42**	--	NA	NA	NA	NA	NA	--
Anthracene	µg/kg	960	18 U	19 U	--	--	--	NA	NA	**69 J**	NA	**210**	--	NA	NA	NA	NA	NA	--
Fluorene	µg/kg	540	18 U	19 U	--	--	--	NA	NA	**49 J**	NA	**180**	--	NA	NA	NA	NA	NA	--
Naphthalene	µg/kg	2,100	18 U	19 U	--	--	--	NA	NA	**160**	NA	**340**	--	NA	NA	NA	NA	NA	--
Phenanthrene	µg/kg	1,500	18 U	19 U	--	--	--	NA	NA	**140**	NA	**340**	--	NA	NA	NA	NA	NA	--

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Sample Location[1]		P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05	LY-05	LY-05
Sample Identification		P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10	LY-SC-05_ 1-2	LY-SC-05_ 3-4
Sample Date		11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15	11/19/15	11/19/15
Sample Interval (dbm)		Subsurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm	1 - 2	3 - 4
Sample Type	Proposed	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit	Sediment	Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone	Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																		
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	--	--	--	**9.03 J**	**6.4 J**	NA	**34.14 J**	NA	NA	**72.58**	**5.37 J**	**10.25 J**	**4.76**	**18.73 J**	--
Benzo(a)anthracene	mg/kg OC	110	NA	NA	--	--	--	**0.55 J**	0.84 U	NA	**2.17 J**	NA	NA	**2.98**	**0.31 J**	**0.7**	**0.31**	**1.11**	--
Benzo(a)pyrene	mg/kg OC	99	NA	NA	--	--	--	**0.55**	**0.59 J**	NA	**1.76**	NA	NA	**1.6**	**0.51**	**0.41 J**	**0.22**	**1.07**	--
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	--	--	--	**2.23 J**	**1.96**	NA	**5.08**	NA	NA	**4.73**	**0.63**	**1.1**	**0.6**	**2.18**	--
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	--	--	--	**1.32**	**0.66 J**	NA	**1.19**	NA	NA	**0.98**	**0.55**	**0.46 J**	**0.19**	**0.78 J**	--
Chrysene	mg/kg OC	110	NA	NA	--	--	--	**1.24 J**	**0.98**	NA	**4.07 J**	NA	NA	**4.36**	**0.48**	**0.95**	**0.42**	**1.34**	--
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.51 U	NA	NA	0.51 U	0.4 U	0.54 U	0.08 U	0.91 U	--
Fluoranthene	mg/kg OC	160	NA	NA	--	--	--	**1.49 J**	**0.84 J**	NA	**11.53**	NA	NA	**35.64**	**1.49 J**	**3.76 J**	**1.35**	**5.99**	--
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	--	--	--	**0.67**	**0.55 J**	NA	**0.88**	NA	NA	**0.84**	0.4 U	0.54 U	**0.13**	**0.64 J**	--
Pyrene	mg/kg OC	1,000	NA	NA	--	--	--	**0.99 J**	**0.82 J**	NA	**7.46**	NA	NA	**21.45**	**1.4 J**	**2.87 J**	**1.53**	**5.63**	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																		
Sum of HPAHs[5]	µg/kg	12,000	**10 J**	19 U	--	--	--	NA	NA	**1332 J**	NA	**3012**	**2717**	NA	NA	NA	NA	NA	--
Benzo(a)anthracene	µg/kg	1,300	18 U	19 U	--	--	--	NA	NA	**99 J**	NA	**190**	**200**	NA	NA	NA	NA	NA	--
Benzo(a)pyrene	µg/kg	1,600	18 U	19 U	--	--	--	NA	NA	**64**	NA	**110**	**120**	NA	NA	NA	NA	NA	--
Benzofluoranthenes[6] (Total)	µg/kg	3,200	37 U	37 U	--	--	--	NA	NA	**220**	NA	**300**	**350**	NA	NA	NA	NA	NA	--
Benzo(g,h,i)perylene	µg/kg	670	18 U	19 U	--	--	--	NA	NA	**43**	NA	**60**	**68**	NA	NA	NA	NA	NA	--
Chrysene	µg/kg	1,400	18 U	19 U	--	--	--	NA	NA	**220 J**	NA	**320**	**320**	NA	NA	NA	NA	NA	--
Dibenzo(a,h)anthracene	µg/kg	230	18 U	19 U	--	--	--	NA	NA	**11 J**	NA	**18**	**17**	NA	NA	NA	NA	NA	--
Fluoranthene	µg/kg	1,700	18 U	19 U	--	--	--	NA	NA	**360**	NA	**1200**	**1000**	NA	NA	NA	NA	NA	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	18 U	19 U	--	--	--	NA	NA	**35**	NA	**54**	**52**	NA	NA	NA	NA	NA	--
Pyrene	µg/kg	2,600	**10 J**	19 U	--	--	--	NA	NA	**280**	NA	**760**	**590**	NA	NA	NA	NA	NA	--
Chlorinated Hydrocarbons (OC Normalized)																		
1,2,4-Trichlorobenzene	mg/kg OC	0.81	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	0.54 U	0.02 U	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	**0.17 J**	0.02 U	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	0.54 U	0.02 U	--	--
Hexachlorobenzene	mg/kg OC	0.38	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	0.54 U	0.02 U	--	--
Chlorinated Hydrocarbons (Dry Weight)																		
1,2,4-Trichlorobenzene	µg/kg	31	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	--	NA	NA	NA	NA	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	**2.8 J**	--	NA	NA	NA	NA	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	--	NA	NA	NA	NA	--	--
Hexachlorobenzene	µg/kg	22	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	--	NA	NA	NA	NA	--	--
Phthalates (OC Normalized)																		
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	NA	NA	--	--	--	**90.91**	**5.88 J**	NA	**6.1**	NA	--	**9.45**	**52.07 J**	**4.86 J**	**2.23**	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	NA	NA	--	--	--	**0.4**	0.84 U	NA	**1.05 J**	NA	--	**0.29**	0.4 U	**0.43 J**	0.02 U	--	--
Dibutyl Phthalate	mg/kg OC	220	NA	NA	--	--	--	1.57 U	3.39 U	NA	0.68 U	NA	--	0.69 U	1.57 U	2.21 U	0.09 U	--	--
Diethyl Phthalate	mg/kg OC	61	NA	NA	--	--	--	2.73 U	3.39 U	NA	0.68 U	NA	--	1.24 U	1.57 U	2.21 U	**0.26**	--	--
Dimethyl Phthalate	mg/kg OC	53	NA	NA	--	--	--	1.57 U	3.39 U	NA	0.68 U	NA	--	0.69 U	1.57 U	2.21 U	0.09 U	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	NA	NA	--	--	--	1.57 U	3.39 U	NA	0.68 U	NA	--	0.69 U	1.57 U	2.21 U	0.09 U	--	--
Phthalates (Dry Weight)																		
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	24 U	27 U	--	--	--	NA	NA	**160**	NA	250 U	--	NA	NA	NA	NA	--	--
Butyl benzyl Phthalate	µg/kg	63	4.6 U	4.6 U	--	--	--	NA	NA	**5.4**	NA	5 U	--	NA	NA	NA	NA	--	--
Dibutyl Phthalate	µg/kg	1,400	18 U	19 U	--	--	--	NA	NA	19 U	NA	**35 J**	--	NA	NA	NA	NA	--	--
Diethyl Phthalate	µg/kg	200	4.6 U	4.6 U	--	--	--	NA	NA	37 U	NA	100 U	--	NA	NA	NA	NA	--	--
Dimethyl Phthalate	µg/kg	71	4.6 U	4.6 U	--	--	--	NA	NA	19 U	NA	100 U	--	NA	NA	NA	NA	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	18 U	19 U	--	--	--	NA	NA	19 U	NA	100 U	--	NA	NA	NA	NA	--	--
Phenols (Dry Weight)																		
2,4-Dimethylphenol	µg/kg	29	18 U	19 U	--	--	--	24 U	24 U	24 U	**13 J**	**17 J**	**12 J**	24 U	24 U	24 U	25 U	--	--
2-methylphenol (o-Cresol)	µg/kg	63	4.6 U	4.6 U	--	--	--	19 U	19 U	19 U	20 U	100 U	19 U	19 U	19 U	20 U	20 U	--	--
4-methylphenol (p-Cresol)	µg/kg	670	37 U	37 U	--	--	--	19 U	19 U	**800 J**	**460 J**	**3900**	**1100**	**1100**	**53**	**46**	**330**	--	--
Pentachlorophenol	µg/kg	360	46 U	46 U	--	--	--	95 U	94 U	96 U	98 U	**480 J**	95 U	96 U	97 U	98 U	98 U	--	--
Phenol	µg/kg	420	18 U	19 U	--	--	--	19 U	19 U	**42 J**	**76 J**	**560**	**370**	**67 J**	**20**	**20**	**300 J**	--	--

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Sample Location[1]			P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05	LY-05	LY-05
Sample Identification			P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10	LY-SC-05_ 1-2	LY-SC-05_ 3-4
Sample Date			11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15	11/19/15	11/19/15
Sample Interval (dbm)			Subsurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm	1 - 2	3 - 4
Sample Type		Proposed Sediment Cleanup Level[2]	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit			Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	NA	NA	--	--	--	**0.26 J**	0.84 U	NA	**1.22**	NA	NA	**12.36**	**0.29 J**	**0.53**	**0.38**	--	--
Hexachlorobutadiene	mg/kg OC	3.9	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	NA	0.17 U	0.4 U	0.54 U	0.02 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	NA	0.17 U	0.4 U	0.54 U	0.02 U	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	18 U	19 U	--	--	--	NA	NA	**48**	NA	**130**	**140**	NA	NA	NA	NA	--	--
Hexachlorobutadiene	µg/kg	11	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	4.8 U	NA	NA	NA	NA	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	18 U	19 U	--	--	--	NA	NA	4.8 U	NA	5 U	4.8 U	NA	NA	NA	NA	--	--
Benzoic Acid	µg/kg	650	370 U	370 U	--	--	--	190 U	190 U	**200**	**220**	**4,300 J**	**160 J**	**110 J**	190 U	200 U	**110 J**	--	--
Benzyl Alcohol	µg/kg	57	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	100 U	19 U	19 U	19 U	20 U	20 U	--	--
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	NA	**0.043 J**	NA	--	**0.067 J**	--	--	**0.01 J**	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	3.8 U	3.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	**1.71 J**	NA	**3.0 J**	--	NA	--	--	NA	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09	LY-10	LY-10	LY-11
Sample Identification			LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4	LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10
Sample Date			11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015	11/17/15	11/18/15	11/17/15
Sample Interval (dbm)			4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4	0 - 10 cm	0 - 1	0 - 10 cm
Sample Type		Proposed	Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface
Stratigraphic Unit		Sediment	Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	Absent	10	10	10	Absent	Absent	Absent	Absent	10	40	<5	10	<5	<5	<5	<5	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	--	**1.75**	**2.24**	--	**0.56**	**0.73**	**0.19**	--	**1.86**	**6.32**	**3.17**	**1.52**	**2.70**	--	**1.84**	**2.65**	**1.32**
Total Volatile Solids (TVS)	%	NE	--	**6.43**	**8.42**	--	--	--	--	--	**6.61**	**16.08**	--	**6.15**	--	--	**5.49**	--	--
Total Solids (TS)	%	NE	--	**55.1**	**55.4**	--	**76.5**	--	**75.8**	--	**55.0**	**47.4**	**51.1**	**56.3**	**47.9**	--	**53.0**	**50.9**	**57.0**
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	**6.2**	**7.0**	**29.6**	--	--	--	--	**7.8**	**41**	--	**7.7**	--	**76.2**	**6.2**	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	**0.2**	**49.2**	**16.2**	--	--	--	--	**1.6**	**8.3**	--	**1.6**	--	**0.3**	**0.9**	--	--
Grain Size																			
Gravel	%	NE	--	**2.9**	**2.8**	--	--	**2.8**	--	--	**1.8**	**6.8**	--	**2.2**	--	--	**2**	--	--
Very Coarse Sand	%	NE	--	**1.5**	**2.1**	--	--	**2.1**	--	--	**1.4**	**3.4**	--	**1.2**	--	--	**1.2**	--	--
Coarse Sand	%	NE	--	**2.5**	**2.9**	--	--	**2.9**	--	--	**1.8**	**3.4**	--	**2.2**	--	--	**0.8**	--	--
Medium Sand	%	NE	--	**5.9**	**6.4**	--	--	**6.4**	--	--	**3.5**	**4.1**	--	**3.9**	--	--	**1.8**	--	--
Fine Sand	%	NE	--	**22.4**	**21.4**	--	--	**21.4**	--	--	**14.5**	**7.5**	--	**10.8**	--	--	**10.6**	--	--
Very Fine Sand	%	NE	--	**17.7**	**18.1**	--	--	**18.1**	--	--	**22.4**	**9.8**	--	**23.7**	--	--	**20.8**	--	--
Coarse Silt	%	NE	--	**13.9**	**12.3**	--	--	**12.3**	--	--	**20.8**	**13.4**	--	**26.2**	--	--	**21.8**	--	--
Medium Silt	%	NE	--	**8.7**	**8.8**	--	--	**8.8**	--	--	**11.2**	**15.7**	--	**11.7**	--	--	**15.1**	--	--
Fine Silt	%	NE	--	**6.4**	**6.7**	--	--	**6.7**	--	--	**5.8**	**9**	--	**4.2**	--	--	**6.4**	--	--
Very Fine Silt	%	NE	--	**3.7**	**4.1**	--	--	**4.1**	--	--	**3.6**	**5.9**	--	**2.9**	--	--	**4.1**	--	--
Clay	%	NE	--	**14.3**	**14.5**	--	--	**14.5**	--	--	**13.2**	**21**	--	**11**	--	--	**15.4**	--	--
Metals																			
Arsenic	mg/kg	57	--	**12**	**11**	--	**7**	--	--	--	**10**	**10**	--	**8.4 J**	10 U	--	**8.29 J**	--	--
Cadmium	mg/kg	5.1	**0.8**	**0.5**	**0.4**	--	**0.7**	--	--	--	**0.7**	**0.6**	--	**0.7**	**0.7**	--	**0.7**	--	--
Chromium	mg/kg	260	--	**31.8**	**32.1**	--	--	--	--	--	**33**	**38**	--	**29.6**	--	--	**31.5**	--	--
Copper	mg/kg	390	--	**31.7**	**28.3**	--	--	--	--	--	**25.8**	**32.2**	--	**27.2**	--	--	**22.2**	--	--
Lead	mg/kg	450	--	**9**	**8**	--	--	--	--	--	**10**	**14**	--	**7**	--	--	**8**	--	--
Mercury	mg/kg	0.41	--	**0.06**	**0.05**	--	--	--	--	--	**0.0435 J**	**0.15**	--	**0.05**	--	--	**0.09**	--	--
Silver	mg/kg	6.1	--	0.6 U	0.5 U	--	--	--	--	--	0.6 U	0.6 U	--	0.5	--	--	0.5 U	--	--
Zinc	mg/kg	410	--	**67**	**70**	--	--	--	--	--	**79**	**86**	--	**67**	--	--	**68**	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	--	**40.11 J**	**32.72 J**	--	--	--	--	--	**144.25**	NA	**75.43**	**163.62**	**35.96**	--	**23.59**	--	--
2-Methylnaphthalene	mg/kg OC	38	--	**4.63**	**3.08**	--	--	--	--	--	**3.82**	NA	**5.05**	**4.8**	**2.56**	--	**2.72**	--	--
Acenaphthene	mg/kg OC	16	--	**3.31**	**2.81**	--	--	--	--	--	**6.45**	NA	**5.36**	**1.71**	**2.81**	--	**1.3**	--	--
Acenaphthylene	mg/kg OC	66	--	**2.34**	**2.1**	--	--	--	--	--	**5**	NA	**1.92**	**3.36**	**1.3**	--	**1.63**	--	--
Anthracene	mg/kg OC	220	--	**3.89 J**	**4.02 J**	--	--	--	--	--	**9.14**	NA	**15.46**	**85.53**	**9.26**	--	**3.32**	--	--
Fluorene	mg/kg OC	23	--	**3.71**	**2.81**	--	--	--	--	--	**9.14**	NA	**8.52**	**16.45**	**5.93**	--	**2.12**	--	--
Naphthalene	mg/kg OC	99	--	**16.57**	**12.5**	--	--	--	--	--	**12.37**	NA	**24.92**	**9.21**	**5.93**	--	**8.15**	--	--
Phenanthrene	mg/kg OC	100	--	**10.29**	**8.48**	--	--	--	--	--	**102.15**	NA	**19.24**	**47.37**	**10.74**	--	**7.07**	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	--	NA	NA	--	--	--	--	--	NA	**4230**	NA	NA	NA	--	NA	--	--
2-Methylnaphthalene	µg/kg	670	--	NA	NA	--	--	--	--	--	NA	**120**	NA	NA	NA	--	NA	--	--
Acenaphthene	µg/kg	500	--	NA	NA	--	--	--	--	--	NA	**620**	NA	NA	NA	--	NA	--	--
Acenaphthylene	µg/kg	1,300	--	NA	NA	--	--	--	--	--	NA	**100**	NA	NA	NA	--	NA	--	--
Anthracene	µg/kg	960	--	NA	NA	--	--	--	--	--	NA	**800**	NA	NA	NA	--	NA	--	--
Fluorene	µg/kg	540	--	NA	NA	--	--	--	--	--	NA	**750**	NA	NA	NA	--	NA	--	--
Naphthalene	µg/kg	2,100	--	NA	NA	--	--	--	--	--	NA	**860**	NA	NA	NA	--	NA	--	--
Phenanthrene	µg/kg	1,500	--	NA	NA	--	--	--	--	--	NA	**1100**	NA	NA	NA	--	NA	--	--

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Sample Location[1]			LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09	LY-10	LY-10	LY-11
Sample Identification			LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4	LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10
Sample Date			11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015	11/17/15	11/18/15	11/17/15
Sample Interval (dbm)			4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4	0 - 10 cm	0 - 1	0 - 10 cm
Sample Type	Proposed Sediment Cleanup Level[2]		Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	mg/kg OC	960	--	**87.37 J**	**59.51**	--	--	--	--	--	**369.57**	NA	**143.15**	**619.54**	**182.26**	--	**62.01 J**	**196.64**	**--**
Benzo(a)anthracene	mg/kg OC	110	--	**8**	**4.46**	--	**3.59**	--	NA	--	**11.83**	NA	**10.09**	**72.37**	**12.96**	--	**5.98**	**21.89**	**9.85**
Benzo(a)pyrene	mg/kg OC	99	--	**5.31**	**3.71**	--	**2.51**	--	NA	--	**6.99**	NA	**5.68**	**55.26**	**7.04**	--	**4.46**	**12.08**	**8.33**
Benzofluoranthenes[6] (Total)	mg/kg OC	230	--	**10.86**	**8.93**	--	4.67	--	5.79	--	**32.26**	NA	**12.93**	**111.84**	**3.19**	--	**12.5**	**30.94**	**20.45**
Benzo(g,h,i)perylene	mg/kg OC	31	--	**2.63**	**1.96**	--	**--**	--	NA	--	**3.39**	NA	**3.47**	**21.05**	**20.74**	--	**2.23**	**4.91**	**--**
Chrysene	mg/kg OC	110	--	**8.57**	**6.25**	--	**3.23**	--	NA	--	**41.94**	NA	**12.93**	**118.42**	**23.33**	--	**9.78**	**30.94**	**14.39**
Dibenzo(a,h)anthracene	mg/kg OC	12	--	**0.69 J**	0.63 U	--	0.86 U	--	NA	--	**0.97**	NA	**0.73**	**5.72**	**0.96**	--	**0.65 J**	**1.55**	**1.29**
Fluoranthene	mg/kg OC	160	--	**17.71**	**14.29**	--	--	--	--	--	**161.29**	NA	**56.78**	**125**	**66.67**	--	**10.33**	**33.21**	**--**
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	--	**2.17**	**1.61**	--	**1.33**	--	NA	--	**3.39**	NA	**2.68**	**17.76**	**2.93**	--	**1.96**	**4.53**	**3.71**
Pyrene	mg/kg OC	1,000	--	**31.43**	**18.3**	--	--	--	--	--	**107.53**	NA	**37.85**	**92.11**	**44.44**	--	**14.13**	**56.6**	**--**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	µg/kg	12,000	--	NA	NA	--	--	--	--	--	NA	**8086**	NA	NA	NA	--	NA	NA	--
Benzo(a)anthracene	µg/kg	1,300	--	NA	NA	--	NA	--	**5**	--	NA	**540**	NA	NA	NA	--	NA	NA	NA
Benzo(a)pyrene	µg/kg	1,600	--	NA	NA	--	NA	--	**4.2 J**	--	NA	**240**	NA	NA	NA	--	NA	NA	NA
Benzofluoranthenes[6] (Total)	µg/kg	3,200	--	NA	NA	--	26	--	11	--	NA	**660**	NA	NA	NA	--	NA	NA	NA
Benzo(g,h,i)perylene	µg/kg	670	--	NA	NA	--	NA	--	--	--	NA	**95**	NA	NA	NA	--	NA	NA	--
Chrysene	µg/kg	1,400	--	NA	NA	--	NA	--	**6.3**	--	NA	**750**	NA	NA	NA	--	NA	NA	NA
Dibenzo(a,h)anthracene	µg/kg	230	--	NA	NA	--	NA	--	4.8 U	--	NA	**23**	NA	NA	NA	--	NA	NA	NA
Fluoranthene	µg/kg	1,700	--	NA	NA	--	--	--	--	--	NA	**3500**	NA	NA	NA	--	NA	NA	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	--	NA	NA	--	NA	--	4.8 U	--	NA	**78**	NA	NA	NA	--	NA	NA	NA
Pyrene	µg/kg	2,600	--	NA	NA	--	--	--	--	--	NA	**2200**	NA	NA	NA	--	NA	NA	--
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	NA	0.33 U	--	--	0.26 U	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	NA	0.33 U	--	--	0.26 U	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	0.27 U	**0.11 J**	--	--	--	--	--	0.26 U	NA	NA	0.33 U	--	--	0.26 U	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	NA	0.33 U	--	--	0.26 U	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	NA	NA	--	--	--	--	--	NA	4.8 U	--	NA	--	--	NA	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	NA	NA	--	--	--	--	--	NA	**3.5 J**	--	NA	--	--	NA	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	NA	NA	--	--	--	--	--	NA	**11**	--	NA	--	--	NA	--	--
Hexachlorobenzene	µg/kg	22	--	NA	NA	--	--	--	--	--	NA	4.8 U	--	NA	--	--	NA	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	**3.43**	**2.86**	--	--	--	--	--	**3.6**	NA	--	**3.68**	--	--	**2.28 J**	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	0.27 U	0.21 U	--	--	--	--	--	**0.7**	NA	--	**1.32**	--	--	**0.52**	--	--
Dibutyl Phthalate	mg/kg OC	220	--	1.09 U	0.85 U	--	--	--	--	--	1.08 U	NA	--	1.32 U	--	--	1.03 U	--	--
Diethyl Phthalate	mg/kg OC	61	--	1.09 U	**1.7 U**	--	--	--	--	--	1.08 U	NA	--	2.83 U	--	--	3.1 U	--	--
Dimethyl Phthalate	mg/kg OC	53	--	1.09 U	0.85 U	--	--	--	--	--	1.08 U	NA	--	1.32 U	--	--	1.03 U	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	1.09 U	0.85 U	--	--	--	--	--	1.08 U	NA	--	1.32 U	--	--	1.03 U	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	NA	NA	--	--	--	--	--	NA	**62 J**	--	NA	--	--	NA	--	--
Butyl benzyl Phthalate	µg/kg	63	--	NA	NA	--	--	--	--	--	NA	4.8 U	--	NA	--	--	NA	--	--
Dibutyl Phthalate	µg/kg	1,400	--	NA	NA	--	--	--	--	--	NA	19 U	--	NA	--	--	NA	--	--
Diethyl Phthalate	µg/kg	200	--	NA	NA	--	--	--	--	--	NA	19 U	--	NA	--	--	NA	--	--
Dimethyl Phthalate	µg/kg	71	--	NA	NA	--	--	--	--	--	NA	19 U	--	NA	--	--	NA	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	NA	NA	--	--	--	--	--	NA	19 U	--	NA	--	--	NA	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	24 U	**14 J**	--	24 U	--	--	--	24 U	**12 J**	--	25 U	--	--	24 U	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	19 U	19 U	--	19 U	--	--	--	20 U	**15 J**	--	20 U	--	--	19 U	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	**310 J**	**550 J**	--	19 U	--	--	--	**280**	**330**	--	**200**	--	--	**370**	--	--
Pentachlorophenol	µg/kg	360	--	97 U	97 U	--	96 U	--	--	--	97 U	96 U	--	99 U	--	--	96 U	--	--
Phenol	µg/kg	420	--	**50 J**	**78 J**	--	8.6 J	--	--	--	**41 J**	**160**	--	**47 J**	--	--	**46 J**	--	--

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Sample Location[1]			LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09	LY-10	LY-10	LY-11
Sample Identification			LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4	LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10
Sample Date			11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015	11/17/15	11/18/15	11/17/15
Sample Interval (dbm)			4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4	0 - 10 cm	0 - 1	0 - 10 cm
Sample Type		Proposed Sediment	Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface
Stratigraphic Unit		Cleanup Level[2]	Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	**3.49**	**2.37**	--	--	--	--	--	**5.91**	NA	--	**4.41**	--	--	**1.79**	--	--
Hexachlorobutadiene	mg/kg OC	3.9	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	--	0.33 U	--	--	0.26 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	--	0.33 U	--	--	0.26 U	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	NA	NA	--	--	--	--	--	NA	**370**	--	NA	--	--	NA	--	--
Hexachlorobutadiene	µg/kg	11	--	NA	NA	--	--	--	--	--	NA	4.8 U	--	NA	--	--	NA	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	NA	NA	--	--	--	--	--	NA	4.8 U	--	NA	--	--	NA	--	--
Benzoic Acid	µg/kg	650	--	**130 J**	**78 J**	--	--	--	--	--	**92 J**	**360**	--	**96 J**	--	--	**110 J**	--	--
Benzyl Alcohol	µg/kg	57	--	19 U	19 U	--	--	--	--	--	20 U	19 U	--	20 U	--	--	19 U	--	--
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	mg/kg OC	12	--	**0.61 J**	**0.16 J**	--	**0.009 J**	**0.06 J**	--	--	**0.06 J**	--	--	--	--	--	**0.05**	--	**0.04**
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	µg/kg	130	--	NA	NA	--	NA	NA	--	--	NA	--	--	--	--	--	NA	--	NA
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			LY-11	LY-13	LY-14	LY-14	LY-14	LY-15	LY-15	LY-16	LY-16	LY-17	LY-17	LY-18	LY-18	LY-19	LY-19	LY-19	LY-20
Sample Identification			LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	LY-SS-15_ 0-10	LY-SC-15_ 0-1	LY-SS-16_ 0-10	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1	LY-SS-19_ 0-10	LY-SC-19_ 1-2	LY-SC-19_ 2-3	LY-SS-20_ 0-10
Sample Date			11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/30/21	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21
Sample Interval (dbm)			0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm
Sample Type		Proposed	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Core	Surface
Stratigraphic Unit		Sediment	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	<5	Absent	Absent	Absent	Absent	10	Absent	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	5
Conventionals																			
Total Organic Carbon (TOC)	%	NE	1.25	1.29	1.11	1.55	0.10	0.84	0.49	1.35	1.00	0.49	0.09	--	--	1.73	1.44 J	1.07	2.23
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	53.2	59.1	64.3	77.3	79.0	62.3	64.5	68.9	71.6	70.3	84.9	--	--	47.1	61.4	67.1	51.3
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Arsenic	mg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	5.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	260	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	390	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	450	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	6.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	410	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg OC	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg OC	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	mg/kg OC	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg OC	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg OC	99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	mg/kg OC	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	2,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-11	LY-13	LY-14	LY-14	LY-14	LY-15	LY-15	LY-16	LY-16	LY-17	LY-17	LY-18	LY-18	LY-19	LY-19	LY-19	LY-20
Sample Identification			LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	LY-SS-15_ 0-10	LY-SC-15_ 0-1	LY-SS-16_ 0-10	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1	LY-SS-19_ 0-10	LY-SC-19_ 1-2	LY-SC-19_ 2-3	LY-SS-20_ 0-10
Sample Date			11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/30/21	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21
Sample Interval (dbm)			0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm
Sample Type	Proposed Sediment Cleanup Level[2]		Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	mg/kg OC	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	mg/kg OC	110	**13.6**	**5.81**	0.9	**2.53**	--	*3.83*	*5.1*	*0.79*	**1.27**	2.59	3.73 J	--	--	*2.5*	**1.2**	--	*11.79*
Benzo(a)pyrene	mg/kg OC	99	**13.6**	**10.08**	0.91	**2.28**	--	*3*	*5.39*	*1.17*	**1.73**	3.53	3.44 J	--	--	*2.1*	**1.85**	--	*10.85*
Benzofluoranthenes[6] (Total)	mg/kg OC	230	**32.8**	**25.58**	1.33	**5.17**	--	*5.7*	*8.12*	*1.99*	**2.56**	5.21	3.57 J	--	--	*4.72*	**3.1**	--	*36.77*
Benzo(g,h,i)perylene	mg/kg OC	31	--	--	0.81	**1.17**	--	*1.99*	*4.16*	*0.88*	**1.26**	2.57	1.3 J	--	--	*1.66*	**1.38**	--	*6.55 J*
Chrysene	mg/kg OC	110	**26.4**	**10.08**	1.15	**5.52**	--	*5.32*	*7.63*	*1.31*	**2.08**	4.24	5.14 J	--	--	*5.05*	**2.15**	--	*40*
Dibenzo(a,h)anthracene	mg/kg OC	12	**1.84**	**1.55**	0.35 J	**0.46**	--	*0.67*	*1.62*	*0.32 J*	**0.41 J**	0.84 J	5.54 U	--	--	*0.54*	**0.36**	--	*1.5 J*
Fluoranthene	mg/kg OC	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	**5.6**	**4.81**	0.56	**0.98**	--	*1.73*	*3.71*	*0.67*	**1.16**	2.37	1.24 J	--	--	*1.38*	**1.04**	--	*6.5 J*
Pyrene	mg/kg OC	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	µg/kg	12,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	µg/kg	1,300	NA	NA	**10**	NA	--	*NA*	*25*	*NA*	NA	**12.7**	**3.36 J**	**2.29 J**	4.97 U	*NA*	NA	--	*NA*
Benzo(a)pyrene	µg/kg	1,600	NA	NA	**10.1**	NA	--	*NA*	*26.4*	*NA*	NA	**17.3**	**3.1 J**	**2.96 J**	4.97 U	*NA*	NA	--	*NA*
Benzofluoranthenes[6] (Total)	µg/kg	3,200	NA	NA	**14.76**	NA	--	*NA*	*39.8*	*NA*	NA	**25.55**	**3.21 J**	**3.88 J**	4.97 U	*NA*	NA	--	*NA*
Benzo(g,h,i)perylene	µg/kg	670	--	--	**8.98**	NA	--	*NA*	*20.4*	*NA*	NA	**12.6**	**1.17 J**	**2.65 J**	4.97 U	*NA*	NA	--	*NA*
Chrysene	µg/kg	1,400	NA	NA	**12.8**	NA	--	*NA*	*37.4*	*NA*	NA	**20.8**	**4.63 J**	**4.02 J**	4.97 U	*NA*	NA	--	*NA*
Dibenzo(a,h)anthracene	µg/kg	230	NA	NA	**3.84 J**	NA	--	*NA*	*7.93*	*NA*	NA	**4.14 J**	4.99 U	5 U	4.97 U	*NA*	NA	--	*NA*
Fluoranthene	µg/kg	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	NA	NA	**6.26**	NA	--	*NA*	*18.2*	*NA*	NA	**11.6**	**1.12 J**	**2.09 J**	4.97 U	*NA*	NA	--	*NA*
Pyrene	µg/kg	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-11	LY-13	LY-14	LY-14	LY-14	LY-15	LY-15	LY-16	LY-16	LY-17	LY-17	LY-18	LY-18	LY-19	LY-19	LY-19	LY-20
Sample Identification			LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	LY-SS-15_ 0-10	LY-SC-15_ 0-1	LY-SS-16_ 0-10	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1	LY-SS-19_ 0-10	LY-SC-19_ 1-2	LY-SC-19_ 2-3	LY-SS-20_ 0-10
Sample Date			11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/30/21	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21
Sample Interval (dbm)			0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm
Sample Type	Proposed Sediment Cleanup Level[2]		Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	--	--	**0.08 J**	**0.64 J**	NA	*14.4*	NA	*11.9*	**0.2 J**	NA	NA	--	--	*0.53 J*	**2.64 J**	**0.11 J**	*0.43 J*
Total PCBs Congeners	mg/kg OC	12	--	**1.01 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	--	--	NA	NA	1.6 U	NA	*13.9*	NA	NA	1.6 U	1.6 U	--	--	NA	NA	NA	NA
Total PCBs Congeners	µg/kg	130	--	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24	LY-24	LY-25	LY-25	LY-25	LY-26
Sample Identification			LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1	LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10
Sample Date			08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21	09/01/21	08/30/21	09/02/21	09/02/21	08/31/21
Sample Interval (dbm)			1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm
Sample Type		Proposed	Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit		Sediment	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	Absent	Absent	5	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	--	**1.20**	*1.92*	**3.09**	*1.68 J*	*1.36*	**1.24**	--	**2.33**	--	--	*1.62*	--	*1.60*	**1.78**	--	*0.61 J*
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	--	**64.2**	*56.4*	**50.1**	*69.6*	*70.3*	**58.8**	--	**53.7**	--	--	*55.1*	--	*47.1*	**55.5**	--	*63.4*
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Arsenic	mg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	5.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	260	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	390	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	450	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	6.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	410	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg OC	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg OC	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	mg/kg OC	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg OC	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg OC	99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	mg/kg OC	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	2,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24	LY-24	LY-25	LY-25	LY-25	LY-26
Sample Identification			LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1	LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10
Sample Date			08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21	09/01/21	08/30/21	09/02/21	09/02/21	08/31/21
Sample Interval (dbm)			1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm
Sample Type	Proposed		Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit	Sediment		Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone	Cleanup Level[2]		Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	mg/kg OC	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	mg/kg OC	110	--	**8.33**	*12.4*	**5.6**	*4.5 J*	*3.68*	**4.74**	--	**7.77**	--	--	--	--	*1.88*	**7.02**	--	*74.59 J*
Benzo(a)pyrene	mg/kg OC	99	--	**6.06**	*9.95*	**4.08**	*3.85 J*	*6.79*	**6.36**	--	**6.18**	--	--	--	--	*2.04*	**8.09**	--	*54.43 J*
Benzofluoranthenes[6] (Total)	mg/kg OC	230	--	**9.81**	*36.51*	**7.4**	*10.57 J*	*15.1*	**12.37**	--	**12.36**	--	--	--	--	*5.38*	**18.15**	--	*89.84 J*
Benzo(g,h,i)perylene	mg/kg OC	31	--	**3.25**	*5.57*	**2.82**	*2.4 J*	*3.64*	**3.44**	--	**3.53**	--	--	--	--	*1.28*	**5.62**	--	*23.61 J*
Chrysene	mg/kg OC	110	--	**8.42**	*50.31*	**9.58**	*13.04 J*	*9.85*	**8.47**	--	**16.09**	--	--	--	--	*4.23*	**14.33**	--	*109.02 J*
Dibenzo(a,h)anthracene	mg/kg OC	12	--	**2.25**	*2.21 J*	**0.87**	*0.72*	*1.17*	**1.23**	--	**1.25**	--	--	--	--	*0.38*	**1.96**	--	*7.8 J*
Fluoranthene	mg/kg OC	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	--	**3.11**	*6.04*	**2.69**	*2.29 J*	*3.57*	**3.6**	--	**3.56**	--	--	--	--	*1.19*	**5.62**	--	*25.41 J*
Pyrene	mg/kg OC	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	µg/kg	12,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	µg/kg	1,300	**229**	NA	*NA*	NA	*NA*	*NA*	NA	**89.2**	NA	**198**	*11.8*	--	**68.1**	*NA*	NA	**34.6**	*NA*
Benzo(a)pyrene	µg/kg	1,600	**154**	NA	*NA*	NA	*NA*	*NA*	NA	**56.1**	NA	**172**	*14*	--	**114**	*NA*	NA	**46.6**	*NA*
Benzofluoranthenes[6] (Total)	µg/kg	3,200	**324**	NA	*NA*	NA	*NA*	*NA*	NA	**110.7**	NA	**247.5**	*23.43*	--	**223**	*NA*	NA	**71.9**	*NA*
Benzo(g,h,i)perylene	µg/kg	670	**86.9**	NA	*NA*	NA	*NA*	*NA*	NA	**34.6**	NA	**103**	*12.2*	--	**64.6**	*NA*	NA	**35.5**	*NA*
Chrysene	µg/kg	1,400	**445**	NA	*NA*	NA	*NA*	*NA*	NA	**235**	NA	**258**	*18.5*	--	**119**	*NA*	NA	**47.8**	*NA*
Dibenzo(a,h)anthracene	µg/kg	230	**27.7**	NA	*NA*	NA	*NA*	*NA*	NA	**11.7**	NA	**24**	*3.4 J*	--	**21.4**	*NA*	NA	**6.1**	*NA*
Fluoranthene	µg/kg	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	**81.5**	NA	*NA*	NA	*NA*	*NA*	NA	**31.8**	NA	**81.7**	*9.27*	--	**61.3**	*NA*	NA	**23.5**	*NA*
Pyrene	µg/kg	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24	LY-24	LY-25	LY-25	LY-25	LY-26
Sample Identification			LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1	LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10
Sample Date			08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21	09/01/21	08/30/21	09/02/21	09/02/21	08/31/21
Sample Interval (dbm)			1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm
Sample Type	Proposed		Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit	Sediment		Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone	Cleanup Level[2]		Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	--	**0.31 J**	*0.42 J*	**0.76 J**	*0.58 J*	*0.68 J*	**0.85 J**	--	**0.54 J**	--	--	*1.58 J*	--	*0.53*	**1.74**	--	*1.44 J*
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	--	NA	*NA*	NA	*NA*	*NA*	NA	--	NA	--	--	*NA*	--	*NA*	NA	--	*NA*
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30	LY-31	LY-31	LY-32	COA_01	COA_02	COA_03
Sample Identification			LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2	LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118
Sample Date			08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type		Proposed	Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Surface	Surface	Surface
Stratigraphic Unit		Sediment	Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native	Recent	Native	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	1.08	1.15	--	--	--	--	--	--	--	--	--	--	--	--	1.08	1.36	1.57
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.60	4.92	5.87
Total Solids (TS)	%	NE	60.8	62.3	--	--	--	--	--	--	--	--	--	--	--	--	82.2	54.1	44.9
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.9	27.9	41.5
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.6	984	2,260
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Arsenic	mg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.15	6.44	6.17
Cadmium	mg/kg	5.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.14	0.85	0.58
Chromium	mg/kg	260	--	--	--	--	--	--	--	--	--	--	--	--	--	--	27.5	32.3	34.3
Copper	mg/kg	390	--	--	--	--	--	--	--	--	--	--	--	--	--	--	28.4	36.3	31.7
Lead	mg/kg	450	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13.6	11.4	9.44
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0149 J	0.111	0.0835
Silver	mg/kg	6.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05 J	0.17 J	0.11
Zinc	mg/kg	410	--	--	--	--	--	--	--	--	--	--	--	--	--	--	122	82.8	77.8
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.65 J	22.6 J	12.83 J
2-Methylnaphthalene	mg/kg OC	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.84 J	1.31 J	1.54
Acenaphthene	mg/kg OC	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	0.79 J	1.59
Acenaphthylene	mg/kg OC	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	2.56	0.92 J
Anthracene	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	4.58	1.9
Fluorene	mg/kg OC	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.69	1.99
Naphthalene	mg/kg OC	99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	2.25	1.52
Phenanthrene	mg/kg OC	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.65 J	10.74	4.91
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
2-Methylnaphthalene	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Acenaphthene	µg/kg	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Acenaphthylene	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Anthracene	µg/kg	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Fluorene	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Naphthalene	µg/kg	2,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Phenanthrene	µg/kg	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA

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Sample Location[1]			LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30	LY-31	LY-31	LY-32	COA_01	COA_02	COA_03
Sample Identification			LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2	LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118
Sample Date			08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	Proposed		Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Surface	Surface	Surface
Stratigraphic Unit	Sediment		Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native	Recent	Native	Recent	Recent	Recent	Recent
Tidal Zone	Cleanup Level[2]		Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)									--										
Sum of HPAHs[5]	mg/kg OC	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	***11.68***	***350.04***	***64.38 J***
Benzo(a)anthracene	mg/kg OC	110	***1.84 J***	***3.24***	--	--	--	--	--	--	--	--	--	--	--	--	***0.57 J***	***14.19***	***3.69***
Benzo(a)pyrene	mg/kg OC	99	***2.23 J***	***3.5***	--	--	--	--	--	--	--	--	--	--	--	--	*1.15 J*	***12.35***	***4.48***
Benzofluoranthenes[6] (Total)	mg/kg OC	230	***4.43 J***	***6.5***	--	--	--	--	--	--	--	--	--	--	--	--	*2.63 J*	***57.94***	***13.31***
Benzo(g,h,i)perylene	mg/kg OC	31	***1.78 J***	***3.3***	--	--	--	--	--	--	--	--	--	--	--	--	*1.39 J*	***5.96***	***2.62***
Chrysene	mg/kg OC	110	***3.25 J***	***4.58***	--	--	--	--	--	--	--	--	--	--	--	--	*2.45*	***64.19***	***10.19***
Dibenzo(a,h)anthracene	mg/kg OC	12	***0.79 J***	***0.92***	--	--	--	--	--	--	--	--	--	--	--	--	*1.84 U*	***2.49***	***1.14 J***
Fluoranthene	mg/kg OC	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	***1.05 J***	***108.82***	***11.59***
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	***1.69 J***	***2.03***	--	--	--	--	--	--	--	--	--	--	--	--	***1.84 U***	***6.88***	***2.45***
Pyrene	mg/kg OC	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	***2.44***	***77.21***	***14.9***
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	µg/kg	12,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Benzo(a)anthracene	µg/kg	1,300	*NA*	*NA*	--	**11.2 J**	**28.7 J**	**136**	**3.80 J**	--	--	**9.31**	**1.57 J**	**9.01**	4.98 U	--	*NA*	*NA*	*NA*
Benzo(a)pyrene	µg/kg	1,600	*NA*	*NA*	--	**11.4 J**	**29.2 J**	**204**	**7.37**	--	--	**11.8**	**3.41 J**	**6.83**	4.98 U	--	*NA*	*NA*	*NA*
Benzofluoranthenes[6] (Total)	µg/kg	3,200	*NA*	*NA*	--	**13.45 J**	**79.5 J**	**333**	**14.43 J**	--	--	**10.46 J**	**7.37 J**	**7.2 J**	4.98 U	--	*NA*	*NA*	*NA*
Benzo(g,h,i)perylene	µg/kg	670	*NA*	*NA*	--	**9.15 J**	**13.9**	**118**	**3.11 J**	--	--	**9.28**	**1.62 J**	**4.04 J**	4.98 U	--	*NA*	*NA*	*NA*
Chrysene	µg/kg	1,400	*NA*	*NA*	--	**11.9 J**	**62.7 J**	**212**	**6.13**	--	--	**25**	**2.73 J**	**11.4**	4.98 U	--	*NA*	*NA*	*NA*
Dibenzo(a,h)anthracene	µg/kg	230	*NA*	*NA*	--	**2.83 J**	**4.06 J**	**32.2**	4.98 U	--	--	**2.9**	4.95	**1.09 J**	4.98 U	--	*NA*	*NA*	*NA*
Fluoranthene	µg/kg	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Indeno(1,2,3-c,d)pyrene	µg/kg	600	*NA*	*NA*	--	**5.35**	**13.1**	**106**	**2.43 J**	--	--	**3.77**	**1.31 J**	**2.98 J**	4.98 U	--	*NA*	*NA*	*NA*
Pyrene	µg/kg	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*0.46 U*	*0.37 U*	*0.32 U*
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*0.46 U*	*0.37 U*	*0.32 U*
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*0.46 U*	*0.37 U*	*0.32 U*
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*1.84 U*	*1.46 U*	*1.27 U*
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*4.59 U*	***3.59 J***	***2.22 J***
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*1.84 U*	***0.72 J***	*1.27 U*
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	***1.39 J***	***1.17 J***	***1.25 J***
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*1.84 U*	***2.01***	*1.27 U*
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*1.84 U*	***1.93***	*1.27 U*
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*1.84 U*	*1.46 U*	*1.27 U*
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*NA*	*NA*	*NA*
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*19.9 U*	***3 J***	***2.2 J***
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*19.9 U*	*19.9 U*	*19.9 U*
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*19.9 U*	***51.3***	***33.5***
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*99.3 U*	*99.6 U*	*99.7 U*
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*19.9 U*	***12.7 J***	***11.9 J***

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Sample Location[1]			LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30	LY-31	LY-31	LY-32	COA_01	COA_02	COA_03
Sample Identification			LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2	LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118
Sample Date			08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type	Proposed		Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Surface	Surface	Surface
Stratigraphic Unit	Sediment		Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native	Recent	Native	Recent	Recent	Recent	Recent
Tidal Zone	Cleanup Level[2]		Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	**0.88 J**	**1.76**
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.46 U	0.37 U	0.32 U
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.46 U	1.27 U
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**73.4 J**	199 U	199 U
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	19.9 U	19.9 U
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	**1.13 J**	**4.24**	--	NA	NA	NA	NA	NA	NA	NA	--	NA	NA	NA	**1.06 J**	**1.09 J**	**0.48 J**
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	NA	NA	--	1.6 U	1.6 U	**24.4**	1.16 U	**8.5**	1.16 U	1.16 U	--	1.6 U	1.6 U	1.6 U	NA	NA	NA
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	COA-SS-1	COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-3	COA-SS-3	COA-SS-3
Sample Identification			COA_04_G_20201118	COA_05_G_20201119	COA-05-D_G_20201119	COA_06_G_20201120	COA-06-D_G_20201120	COA_07_G_20201118	COA_08_G_20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	**COA-SS-1-6.5-8.5-20201116**	COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	**COA-SS-2-7.5-9.5-20201118**	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118
Sample Date			11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	**11/16/20**	11/18/20	11/18/20	11/18/20	**11/18/20**	11/18/20	11/18/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	**6.5 - 8.5 ft**	1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	**7.5 - 9.5 ft**	1 - 3 ft	3 -5 ft	5 -7 ft
Sample Type		Proposed	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	**Core**	Core	Core	Core	**Core**	Core	Core	Core
Stratigraphic Unit		Sediment	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	**Native**	Recent	Native	Native	**Native**	Recent	Native	Native
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	<5	Absent	Absent	Absent	<5	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	1.38	1.56	1.63	0.97	1.09	0.93 J	0.13	0.35	0.14	**0.11**	0.20	0.21	0.09	**0.11**	1.12 J	0.07	0.07
Total Volatile Solids (TVS)	%	NE	5.39	5.04	5.26	3.41	3.44	3.48 J	1.05	2.50	1.29	**1.35**	2.34	1.68	1.97	**1.41**	1.61	1.11	1.07
Total Solids (TS)	%	NE	48.2	57.2	56.5	69.2	69.3	68.82 J	77.9	75.7	86.6	**87.0**	77.2	81.9	81.1	**86.3**	79.6	87.4	90.4
Total Ammonia	mg-N/kg	NE	34.8	27.7	28.0	11.8	12.8	8.76 J	1.8	8.8	2.3	**2.5**	6.7	3.4	3.0	**1.6**	5.0	3.6	3.4
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	1,690	1,380	1,270	257	277	114	2.9	158	1.19 U	**1.4**	20.9	1.17 U	1.26 U	1.14 U	1.6	1.14 U	1.18 U
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	2.03	--	--	--	--	--	20.1	16	**29**	5.6	7	2	**6.3**	--	10.6	21.2
Very Coarse Sand	%	NE	--	0.96	--	--	--	--	--	2.3	3.7	**4.6**	2.4	3	1.4	**2.6**	--	5.1	4.3
Coarse Sand	%	NE	--	1.96	--	--	--	--	--	3.1	4.5	**6.1**	2.7	4.3	2	**3.2**	--	6.7	4.6
Medium Sand	%	NE	--	3.9	--	--	--	--	--	5.6	6.2	**8.5**	4.7	5.7	2.7	**5.3**	--	10	7
Fine Sand	%	NE	--	20.9	--	--	--	--	--	7.2	11	**8.3**	6.7	8.9	6	**6.6**	--	9.9	8.3
Very Fine Sand	%	NE	--	25.9	--	--	--	--	--	6.8	8.5	**7**	6.9	6.2	4.5	**6.7**	--	8.7	8.2
Coarse Silt	%	NE	--	11.76	--	--	--	--	--	9.7	9.5	**6.7**	10.4	10	5.3	**8.4**	--	11.2	9.6
Medium Silt	%	NE	--	10.73	--	--	--	--	--	10.5	10.1	**6.6**	11.8	9.4	14.5	**14.9**	--	10	10.3
Fine Silt	%	NE	--	4.96	--	--	--	--	--	7.6	8	**6.7**	10	10.1	13.3	**10.7**	--	8.7	9.3
Very Fine Silt	%	NE	--	3.1	--	--	--	--	--	6.8	6.9	**5.3**	8.4	8.6	12.2	**9.8**	--	6.7	7.1
Clay	%	NE	--	13.8	--	--	--	--	--	20.2	15.7	**11.3**	30.5	26.8	36.1	**25.5**	--	12.5	10.2
Metals																			
Arsenic	mg/kg	57	6.26	7.5	7.24	6.56	5.65	5.98	3.2	4.38	4.02	**5.11**	3.96	6.05	6.37	**4.9**	3.78	5.02	1.14
Cadmium	mg/kg	5.1	0.57	0.54	0.55	0.39	0.39	0.41	0.14	0.28	0.12	**0.12**	0.11 J	0.05 J	0.08 J	**0.13**	0.25	0.09 J	0.11 U
Chromium	mg/kg	260	34.2	36.9	30.8	25.4	30.3	55.6	32	62	124	**99.7**	23.3	40.2	38.2	**73.5**	23.6	81.5	39.3
Copper	mg/kg	390	25.4	29.3	22.2	12.3	6.63	23.8	12.5	34.3	23.7	**23.9**	19.5	41.2	41.3	**37.4**	8.34	21.3	9.48
Lead	mg/kg	450	7.82	9.73	7.21	5.16	3.82	2.02	3.71	5.01	2.78	**3.02**	2.99	4.73	4.87	**3.95**	2.41	2.42	0.87
Mercury	mg/kg	0.41	0.0716	0.0531	0.46	0.0534	0.04	0.046	0.0181 J	0.157	0.0347	**0.0321**	0.0574	0.0377	0.0364	**0.0317**	0.019 J	0.0319	0.0307
Silver	mg/kg	6.1	0.11 J	0.08 J	0.08 J	0.06 J	0.05 J	0.05 J	0.03 J	0.1 J	0.07 J	**0.06 J**	0.06 J	0.05 J	0.07 J	**0.07 J**	0.05 J	0.06 J	0.21 U
Zinc	mg/kg	410	76.2	62	63.9	38.5	39.9	38.4	38.6	59.9	45.4	**47.4**	34.9	68.1	69.6	**60.1**	27.6	38.6	20.7
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	13.27 J	31.67 J	17.6 J	38.65 J	29.49 J	25.66 J	NA	NA	NA	NA	NA	NA	NA	NA	8.49 J	NA	NA
2-Methylnaphthalene	mg/kg OC	38	1.57	1.36	1.48	1.41 J	1.7 J	1.53 J	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Acenaphthene	mg/kg OC	16	0.78 J	1.15 J	1.41	1.76 J	0.83 J	1.49 J	NA	NA	NA	NA	NA	NA	NA	NA	0.5 J	NA	NA
Acenaphthylene	mg/kg OC	66	0.92 J	3.08	0.98 J	1.41 J	2.04	1.6 J	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Anthracene	mg/kg OC	220	2.2	7.69	2.85	5.34	6.21	4.15	NA	NA	NA	NA	NA	NA	NA	NA	1.41 J	NA	NA
Fluorene	mg/kg OC	23	1.6	2.65	1.96	3.02	1.99	1.86 J	NA	NA	NA	NA	NA	NA	NA	NA	0.68 J	NA	NA
Naphthalene	mg/kg OC	99	2.73	4.22	4.92	10.52	6.22	7	NA	NA	NA	NA	NA	NA	NA	NA	3.22	NA	NA
Phenanthrene	mg/kg OC	100	5.04	12.88	5.48	16.6	12.2	9.55	NA	NA	NA	NA	NA	NA	NA	NA	2.68	NA	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	NA	NA	NA	NA	NA	NA	7.7 J	65.7 J	6.2 J	**6 J**	18.7 J	4.7 J	4.8 J	19.9 U	NA	20 U	19.9 U
2-Methylnaphthalene	µg/kg	670	NA	NA	NA	NA	NA	NA	19.9 U	8.3 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Acenaphthene	µg/kg	500	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Acenaphthylene	µg/kg	1,300	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Anthracene	µg/kg	960	NA	NA	NA	NA	NA	NA	19.9 U	6.1 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Fluorene	µg/kg	540	NA	NA	NA	NA	NA	NA	19.9 U	5 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Naphthalene	µg/kg	2,100	NA	NA	NA	NA	NA	NA	7.7 J	34.5	19.9 U	19.9 U	6.4 J	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Phenanthrene	µg/kg	1,500	NA	NA	NA	NA	NA	NA	19.9 U	20.1	6.2 J	**6 J**	12.3 J	4.7 J	4.8 J	19.9 U	NA	20 U	19.9 U

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Sample Location[1]			COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	**COA-SS-1**	COA-SS-2	COA-SS-2	COA-SS-2	**COA-SS-2**	COA-SS-3	COA-SS-3	COA-SS-3
Sample Identification			COA_04_G_20201118	COA_05_G_20201119	COA_05-D_G_20201119	COA_06_G_20201120	COA_06-D_G_20201120	COA_07_G_20201118	COA_08_G_20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	**COA-SS-1-6.5-8.5-20201116**	COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	**COA-SS-2-7.5-9.5-20201118**	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118
Sample Date			11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	**11/16/20**	11/18/20	11/18/20	11/18/20	**11/18/20**	11/18/20	11/18/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	**6.5 - 8.5 ft**	1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	**7.5 - 9.5 ft**	1 - 3 ft	3 -5 ft	5 -7 ft
Sample Type	**Proposed**		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	**Core**	Core	Core	Core	**Core**	Core	Core	Core
Stratigraphic Unit	**Sediment**		Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	**Native**	Recent	Native	Native	**Native**	Recent	Native	Native
Tidal Zone	**Cleanup Level[2]**		Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	mg/kg OC	960	61.52 J	302.23	70.31 J	100.52 J	338.83	160.58	NA	NA	NA	NA	NA	NA	NA	NA	28.66 J	NA	NA
Benzo(a)anthracene	mg/kg OC	110	4.51	23.46	5.04	8.3	15.6	6.94	NA	NA	NA	NA	NA	NA	NA	NA	2.11	NA	NA
Benzo(a)pyrene	mg/kg OC	99	5.23	23.53	5.09	8.76	35.87	9.46	NA	NA	NA	NA	NA	NA	NA	NA	2.24	NA	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	15.72	52.31	12.39	18.04	90.73	64.52	NA	NA	NA	NA	NA	NA	NA	NA	6.8	NA	NA
Benzo(g,h,i)perylene	mg/kg OC	31	2.85	10.58	2.9	3.39	14.86	8.45	NA	NA	NA	NA	NA	NA	NA	NA	1.21 J	NA	NA
Chrysene	mg/kg OC	110	10.36	41.79	8.96	9.9	70.73	25.38	NA	NA	NA	NA	NA	NA	NA	NA	5.84	NA	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	1.32 J	4.86	1.2 J	1.41 J	7.08	3.63	NA	NA	NA	NA	NA	NA	NA	NA	0.56 J	NA	NA
Fluoranthene	mg/kg OC	160	7.25	67.95	13.37	19.48	41.28	13.23	NA	NA	NA	NA	NA	NA	NA	NA	3.75	NA	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	2.84	11.73	2.69	3.81	16.51	9.19	NA	NA	NA	NA	NA	NA	NA	NA	1.06 J	NA	NA
Pyrene	mg/kg OC	1,000	11.45	66.03	18.65	27.42	46.15	19.78	NA	NA	NA	NA	NA	NA	NA	NA	5.09	NA	NA
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	µg/kg	12,000	NA	NA	NA	NA	NA	NA	13.4 J	266.7 J	8.2 J	9.3 J	171.9 J	39.7 U	39.7 U	6.6 J	NA	39.9 U	39.8 U
Benzo(a)anthracene	µg/kg	1,300	NA	NA	NA	NA	NA	NA	19.9 U	11.5 J	19.9 U	19.9 U	5.4 J	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Benzo(a)pyrene	µg/kg	1,600	NA	NA	NA	NA	NA	NA	19.9 U	16 J	19.9 U	19.9 U	9.7 J	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Benzofluoranthenes[6] (Total)	µg/kg	3,200	NA	NA	NA	NA	NA	NA	39.8 U	42	39.8 U	39.8 U	31.3 J	39.7 U	39.7 U	39.9 U	NA	39.9 U	39.8 U
Benzo(g,h,i)perylene	µg/kg	670	NA	NA	NA	NA	NA	NA	19.9 U	13.6 J	19.9 U	9.3 J	6.2 J	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Chrysene	µg/kg	1,400	NA	NA	NA	NA	NA	NA	19.9 U	23.3	19.9 U	19.9 U	10.8 J	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Dibenzo(a,h)anthracene	µg/kg	230	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Fluoranthene	µg/kg	1,700	NA	NA	NA	NA	NA	NA	4.6 J	34.2	19.9 U	19.9 U	14.8 J	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Indeno(1,2,3-c,d)pyrene	µg/kg	600	NA	NA	NA	NA	NA	NA	19.9 U	10.1 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Pyrene	µg/kg	2,600	NA	NA	NA	NA	NA	NA	8.8 J	116	8.2 J	19.9 U	93.7	19.9 U	19.9 U	6.6 J	NA	20 U	19.9 U
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	0.36 U	0.32 U	0.31 U	0.52 U	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	0.36 U	0.32 U	0.31 U	0.52 U	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	0.36 U	0.32 U	0.1 J	0.11 J	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
Hexachlorobenzene	mg/kg OC	0.38	1.44 U	1.28 U	1.22 U	2.05 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.78 U	NA	NA
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
Hexachlorobenzene	µg/kg	22	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	NA	19.9 U	19.9 U
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	2.59 J	2.09 J	3.06 U	5.14 U	10.83	5.35 U	NA	NA	NA	NA	NA	NA	NA	NA	4.41 J	NA	NA
Butyl benzyl Phthalate	mg/kg OC	4.9	1.44 U	1.28 U	1.23 U	2.06 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Dibutyl Phthalate	mg/kg OC	220	1.33 J	1.1 J	0.96 J	1.47 J	1.81 J	1.88 J	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Diethyl Phthalate	mg/kg OC	61	1.44 U	1.28 U	1.23 U	2.45	1.61 J	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	2.82	NA	NA
Dimethyl Phthalate	mg/kg OC	53	0.6 J	1.28 U	0.52 J	2.06 U	16.79	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Di-N-Octyl Phthalate	mg/kg OC	58	1.44 U	1.28 U	1.23 U	2.06 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	NA	NA	NA	NA	NA	NA	49.8 U	378	49.8 U	49.8 U	49.6 U	49.7 U	49.6 U	49.8 U	NA	49.9 U	219
Butyl benzyl Phthalate	µg/kg	63	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Dibutyl Phthalate	µg/kg	1,400	NA	NA	NA	NA	NA	NA	14.8 J	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Diethyl Phthalate	µg/kg	200	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	25.9	19.9 U	26.8	19.9 U	NA	33.7	26
Dimethyl Phthalate	µg/kg	71	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Di-N-Octyl Phthalate	µg/kg	6,200	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	19.9 U	19.9 U	3.6 J	2.2 J	3.2 J	2.2 J	19.9 U	19.9 U	19.9 U	99.5 U	19.8 U	19.9 U	99.3 U	19.9 U	20 U	20 U	99.6 U
2-methylphenol (o-Cresol)	µg/kg	63	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
4-methylphenol (p-Cresol)	µg/kg	670	16.3 J	81.3	46	31.5	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Pentachlorophenol	µg/kg	360	99.7 U	99.6 U	99.8 U	99.8 U	99.6 U	99.5 U	99.6 U	99.5 U	99.6 U	99.5 U	99.2 U	99.4 U	99.3 U	99.7 U	99.8 U	99.8 U	99.6 U
Phenol	µg/kg	420	11.3 J	10 J	15 J	10.8 J	8.7 J	19.9 U	19.9 U	19.9 U	19.9 U	8.9 J	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U

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Sample Location[1]			COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	**COA-SS-1**	COA-SS-2	COA-SS-2	COA-SS-2	**COA-SS-2**	COA-SS-3	COA-SS-3	COA-SS-3
Sample Identification			COA_04_G_20201118	COA_05_G_20201119	COA-05-D_G_20201119	COA_06_G_20201120	COA-06-D_G_20201120	COA_07_G_20201118	COA_08_G_20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	**COA-SS-1-6.5-8.5-20201116**	COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	**COA-SS-2-7.5-9.5-20201118**	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118
Sample Date			11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	**11/16/20**	11/18/20	11/18/20	11/18/20	**11/18/20**	11/18/20	11/18/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	**6.5 - 8.5 ft**	1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	**7.5 - 9.5 ft**	1 - 3 ft	3 -5 ft	5 -7 ft
Sample Type	**Proposed**		Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	**Core**	Core	Core	Core	**Core**	Core	Core	Core
Stratigraphic Unit	**Sediment**		Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	**Native**	Recent	Native	Native	**Native**	Recent	Native	Native
Tidal Zone	**Cleanup Level[2]**		Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	**1.02 J**	**1.41**	**1.48**	**1.48 J**	**1.94**	**1.6 J**	NA	NA	NA	NA	NA	NA	NA	NA	**0.62 J**	NA	NA
Hexachlorobutadiene	mg/kg OC	3.9	0.36 U	0.32 U	0.31 U	0.52 U	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	1.44 U	1.28 U	1.23 U	2.06 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	NA	NA	NA	NA	NA	NA	19.9 U	**5.1 J**	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Hexachlorobutadiene	µg/kg	11	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	19.9 U	5 U	5 U	19.9 U	19.9 U	NA	5 U	5 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	NA	20 U	19.9 U
Benzoic Acid	µg/kg	650	199 U	199 U	200 U	200 U	199 U	199 U	199 U	199 U	199 U	199 U	198 U	199 U	199 U	199 U	200 U	200 U	199 U
Benzyl Alcohol	µg/kg	57	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	**0.52 J**	**1.11 J**	**0.43 J**	**0.22 J**	**0.41 J**	**1.49 J**	NA	NA	NA	NA	NA	NA	NA	NA	0.14 U	NA	NA
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)																			
Total PCBs Aroclors	µg/kg	130	NA	NA	NA	NA	NA	NA	1.6 U	2.1 U	1.6 U	1.6 U	**1.8 J**	1.6 U	1.6 U	1.6 U	NA	1.6 U	1.6 U
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]			COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre	PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post
Sample Identification			COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730	COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	COA_PP-01-POST_20241002DUP
Sample Date			11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24
Sample Interval (dbm)			7 - 9 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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm
Sample Type		Proposed	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Sediment	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	**0.08**	*1.84*	*1.55*	*1.67*	*1.52*	*0.95*	*2.44*	*1.64*	*0.96*	*0.89*	*2.00*	*1.63*	*0.72*	*1.22*	*1.56*	**1.60**	**1.40**
Total Volatile Solids (TVS)	%	NE	**1.18**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	**89.5**	*53.0*	*42.6*	*52.4*	*49.7*	*56.1*	*56.7*	*55.2*	*57.3*	*72.7*	*55.0*	*42.1*	*77.1*	*62.3*	*54.3*	**47.7**	**47.8**
Total Ammonia	mg-N/kg	NE	**3.0**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	1.05 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	**15.2**	*0.3 U*	*0.3 U*	*0.3*	*3.1*	*1*	--	*7.8*	*16.4*	*0.4*	*0.6*	*0.4*	*1.8*	*1*	*0.3 U*	**5.3**	--
Very Coarse Sand	%	NE	**4.3**	*40.4*	*19.9*	*22.4*	*38.4*	*52*	--	*48.4*	*27*	*87.9*	*47.9*	*20.1*	*87*	*57.9*	*49.1*	**33.6**	--
Coarse Sand	%	NE	**4.1**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	**5.4**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	**10.2**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	**9.6**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	**10.5**	*47.8*	*65.9*	*67.8*	*46.2*	*34*	--	*34.1*	*46.4*	*7.7*	*41.2*	*65.6*	*7.2*	*33.5*	*42.9*	**46.2**	--
Medium Silt	%	NE	**11.8**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	**9.6**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	**8.3**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	**11**	*11.7*	*14.1*	*9.7*	*12.2*	*13*	--	*9.8*	*10*	*4.3*	*10.4*	*14.1*	*4.1*	*8*	*8.2*	14.8	--
Metals																			
Arsenic	mg/kg	57	**2.82**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	5.1	**0.07 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	260	**79.4**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	390	**26.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	450	**2.81**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	**0.0307**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	6.1	**0.09 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	410	**43.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	mg/kg OC	370	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
2-Methylnaphthalene	mg/kg OC	38	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Acenaphthene	mg/kg OC	16	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Acenaphthylene	mg/kg OC	66	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Anthracene	mg/kg OC	220	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Fluorene	mg/kg OC	23	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Naphthalene	mg/kg OC	99	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Phenanthrene	mg/kg OC	100	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (																			
Sum of LPAHs[4]	µg/kg	5,200	**6 J**	*221.38 J*	*94.5 J*	*219.9 J*	*335.6 J*	*207.2 J*	*151.9 J*	*1145.8*	*80.55 J*	*132.9 J*	*574.1*	*63.6 J*	*36.5 J*	*262.5 J*	*234.5 J*	**124.9 J**	**133.6 J**
2-Methylnaphthalene	µg/kg	670	20 U	*21.9*	*16.6*	*26.2*	*22.4*	*21.6*	*18.4*	*33.4*	*13 J*	*13.7 J*	*38.7*	*17.2*	*7.47 U*	*18.9*	*22.8*	**15.7**	**11.1**
Acenaphthene	µg/kg	500	20 U	*10.2 J*	*7.5 U*	*12.8 J*	*13.5 J*	*7.98 J*	*14.4 J*	*41.8*	*7.49 U*	*7.48 U*	*44*	*7.49 U*	*7.47 U*	*11.7 J*	*11.7 J*	**6.7**	**5.9**
Acenaphthylene	µg/kg	1,300	20 U	*9.28 J*	*7.5 U*	*11.2 J*	*13.3 J*	*7.83 J*	*7.5 UJ*	*69.4*	*7.49 U*	*7.48 U*	*25.1*	*7.49 U*	*7.47 U*	*11.8 J*	*12.1 J*	**6.2 J**	**8.9**
Anthracene	µg/kg	960	20 U	*28.5*	*21.2*	*38.1*	*93.8*	*44.2 J*	*13.2 J*	*184*	*17.3*	*13.6 J*	*119*	*10.7 J*	*7.47 U*	*48.8*	*45.7*	**20**	**27.4 J**
Fluorene	µg/kg	540	20 U	*12.6 J*	*8.44 J*	*16.5*	*20.1*	*13.3 J*	*12 J*	*65.3*	*8.95 J*	*8.11 J*	*42.7*	*7.49 U*	*7.47 U*	*16.3*	*20.2*	**11.4**	**12.7**
Naphthalene	µg/kg	2,100	20 U	*64.6*	*14.4 J*	*34.3*	*63.9*	*48.5*	*73.8*	*85.3*	*21.9*	*66*	*76.3*	*23.8*	*25.8*	*69.9*	*61.6*	**39.8 J**	**21.2 J**
Phenanthrene	µg/kg	1,500	**6 J**	*96.2*	*50.5*	*107*	*131*	*85.4 J*	*38.5 J*	*700*	*32.4*	*45.2 J*	*267*	*29.1*	*10.7 J*	*104*	*83.2*	**40.8**	**57.5 J**

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Sample Location[1]			COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre	PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post
Sample Identification			COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730	COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	COA_PP-01-POST_20241002DUP
Sample Date			11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24
Sample Interval (dbm)			7 - 9 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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm
Sample Type		Proposed	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Sediment	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	mg/kg OC	99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	mg/kg OC	160	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	mg/kg OC	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Sum of HPAHs[5]	µg/kg	12,000	40 U	*1078.8 J*	*610.46 J*	*1459.5*	*2509.3*	*742.9 J*	*227.75 J*	*26363.7*	*497.5*	*536.1 J*	*3908.2*	*376.9 J*	*50.4 J*	*1426.6*	*2305.6*	**660.9 J**	**1094.3 J**
Benzo(a)anthracene	µg/kg	1,300	20 U	*56.4*	*55.1*	*86.3*	*313*	*59.2 J*	*13.8 J*	*805*	*31.2*	*32.6*	*307*	*24.7*	*7.47 U*	*89.3*	*161*	**55.2**	**59.6 J**
Benzo(a)pyrene	µg/kg	1,600	20 U	*68.5*	*65.9*	*106*	*258*	*62.3 J*	*15.9 J*	*762*	*46.7*	*34.8*	*341*	*29.7*	*7.47 U*	*129*	*129*	**56.2**	**48.6**
Benzofluoranthenes[6] (Total)	µg/kg	3,200	40 U	*186*	*136*	*280*	*598*	*122 J*	*33.2 J*	*2850*	*110*	*77.5*	*807*	*70*	*22.4 U*	*317*	*438*	**140 J**	**154 J**
Benzo(g,h,i)perylene	µg/kg	670	20 U	*39*	*29.9*	*54*	*77.3*	*39.5 J*	*19.6 J*	*292*	*26.2*	*22.8*	*131*	*16.6*	*7.47 U*	*63*	*52*	**26.3**	**25.3**
Chrysene	µg/kg	1,400	20 U	*138*	*75.2*	*191*	*424*	*159 J*	*22.7 J*	*2320*	*54.2*	*71.8 J*	*524*	*46.1*	*9.6 J*	*195*	*366*	**69.6**	**115 J**
Dibenzo(a,h)anthracene	µg/kg	230	20 U	*11.2 J*	*8.16 J*	*15.5*	*30.3*	*13.5 J*	*7.5 UJ*	*79.7*	*7.49 U*	*7.48 U*	*46.2*	*7.49 U*	*7.47 U*	*19.6*	*17*	**6.5 J**	**6.6**
Fluoranthene	µg/kg	1,700	20 U	*286*	*97.6*	*320*	*350*	*129 J*	*42.9 J*	*10700*	*67.3*	*148 J*	*751*	*73.1*	*18*	*290*	*605*	**87.4 J**	**344 J**
Indeno(1,2,3-c,d)pyrene	µg/kg	600	20 U	*34.7*	*27.6*	*48.7*	*85.7*	*30.4 J*	*8.55 J*	*335*	*23.9*	*16.6*	*140*	*13.7 J*	*7.47 U*	*60.7*	*51.6*	**20.7 J**	**22.2**
Pyrene	µg/kg	2,600	20 U	*259*	*115*	*358*	*373*	*128 J*	*71.1 J*	*8220*	*138*	*132 J*	*861*	*103*	*22.8*	*263*	*486*	**199 J**	**319 J**
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	19.9 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	50 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	99.9 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre	PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post
Sample Identification			COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730	COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	COA_PP-01-POST_20241002DUP
Sample Date			11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24
Sample Interval (dbm)			7 - 9 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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm
Sample Type		Proposed	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Sediment	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	mg/kg OC	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	20 U	12.5 J	7.95 J	16.3 J	17.6	11.8 J	14.9 J	34.9	9.51 J	7.48 U	35.2	7.79 J	7.47 U	17.2	15 J	8.3	9.7
Hexachlorobutadiene	µg/kg	11	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	200 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	NA	1.33 J	0.85 J	1.32 J	0.84 J	0.93	0.42 J	1.4 J	1.84 J	5.55 J	0.1 U	4.87 J	1.22	3.2 J	1.25 J	0.98 J	0.46
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)															NA				
Total PCBs Aroclors	µg/kg	130	**1.3**	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized scre

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compound

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 6

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]	PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post	PP-10-Post
Sample Identification			COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002	COA_PP-10-POST_20241002
Sample Date			10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening											
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals											
Total Organic Carbon (TOC)	%	NE	**0.90**	**1.70**	**1.20**	**1.50**	**1.90**	**1.60**	**0.60**	**1.20**	**1.10**
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	**54.3**	**55.0**	**58.0**	**71.8**	**60.7**	**42.5**	**79.3**	**62.8**	**58.7**
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--
Grain Size											
Gravel	%	NE	**1.9**	**8.3**	**20.3**	**1.4**	**1**	**0.3**	**1.4**	**0.7**	**4.2**
Very Coarse Sand	%	NE	**54.6**	**47.7**	**27.1**	**84.3**	**57.8**	**25.3**	**88.1**	**61.7**	**64.2**
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	**30.3**	**29.6**	**40.8**	**7.7**	**30.9**	**60.4**	**5.4**	**28**	**20.4**
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--
Clay	%	NE	13.2	14.3	11.7	6.6	10.3	14.1	5.2	9.5	11.2
Metals											
Arsenic	mg/kg	57	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	5.1	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	260	--	--	--	--	--	--	--	--	--
Copper	mg/kg	390	--	--	--	--	--	--	--	--	--
Lead	mg/kg	450	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--
Silver	mg/kg	6.1	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	410	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (											
Sum of LPAHs[4]	mg/kg OC	370	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	mg/kg OC	38	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	mg/kg OC	16	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	mg/kg OC	66	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	mg/kg OC	220	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	mg/kg OC	23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	mg/kg OC	99	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	mg/kg OC	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs) (											
Sum of LPAHs[4]	µg/kg	5,200	**72.1 J**	**1586.8 J**	**63.5 J**	**250.3 J**	**1304.3 J**	**217.1 J**	**58.1**	**141.1 J**	**115.3 J**
2-Methylnaphthalene	µg/kg	670	**9.2**	**33.9**	**9.9**	**9.5**	**113**	**23.3**	**7.3**	**11.3**	**8.6**
Acenaphthene	µg/kg	500	**4.3 J**	**43.3**	**3.2 J**	**13.5**	**40**	**17.2**	**10.3**	**8**	**6.7**
Acenaphthylene	µg/kg	1,300	**3.1 J**	**100 J**	**4.3 J**	**5.5 J**	**62.7 J**	**6.8 J**	**2.5 U**	**8.9 J**	**4.2 J**
Anthracene	µg/kg	960	**11.6 J**	**160**	**12.7**	**46.3 J**	**123**	**40.4**	**7.9**	**29.5**	**22**
Fluorene	µg/kg	540	**6.8**	**94.3**	**7.1**	**16.4**	**88.2**	**26.8**	**9.3**	**11.2**	**11.2**
Naphthalene	µg/kg	2,100	**22.7**	**59.2**	**12.7**	**51.6**	**78.4**	**27.9**	**8.2**	**37.6**	**15**
Phenanthrene	µg/kg	1,500	**23.6 J**	**1130**	**23.5**	**117 J**	**912**	**98**	**22.4**	**45.9**	**56.2**

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Sample Location[1]			PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post	PP-10-Post
Sample Identification			COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002	COA_PP-10-POST_20241002
Sample Date			10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type		Proposed Sediment Cleanup Level[2]	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)											
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	mg/kg OC	99	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	mg/kg OC	160	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	mg/kg OC	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)											
Sum of HPAHs[5]	µg/kg	12,000	**227.1 J**	**35687 J**	**442.1 J**	**999.1 J**	**5573 J**	**855.3 J**	**125.1 J**	**891.1 J**	**636.6 J**
Benzo(a)anthracene	µg/kg	1,300	**16.4 J**	**1030**	**31.9**	**114**	**434**	**73.5**	**5.2**	**60.9**	**59.4**
Benzo(a)pyrene	µg/kg	1,600	**18.7**	**933**	**28.9**	**85.4**	**261**	**62**	**9.7**	**73.7**	**49.3**
Benzofluoranthenes[6] (Total)	µg/kg	3,200	**41.3 J**	**4200**	**86.8 J**	**188 J**	**703 J**	**165 J**	**33.3 J**	**239 J**	**119 J**
Benzo(g,h,i)perylene	µg/kg	670	**12.6**	**407 J**	**13.3**	**41.2**	**102**	**27.4**	**3.9 J**	**28.5**	**20.7**
Chrysene	µg/kg	1,400	**23 J**	**2670**	**66.8**	**119**	**846**	**109**	**8.6**	**138**	**68.1**
Dibenzo(a,h)anthracene	µg/kg	230	**2.7 J**	**103 J**	**3.3 J**	**13.4 J**	**35 J**	**7.5 J**	2.5 U	**6.5 J**	**4.1 J**
Fluoranthene	µg/kg	1,700	**42.6 J**	**14500**	**64.1**	**202 J**	**1490**	**156**	**26.9**	**138**	**136**
Indeno(1,2,3-c,d)pyrene	µg/kg	600	**9.4 J**	**444 J**	**11 J**	**36.1 J**	**102 J**	**24.9 J**	**3.3 J**	**26.5 J**	**18 J**
Pyrene	µg/kg	2,600	**60.4 J**	**11400**	**136 J**	**200 J**	**1600 J**	**230 J**	**34.2 J**	**180 J**	**162 J**
Chlorinated Hydrocarbons (OC Normalized)											
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)											
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)											
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)											
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)											
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--

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Sample Location[1]			PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post	PP-10-Post
Sample Identification			COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002	COA_PP-10-POST_20241002
Sample Date			10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type		Proposed	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Sediment	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Cleanup Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)											
Dibenzofuran	mg/kg OC	15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	mg/kg OC	3.9	NA	NA	NA	NA	NA	NA	NA	NA	NA
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	NA	NA	NA	NA	NA	NA	NA	NA
Miscellaneous Extractables (Dry Weight)											
Dibenzofuran	µg/kg	540	**5.7**	**63.6 J**	**6**	**9.9**	**33.5**	**18.4**	**14.9**	**9.7**	**7.6**
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (OC Normalized)											
Total PCBs Aroclors	mg/kg OC	12	0.22 UJ	**2.44 J**	**2.24 J**	**1.17 J**	**2.88 J**	**1.93 J**	0.3 U	**1.07 J**	**0.65**
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs) (Dry Weight)											
Total PCBs Aroclors	µg/kg	130	NA	NA	NA	NA	NA	NA	NA	NA	NA
Total PCBs Congeners	µg/kg	130	--	--	--	--	--	--	--	--	--
Bioassay Tests[7]											
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	NE	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	NE	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	NE	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 6.

[2] Proposed cleanup levels (PCULs) area presented in Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

mg/L = milligram per liter

µg/L = microgram per liter

mg-N/kg = milligrams of nitrogen per kilogram

mg-N/L = milligrams of nitrogen per liter

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

µg/kg = microgram per kilogram

--= not analyzed

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

cm = centimeter

ft = feet

n/a = not applicable

NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).

NE = not established

dbm = depth below mudline

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF
Sample Identification				LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)
Sample Date				07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10
Sample Interval (dbm)				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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit				Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Intertidal Zone	Sutidal Zone	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Arsenic	mg/kg	11	11	10 U	10 U	**2.37**	**2.1**	**3.2**	**5.6**	**4.3**	**4.52**	**5.3**	10 U	10 U	10 U	10 U	9 U	10 U	11 U
Cadmium	mg/kg	0.80	0.80	0.5 U	0.5 U	**0.09**	0.08 U	**0.12**	**0.41**	**0.39**	**0.698**	**0.642**	**0.6**	**0.7**	**1**	**1**	**0.9**	1 U	1.1 U
Chromium	mg/kg	62	62	**12**	**29**	**12.3**	**13.5**	**21.2**	**20.4**	**21.2**	**31.2**	**31.9**	**33**	**51**	**39**	**41**	**36.6**	**39**	**41**
Copper	mg/kg	45	45	**17.1**	**31.7**	**10.4**	**9.49**	**15.4**	**12.6**	**11.3**	**28.5**	**29.7**	**40.8**	**248**	**38.2**	**39.8**	**33.9**	**42**	**120**
Lead	mg/kg	21	21	5 U	**8**	**2.23**	**1.63**	**3.39**	**5.74**	**3.48**	**9.29**	**9.32**	**8**	**23**	**10**	**11**	**11**	**11**	**14**
Mercury	mg/kg	0.20	0.20	0.1 U	0.09 U	**0.01 J**	**0.01**	**0.01**	**0.04**	**0.03**	**0.033**	**0.037**	**0.07**	**0.06**	**0.08**	**0.08**	**0.07**	0.1 U	0.11 U
Silver	mg/kg	0.30	0.30	0.8 U	0.8 U	0.02 U	**0.03**	**0.043**	**0.07**	**0.06**	**0.15**	**0.1**	0.6 U	0.7 U	0.7 U	0.7 U	0.6 U	1 U	1.1 U
Zinc	mg/kg	93	93	**35**	**69**	**20.9**	**19.1**	**32.6**	**37.8**	**28.3**	**784**	**711**	**79**	**105**	**102**	**96**	**78**	**79**	**73**
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	--	--	--	--	--	**160**	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	32 U	20 U	9.7 U	9.1 U	9.7 U	**8.7**	**4.9**	**13**	**10 J**	20 U	20 U	20 U	**12**	20 U	14 U	14 U
Acenaphthene	µg/kg	4,800,000	67,000,000	32 U	**28**	9.7 U	9.1 U	9.7 U	**5.7**	10 U	**8.8 J**	**7 J**	20 U	20 U	**12 J**	**14 J**	20 U	14 U	14 U
Acenaphthylene	µg/kg	4,800,000	67,000,000	32 U	20 U	**1.4**	9.1 U	9.7 U	**16**	**5.3**	**13**	**69**	**10 J**	20 U	**13 J**	**15 J**	20 U	14 U	14 U
Anthracene	µg/kg	4,800,000	67,000,000	32 U	**55**	9.7 U	9.1 U	9.7 U	**38**	**8.1**	**73**	**47**	**45**	**31**	**44**	**48**	**17 J**	**40**	**81**
Fluorene	µg/kg	3,200,000	45,000,000	32 U	**27**	9.7 U	9.1 U	9.7 U	**8.7**	**4.4**	**18**	**19**	**16 J**	**14 J**	**19 J**	**26**	20 U	14 U	**16**
Naphthalene	µg/kg	1,600,000	22,000,000	32 U	20 U	9.7 U	9.1 U	9.7 U	**33**	**26**	**16**	**10**	20 U	20 U	20 U	20 U	20 U	14 U	14 U
Phenanthrene	µg/kg	4,800,000	67,000,000	32 U	**94**	**8.2**	9.1 U	**2.4**	**42**	**23**	**160**	**140**	**120**	**170**	**190**	**180**	**62**	**62**	**140**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	32 U	**40**	**4.1**	9.1 U	9.7 U	**59**	**18**	**140**	**320**	**82**	**52**	**84**	**94**	**48**	**79**	**100**
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**32**	**38**	**2.6**	9.1 U	9.7 U	**45**	**17**	**100**	**330**	**72**	**50**	**92**	**100**	**35**	**98**	**89**
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**82**	**125**	**9.9**	9.1 U	9.7 U	**25**	**37.6**	**241**	**398**	**51.7**	**42.48**	**65.24**	**320**	**29.6**	**240**	**236**
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	32 U	20 U	**2**	9.1 U	9.7 U	**27**	**11**	**54**	**150**	**44**	**32**	**48**	**44**	**14 J**	**55**	**51**
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**38**	**73**	**18**	9.1 U	9.7 U	**83**	**26**	**280**	**430**	**150**	**100**	**150**	**160**	**70**	**160**	**190**
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	**19**	**44**	**16 J**	20 U	**20**	20 U	20 U	14 U	14 U
Fluoranthene	µg/kg	3,200,000	45,000,000	**110**	**320**	**50**	**2.2**	**3.1**	**82**	**41**	**490**	**560**	**460**	**450**	**750**	**630**	**260**	**200**	**330**
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	32 U	20 U	**1.8**	9.1 U	9.7 U	**30**	**12**	**66**	**160**	**37**	**27**	**45**	**44**	**14 J**	**55**	**59**
Pyrene	µg/kg	2,400,000	34,000,000	**48**	**130**	**33**	9.1 U	**2.7**	**110**	**44**	**310**	**790**	**200**	**130**	**210**	**170**	**87**	**240**	**290**
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**41.72 L3**	**56.69**	**4.92**	12.83 Lmax	13.68 Lmax	**58.06**	**24.28**	**149.4**	**426.5**	**92.17**	**64.15**	**114.92**	**149**	**45.91**	**138.4**	**127.55**
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3.1 U	2.8 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3.5 U	3.1 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3.5 U	3.1 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
Hexachlorobenzene	µg/kg	690	1,600	32 U	20 U	0.99 U	9.1 U	9.7 U	10 U	10 U	1.5 U	1.3 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	32 U	**25**	97 U	91 U	**11**	**17**	**15**	**75**	**44**	**100**	**680**	**390**	**150**	**110**	**49**	35 U
Butyl benzyl Phthalate	µg/kg	180,000	460,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3.8 U	3.4 U	15 U	16 U	15 U	**20**	15 U	35 U	35 U
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	32 U	20 U	**9.2**	**16**	**20**	**19**	**24**	**22**	26 U	20 U	20 U	20 U	20 U	20 U	35 U	35 U
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	32 U	20 U	**1.9**	9.1 U	9.7 U	10 U	**2**	**10 J**	1.4 U	20 U	20 U	20 U	20 U	20 U	170 U	180 U
Dimethyl Phthalate	µg/kg	NE	NE	32 U	20 U	**1.0**	9.1 U	9.7 U	10 U	10 U	**5.9 J**	**10 J**	**67**	20 U	20 U	20 U	20 U	35 U	35 U
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	2 U	1.8 U	20 U	20 U	20 U	20 U	**130**	35 U	35 U

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF
Sample Identification				LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)
Sample Date				07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10
Sample Interval (dbm)				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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	32 U	20 U	20 U	46 R	49 R	50 R	50 R	6.5 U	5.8 U	**6.6**	6.2 U	6 U	6.1 U	6 U	870 U	880 U
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	32 U	20 U	20 U	9.1 U	**2.1**	10 U	10 U	1.8 U	1.6 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	32 U	**70**	20 U	9.1 U	**65**	10 U	**4**	**130**	**26**	**48**	**47**	**82**	**66**	**55**	35 U	35 U
Pentachlorophenol	µg/kg	550	1,400	160 U	99 U	49 U	91 U	97 U	100 U	100 U	**32 J**	22 U	30 U	31 U	30 U	**71**	30 U	170 U	180 U
Phenol	µg/kg	18,000,000	260,000,000	32 U	20 U	49 U	13 U	**80**	16 U	17 U	**12**	2.2 U	20 U	20 U	**15**	20 U	20 U	**240**	35 U
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	32 U	20 U	9.7 U	9.1 U	9.7 U	**5.7**	**2.8**	**9 J**	**7.3 J**	20 U	**10 J**	**12 J**	**20**	20 U	35 U	35 U
Hexachlorobutadiene	µg/kg	14,000	33,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3 U	2.7 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	1.9 U	1.7 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	320 U	200 U	**200**	19 U	200 R	200 R	200 R	**120 J**	110 U	200 U	200 U	200 U	200 U	200 U	35 U	35 U
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	32 U	20 U	**6.2**	190 R	20 U	20 U	10 U	2.5 U	2.3 U	30 U	31 U	30 U	30 U	30 U	35 U	35 U
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	16 U	16 U	20 U	13 U	14 U	16 U	15 U	14 U	7.5 U	3.9 U	4 U	4 U	**4.6 J**	4 U	100 U	110 U
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	--	--	--	--	--	**1.43**	--	--	--	**8.07**	--	--	--	--	--	--

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		P2-1-3	P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05
Sample Identification				P2-1-A-COMP (P2-1/P2-2/P2-3)	P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10
Sample Date				11/16/12	11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15
Sample Interval (dbm)				Surface Layer Composite (0-4ft)	Susurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm
Sample Type				Core	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal
Field Screening																			
Sheen	n/a	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	NE	NE	--	--	--	--	--	--	<5	Asent	5	5	75	10	20	40	40	10
Metals																			
Arsenic	mg/kg	11	11	6 U	6 U	6 U	--	--	--	**5.60 J**	**5.15 J**	**9.7 J**	**8.0 J**	**8.6 J**	--	**8.3 J**	**11**	**14**	**10**
Cadmium	mg/kg	0.80	0.80	**0.3**	**0.3**	0.2 U	--	--	--	0.072 U	0.023 U	**1.1**	**1.2**	**0.8**	--	**1**	**0.5**	**0.5**	**0.6**
Chromium	mg/kg	62	62	**26.5 J**	**19 J**	**19.9 J**	--	--	--	**42.4**	**53.8**	**40**	**40**	**35**	--	**41**	**15.7**	**18.6**	**33.4**
Copper	mg/kg	45	45	**22.2**	**16.2**	**14.5**	--	--	--	**17.2**	**42.4**	**34.6**	**36.8**	**41.1**	--	**33.8**	**9.6**	**10.8**	**30**
Lead	mg/kg	21	21	**4**	2 U	**4**	--	--	--	**11**	**11**	**18**	**17**	**13**	--	**18**	**2.11 J**	**2.21 J**	**14**
Mercury	mg/kg	0.20	0.20	0.03 U	0.03 U	0.02 U	--	--	--	**0.0052 J**	**0.0026 J**	**0.08**	**0.08**	**0.08**	--	**0.06**	**0.0182 J**	**0.0141 J**	**0.05**
Silver	mg/kg	0.30	0.30	0.4 U	0.4 U	0.3 U	--	--	--	0.4 U	0.3 U	0.6 U	0.6 U	0.7 U	--	0.6 U	0.4 U	0.4 U	0.5 U
Zinc	mg/kg	93	93	**48**	**32**	**30**	--	--	--	**61**	**57**	**95**	**89**	**90**	--	**93**	**27**	**34**	**73**
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	**0.38**	--	--	**4.9 J**	**0.45 J**	**0.02 J**	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	--	**3.7**	**2.9 J**	**280 J**	**91 J**	**10 J**	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	19 U	18 U	19 U	--	--	--	4.7 U	**2.4 J**	**140 J**	**64 J**	**99**	--	**63**	**3.6 J**	**4.4 J**	**72**
Acenaphthene	µg/kg	4,800,000	67,000,000	19 U	18 U	19 U	--	--	--	4.7 U	4.7 U	**25**	**23**	**140**	--	**1,600**	4.8 U	**4.7 J**	**64**
Acenaphthylene	µg/kg	4,800,000	67,000,000	19 U	18 U	19 U	--	--	--	4.7 U	4.7 U	**29**	**16**	**42**	--	**27**	**2.4 J**	4.9 U	**30**
Anthracene	µg/kg	4,800,000	67,000,000	19 U	18 U	19 U	--	--	--	4.7 U	4.7 U	**69 J**	**46 J**	**210**	--	**200**	**5.5**	**8.1**	**70**
Fluorene	µg/kg	3,200,000	45,000,000	19 U	18 U	19 U	--	--	--	4.7 U	4.7 U	**49 J**	**34 J**	**180**	--	**280**	**4.6 J**	**6.4**	**74**
Naphthalene	µg/kg	1,600,000	22,000,000	**17 J**	18 U	19 U	--	--	--	**3.1 J**	4.7 U	**160**	**100**	**340**	--	**100**	**23**	**20**	**280**
Phenanthrene	µg/kg	4,800,000	67,000,000	**18 J**	18 U	19 U	--	--	--	**8.2 J**	**4.0 J**	**140**	**120**	**340**	--	**470**	**15**	**17**	**190**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**15**	18 U	19 U	--	--	--	**6.6 J**	4.7 U	**99 J**	**64 J**	**190**	**200**	**82**	**3.8 J**	**6.3**	**66**
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**58**	18 U	19 U	--	--	--	**6.6**	**3.3 J**	**64**	**52**	**110**	**120**	**44**	**6.2**	**3.7 J**	**48**
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**100**	37 U	37 U	--	--	--	**27 J**	**11**	**220**	**150**	**300**	**350**	**130**	**7.6**	**10**	**130**
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	**26**	18 U	19 U	--	--	--	**16**	**3.7 J**	**43**	**35**	**60**	**68**	**27**	**6.6**	**4.2 J**	**40**
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**30**	18 U	19 U	--	--	--	**15 J**	**5.5**	**220 J**	**120 J**	**320**	**320**	**120**	**5.8**	**8.6**	**91**
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**15**	18 U	19 U	--	--	--	4.7 U	4.7 U	**11 J**	15 U	**18**	**17**	14 U	4.8 U	4.9 U	17 U
Fluoranthene	µg/kg	3,200,000	45,000,000	**26**	18 U	19 U	--	--	--	**18 J**	**4.7 J**	**360**	**340**	**1,200**	**1,000**	**980**	**18 J**	**34 J**	**290**
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**19**	18 U	19 U	--	--	--	**8.1**	**3.1 J**	**35**	**26**	**54**	**52**	**23**	4.8 U	4.9 U	**28**
Pyrene	µg/kg	2,400,000	34,000,000	**250**	**10 J**	19 U	--	--	--	**12 J**	**4.6 J**	**280**	**220**	**760**	**590**	**590**	**17 J**	**26 J**	**330**
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**73.2**	27.28 Lmax	28.59 Lmax	--	--	--	**11.07**	**5.13 J**	**102.7**	**78.4**	**169.4**	**185.1**	**69.9**	**7.84**	**5.59 J**	**72.22**
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	**3.2 J**	4.6 U	4.6 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5.0 U	--	4.8 U	4.8 U	4.9 U	4.9 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	4.7 U	4.6 U	4.6 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	**2.8 J**	--	4.8 U	4.8 U	**1.5 J**	4.9 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	4.7 U	4.6 U	4.6 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5.0 U	--	4.8 U	4.8 U	4.9 U	4.9 U
Hexachlorobenzene	µg/kg	690	1,600	4.7 U	4.6 U	4.6 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5.0 U	--	4.8 U	4.8 U	4.9 U	4.9 U
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	34 U	24 U	27 U	--	--	--	**1,100**	**33 J**	**160**	**180**	250 U	--	**260**	**630 J**	**44 J**	**480**
Butyl benzyl Phthalate	µg/kg	180,000	460,000	4.7 U	4.6 U	4.6 U	--	--	--	**4.9**	4.7 U	**5.4**	**31 J**	5.0 U	--	**7.9**	4.8 U	**3.9 J**	4.9 U
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	19 U	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	**35 J**	--	19 U	19 U	20 U	20 U
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	47 U	4.6 U	4.6 U	--	--	--	33 U	19 U	37 U	20 U	100 U	--	34 U	19 U	20 U	**55**
Dimethyl Phthalate	µg/kg	NE	NE	4.7 U	4.6 U	4.6 U	--	--	--	19 U	19 U	19 U	20 U	100 U	--	19 U	19 U	20 U	20 U
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	19 U	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	100 U	--	19 U	19 U	20 U	20 U

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		P2-1-3	P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05
Sample Identification				P2-1-A-COMP (P2-1/P2-2/P2-3)	P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10
Sample Date				11/16/12	11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15
Sample Interval (dbm)				Surface Layer Composite (0-4ft)	Susurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm
Sample Type				Core	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	19 U	18 U	19 U	--	--	--	24 U	24 U	24 U	**13 J**	**17 J**	**12 J**	24 U	24 U	24 U	25 U
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	4.7 U	4.6 U	4.6 U	--	--	--	19 U	19 U	19 U	20 U	100 U	19 U	19 U	19 U	20 U	20 U
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	38 U	37 U	37 U	--	--	--	19 U	19 U	**800 J**	**460 J**	**3,900**	**1,100**	**1,100**	**53**	**46**	**330**
Pentachlorophenol	µg/kg	550	1,400	47 U	46 U	46 U	--	--	--	95 U	94 U	96 U	98 U	**480 J**	95 U	96 U	97 U	98 U	98 U
Phenol	µg/kg	18,000,000	260,000,000	19 U	18 U	19 U	--	--	--	19 U	19 U	**42 J**	**76 J**	**560**	**370**	**67 J**	**20**	**20**	**300 J**
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	19 U	18 U	19 U	--	--	--	**3.1 J**	4.7 U	**48**	**36**	**130**	**140**	**340**	**3.5 J**	**4.8 J**	**82**
Hexachlorobutadiene	µg/kg	14,000	33,000	4.7 U	4.6 U	4.6 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5.0 U	4.8 U	4.8 U	4.8 U	4.9 U	4.9 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	19 U	18 U	19 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5.0 U	4.8 U	4.8 U	4.8 U	4.9 U	4.9 U
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	380 U	370 U	370 U	--	--	--	190 U	190 U	**200**	**220**	**4,300 J**	**160 J**	**110 J**	190 U	200 U	**110 J**
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	19 U	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	100 U	19 U	19 U	19 U	20 U	20 U
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	3.8 U	3.8 U	3.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	**1.71 J**	**0.128 J**	**3.0 J**	--	**1.83 J**	--	--	**2.06 J**
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	**0.101 J**	**0.108 J**	**0.302 J**	--	**0.074 J**	--	--	**0.143 J**
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	**0.16 JL14**	**0.12 JL16**	**0.12 JL13**	--	--	--	**0.95 JL10**	--	**11.26**	**7.53**	--	--	--	--	--	--

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-05	LY-05	LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09
Sample Identification				LY-SC-05_ 1-2	LY-SC-05_ 3-4	LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4
Sample Date				11/19/15	11/19/15	11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015
Sample Interval (dbm)				1 - 2	3 - 4	4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4
Sample Type				Core	Core	Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	NE	NE	Asent	Asent	Asent	10	10	10	Asent	Asent	Asent	Asent	10	40	<5	10	<5	<5
Metals																			
Arsenic	mg/kg	11	11	**11**	--	--	**12**	**11**	--	**7**	--	--	--	**10**	**10**	--	**8.40 J**	10 U	--
Cadmium	mg/kg	0.80	0.80	**1.6**	**1.1**	**0.8**	**0.5**	**0.4**	--	**0.7**	--	--	--	**0.7**	**0.6**	--	**0.7**	**0.7**	--
Chromium	mg/kg	62	62	--	--	--	**31.8**	**32.1**	--	--	--	--	--	**33**	**38**	--	**29.6**	--	--
Copper	mg/kg	45	45	--	--	--	**31.7**	**28.3**	--	--	--	--	--	**25.8**	**32.2**	--	**27.2**	--	--
Lead	mg/kg	21	21	--	--	--	**9**	**8**	--	--	--	--	--	**10**	**14**	--	**7**	--	--
Mercury	mg/kg	0.20	0.20	--	--	--	**0.06**	**0.05**	--	--	--	--	--	**0.0435 J**	**0.15**	--	**0.05**	--	--
Silver	mg/kg	0.30	0.30	--	--	--	0.6 U	0.5 U	--	--	--	--	--	0.6 U	0.6 U	--	0.5 U	--	--
Zinc	mg/kg	93	93	--	--	--	**67**	**70**	--	--	--	--	--	**79**	**86**	--	**67**	--	--
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	**0.013**	**0.011**	**0.009**	--	0.005 U	--	0.043 U	**0.013**	**0.007**	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	**5**	--	--	**81**	**69**	--	--	--	--	--	**71**	**120**	**160**	**73**	**69**	--
Acenaphthene	µg/kg	4,800,000	67,000,000	**4.0 J**	--	--	**58**	**63**	--	--	--	--	--	**120**	**620**	**170**	**26**	**76**	--
Acenaphthylene	µg/kg	4,800,000	67,000,000	**3.6 J**	--	--	**41**	**47**	--	--	--	--	--	**93**	**100**	**61**	**51**	**35**	--
Anthracene	µg/kg	4,800,000	67,000,000	**8**	--	--	**68 J**	**90 J**	--	--	--	--	--	**170**	**800**	**490**	**1,300**	**250**	--
Fluorene	µg/kg	3,200,000	45,000,000	**7.4**	--	--	**65**	**63**	--	--	--	--	--	**170**	**750**	**270**	**250**	**160**	--
Naphthalene	µg/kg	1,600,000	22,000,000	**41**	--	--	**290**	**280**	--	--	--	--	--	**230**	**860**	**790**	**140**	**160**	--
Phenanthrene	µg/kg	4,800,000	67,000,000	**25**	--	--	**180**	**190**	--	--	--	--	--	**1,900**	**1,100**	**610**	**720**	**290**	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**6.1**	--	--	**140**	**100**	--	**20**	--	**5**	--	**220**	**540**	**320**	**1,100**	**350**	--
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**5.9**	--	--	**93**	**83**	--	**14**	--	**4.2 J**	--	**130**	**240**	**180**	**840**	**190**	--
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**12**	--	--	**190**	**200**	--	26	--	11	--	**600**	**660**	**410**	**1,700**	**86**	--
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	**4.3 J**	--	--	**46**	**44**	--	--	--	--	--	**63**	**95**	**110**	**320**	**560**	--
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**7.4**	--	--	**150**	**140**	--	**18**	--	**6.3**	--	**780**	**750**	**410**	**1,800**	**630**	--
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	5.0 U	--	--	**12 J**	14 U	--	4.8 U	--	4.8 U	--	**18**	**23**	**23**	**87**	**26**	--
Fluoranthene	µg/kg	3,200,000	45,000,000	**33**	--	--	**310**	**320**	--	--	--	--	--	**3,000**	**3,500**	**1,800**	**1,900**	**1,800**	--
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**3.5 J**	--	--	**38**	**36**	--	**7.4**	--	4.8 U	--	**63**	**78**	**85**	**270**	**79**	--
Pyrene	µg/kg	2,400,000	34,000,000	**31**	--	--	**550**	**410**	--	--	--	--	--	**2,000**	**2,200**	**1,200**	**1,400**	**1,200**	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**8.35**	--	--	**132.5**	**119.4**	--	**19.7**	--	**5.99 J**	--	**227.9**	**377.6**	**267.9**	**1173.7**	**250.4**	--
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	--	--	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	4.8 U	--	5.0 U	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	--	--	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	**3.5 J**	--	5.0 U	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	--	--	--	4.8 U	**2.5 J**	--	--	--	--	--	4.9 U	**11**	--	5.0 U	--	--
Hexachlorobenzene	µg/kg	690	1,600	--	--	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	4.8 U	--	5.0 U	--	--
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	--	--	--	**60**	**64**	--	--	--	--	--	**67**	**62 J**	--	**56**	--	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	--	--	--	4.8 U	4.8 U	--	--	--	--	--	**13**	4.8 U	--	**20**	--	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	--	--	--	19 U	19 U	--	--	--	--	--	20 U	19 U	--	20 U	--	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	--	--	--	19 U	38 U	--	--	--	--	--	20 U	19 U	--	43 U	--	--
Dimethyl Phthalate	µg/kg	NE	NE	--	--	--	19 U	19 U	--	--	--	--	--	20 U	19 U	--	20 U	--	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	--	--	--	19 U	19 U	--	--	--	--	--	20 U	19 U	--	20 U	--	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-05	LY-05	LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09
Sample Identification				LY-SC-05_ 1-2	LY-SC-05_ 3-4	LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4
Sample Date				11/19/15	11/19/15	11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015
Sample Interval (dbm)				1 - 2	3 - 4	4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4
Sample Type				Core	Core	Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	--	--	--	24 U	**14 J**	--	24 U	--	--	--	24 U	**12 J**	--	25 U	--	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	--	--	--	19 U	19 U	--	19 U	--	--	--	20 U	**15 J**	--	20 U	--	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	--	--	--	**310 J**	**550 J**	--	19 U	--	--	--	**280**	**330**	--	**200**	--	--
Pentachlorophenol	µg/kg	550	1,400	--	--	--	97 U	97 U	--	96 U	--	--	--	97 U	96 U	--	99 U	--	--
Phenol	µg/kg	18,000,000	260,000,000	--	--	--	**50 J**	**78 J**	--	8.6 J	--	--	--	**41 J**	**160**	--	**47 J**	--	--
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	--	--	--	**61**	**53**	--	--	--	--	--	**110**	**370**	--	**67**	--	--
Hexachlorobutadiene	µg/kg	14,000	33,000	--	--	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	4.8 U	--	5.0 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	--	--	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	4.8 U	--	5.0 U	--	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	--	--	--	**130 J**	**78 J**	--	--	--	--	--	**92 J**	**360**	--	**96 J**	--	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	--	--	--	19 U	19 U	--	--	--	--	--	20 U	19 U	--	20 U	--	--
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	**10.7 J**	**3.62 J**	--	0.0479 J	**0.458 J**	--	--	**1.1 J**	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	**1.149 J**	**0.22 J**	--	**0.043 JL10**	**0.069 J**	--	--	**0.108 J**	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	--	--	--	**3.56 J**	**2.64 J**	--	--	--	--	--	**8.04**	--	**6.56 J**	--	--	--

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-10	LY-10	LY-11	LY-11	LY-13	LY-14	LY-14	LY-14	LY-15	LY-15	LY-16	LY-16	LY-17	LY-17	LY-18	LY-18
Sample Identification				LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10	LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	LY-SS-15_ 0-10	LY-SC-15_ 0-1	LY-SS-16_ 0-10	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1
Sample Date				11/17/15	11/18/15	11/17/15	11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/30/21	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21
Sample Interval (dbm)				0 - 10 cm	0 - 1	0 - 10 cm	0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft
Sample Type				Surface	Core	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core
Stratigraphic Unit				Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent
Tidal Zone		Intertidal Zone	Sutidal Zone	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	NE	NE	<5	<5	Asent	<5	Asent	Asent	Asent	Asent	10	Asent	10	Asent	Asent	Asent	Asent	Asent
Metals																			
Arsenic	mg/kg	11	11	**8.29 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.80	0.80	**0.7**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	62	**31.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	45	**22.2**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	21	**8**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.20	0.20	**0.09**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.30	0.30	0.5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	93	**68**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	--	--	--	--	--	--	--	--	--	--	*4.17*	**1.9**	**0.809**	**0.559**	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	**50**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	4,800,000	67,000,000	**24**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	4,800,000	67,000,000	**30**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	4,800,000	67,000,000	**61**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	3,200,000	45,000,000	**39**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	1,600,000	22,000,000	**150**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	4,800,000	67,000,000	**130**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**110**	**580**	**130**	**170**	**75**	**10**	**39.2**	--	*32.2*	*25*	*376*	**10.7**	**12.7**	**3.36 J**	**2.29 J**	4.97 U
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**82**	**320**	**110**	**170**	**130**	**10.1**	**35.3**	--	*25.2*	*26.4*	*276*	**15.8**	**17.3**	**3.1 J**	**2.96 J**	4.97 U
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**230**	**820**	**270**	**410**	**330**	**14.76**	**80.1**	--	*47.9*	*39.8*	*602*	**26.84**	**25.55**	**3.21 J**	**3.88 J**	4.97 U
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	**41**	**130**	--	--	--	**8.98**	**18.1**	--	*16.7*	*20.4*	*98.7*	**11.9**	**12.6**	**1.17 J**	**2.65 J**	4.97 U
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**180**	**820**	**190**	**330**	**130**	**12.8**	**85.6**	--	*44.7*	*37.4*	*640*	**17.7**	**20.8**	**4.63 J**	**4.02 J**	4.97 U
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**12 J**	**41**	**17**	**23**	**20**	**3.84 J**	**7.17**	--	*5.63*	*7.93*	*44.6*	**4.38 J**	**4.14 J**	4.99 U	5 U	4.97 U
Fluoranthene	µg/kg	3,200,000	45,000,000	**190**	**880**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**36**	**120**	**49**	**70**	**62**	**6.26**	**15.2**	--	*14.5*	*18.2*	*107*	**9**	**11.6**	**1.12 J**	**2.09 J**	4.97 U
Pyrene	µg/kg	2,400,000	34,000,000	**260**	**1,500**	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**122.6**	**484.3**	**158.5**	**240.6**	**180**	**13.71**	**50.32**	--	*35.67*	*35.87*	*395.36*	**21.07**	**22.91**	**4.12 J**	**4.04 J**	7.01 Lmax
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	4.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	4.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	4.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	690	1,600	4.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	**42 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	**9.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	19 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	57 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	NE	NE	19 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	19 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-10	LY-10	LY-11	LY-11	LY-13	LY-14	LY-14	LY-14	*LY-15*	*LY-15*	*LY-16*	LY-16	LY-17	LY-17	LY-18	LY-18
Sample Identification				LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10	LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	*LY-SS-15_ 0-10*	*LY-SC-15_ 0-1*	*LY-SS-16_ 0-10*	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1
Sample Date				11/17/15	11/18/15	11/17/15	11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	*08/30/21*	*09/02/21*	*08/30/21*	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21
Sample Interval (dbm)				0 - 10 cm	0 - 1	0 - 10 cm	0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	*0 - 10 cm*	*0 - 1 ft*	*0 - 10 cm*	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft
Sample Type				Surface	Core	Surface	Core	Surface	Surface	Core	Core	*Surface*	*Core*	*Surface*	Core	Surface	Core	Surface	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	*Recent*	*Recent*	*Recent*	Recent	Recent	Native	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	*Subtidal*	*Subtidal*	*Subtidal*	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	24 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	19 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	**370**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	550	1,400	96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	18,000,000	260,000,000	**46 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	**33**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	14,000	33,000	4.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	4.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	**110 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	19 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	--	--	--	--	--	**0.9 J**	**9.9 J**	1.6 U	*121*	*13.9*	*160.6*	**2 J**	1.6 U	1.6 U	--	--
Total PCBs Congeners	µg/kg	3.5	3.5	**0.997 J**	--	**0.489 J**	--	**13.0 J**	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	**0.094 J**	--	**0.097 J**	--	**0.458**	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	**4.02 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-19	LY-19	LY-19	LY-20	LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24
Sample Identification				LY-SS-19_0-10	LY-SC-19_1-2	LY-SC-19_2-3	LY-SS-20_0-10	LY-SC-20_1-2	LY-SC-20_2-3	LY-SS-21_0-10	LY-SC-21_1-2	LY-SS-22_0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_1-2	LY-SS-23_0-10	LY-SC-23_2-3	LY-SC-23_5-6	LY-SS-24_0-10	LY-SC-24_0-1
Sample Date				08/30/21	08/31/21	08/31/21	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21
Sample Interval (dbm)				0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft
Sample Type				Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	NE	NE	Asent	Asent	Asent	5	Asent	Asent	5	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent
Metals																			
Arsenic	mg/kg	11	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.80	0.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.30	0.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	5.72	--	--	97.9	--	--	21.9	4.31	42.3 J	17.6 J	17.9 J	--	--	--	--	267
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	3,200,000	45,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	1,600,000	22,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	43.3	17.3	--	263	229	100.0	238	173	75.6 J	50.1	58.8	89.2	181	198	11.8	--
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	36.3	26.7	--	242	154	72.7	191	126	64.7 J	92.4	78.9	56.1	144	172	14	--
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	81.6	44.6	--	820	324	117.7	701	228.6	177.5 J	205.3	153.4	110.7	288	247.5	23.43	--
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	28.8	19.9	--	146 J	86.9	39.0	107	87.1	40.4 J	49.5	42.6	34.6	82.3	103	12.2	--
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	87.3	30.9	--	892	445	101.0	966	296	219 J	134	105	235	375	258	18.5	--
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	9.31	5.17	--	33.4 J	27.7	27.0	42.4 J	26.8	12.1	15.9	15.2	11.7	29.2	24	3.4 J	--
Fluoranthene	µg/kg	3,200,000	45,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	23.9	15	--	145 J	81.5	37.3	116	83	38.5 J	48.6	44.7	31.8	82.9	81.7	9.27	--
Pyrene	µg/kg	2,400,000	34,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	52.98	35.22	--	377.06	224.67	101.91	310.4	180.1	97.26 J	125.73	107.16	82.79	205.86	229.7	18.98	--
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	690	1,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-19	LY-19	LY-19	LY-20	LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24
Sample Identification				LY-SS-19_ 0-10	LY-SC-19_ 1-2	LY-SC-19_ 2-3	LY-SS-20_ 0-10	LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1
Sample Date				08/30/21	08/31/21	08/31/21	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21
Sample Interval (dbm)				0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft
Sample Type				Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	550	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	18,000,000	260,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	14,000	33,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	*9.2 J*	**38 J**	**1.2 J**	*9.6 J*	--	**3.7 J**	*8.1 J*	**23.4**	*9.8 J*	*9.2 J*	**10.5 J**	--	**12.5 J**	--	--	*25.6 J*
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	--	--	--	*2.68*	**8.09**	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-24	LY-25	LY-25	LY-25	LY-26	LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30
Sample Identification				LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10	LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2
Sample Date				09/01/21	08/30/21	09/02/21	09/02/21	08/31/21	08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23
Sample Interval (dbm)				1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft
Sample Type				Core	Surface	Core	Core	Surface	Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	NE	NE	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent
Metals																			
Arsenic	mg/kg	11	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.80	0.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.30	0.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	--	*15.5 J*	**97.8**	**87.9 J**	*12 J*	*128 J*	*257*	**291**	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	3,200,000	45,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	1,600,000	22,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	4,800,000	67,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**68.1**	*30*	**125**	**34.6**	*455 J*	*19.9 J*	*37.3*	--	**11.2 J**	**28.7 J**	**136**	**3.80 J**	--	--	**9.31**	**1.57 J**
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**114**	*32.6*	**144**	**46.6**	*332 J*	*24.1 J*	*40.3*	--	**11.4 J**	**29.2 J**	**204**	**7.37**	--	--	**11.8**	**3.41 J**
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**223**	*86.1*	**323**	**71.9**	*548 J*	*47.8 J*	*74.7*	--	**13.45 J**	**79.5 J**	**333**	**14.43 J**	--	--	**10.46 J**	**7.37 J**
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	**64.6**	*20.4*	**100**	**35.5**	*144 J*	*19.2 J*	*37.9*	--	**9.15**	**13.9**	**118**	**3.11 J**	--	--	**9.28**	**1.62 J**
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**119**	*67.7*	**255**	**47.8**	*665 J*	*35.1 J*	*52.7*	--	**11.9 J**	**62.7 J**	**212**	**6.13**	--	--	**25**	**2.73 J**
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**21.4**	*6.13*	**34.9**	**6.1**	*47.6 J*	*8.48 J*	*10.6*	--	**2.83 J**	**4.06 J**	**32.2**	4.98 U	--	--	**2.9**	4.95 U
Fluoranthene	µg/kg	3,200,000	45,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**61.3**	*19*	**100**	**23.5**	*155 J*	*18.2 J*	*23.3*	--	**5.35**	**13.1**	**106**	**2.43 J**	--	--	**3.77**	**1.31 J**
Pyrene	µg/kg	2,400,000	34,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**152.57**	*47.4*	**204.84**	**60.69**	*459.21 J*	*33.89 J*	*55.42*	--	**14.8 J**	**42.36 J**	**266.84**	**9.73**	--	--	**14.69**	**4.57 J**
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	690	1,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-24	LY-25	LY-25	LY-25	LY-26	LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30
Sample Identification				LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10	LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2
Sample Date				09/01/21	08/30/21	09/02/21	09/02/21	08/31/21	08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23
Sample Interval (dbm)				1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft
Sample Type				Core	Surface	Core	Core	Surface	Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	550	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	18,000,000	260,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	14,000	33,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	--	*8.5*	**10.2**	--	*8.8 J*	*12.2 J*	*48.8*	--	1.6 U	1.6 U	24.4 J	1.6 U	8.5	1.6 U	1.6 U	--
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	--	*4.38*	**10.62**	--	*1.83 J*	*2.17*	*4.87*	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specil

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-31	LY-31	LY-32	COA_01	COA_02	COA_03	COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	COA-SS-1
Sample Identification				LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118	COA_04_G_ 20201118	COA_05_G_ 20201119	COA_05-D_G_ 20201119	COA_06_G_ 20201120	COA_06-D_G_ 20201120	COA_07_G_ 20201118	COA_08_G_ 20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	COA-SS-1-6.5-8.5-20201116
Sample Date				01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20	11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	11/16/20
Sample Interval (dbm)				0 - 10 cm	1 -2 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 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	6.5 - 8.5 ft
Sample Type				Surface	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	Native
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	NS	NS	NS	–	–	–	–	–	–	–	–	–	–	–	–	–
Visual Wood Content[3]	%	NE	NE	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Asent	<5	Asent	Asent	Asent
Metals																			
Arsenic	mg/kg	11	11	–	–	–	3.15	6.44	6.17	6.26	7.5	7.24	6.56	5.65	5.98	3.2	4.38	4.02	**5.11**
Cadmium	mg/kg	0.80	0.80	–	–	–	0.14	0.85	0.58	0.57	0.54	0.55	0.39	0.39	0.41	0.14	0.28	0.12	**0.12**
Chromium	mg/kg	62	62	–	–	–	27.5	32.3	34.3	34.2	36.9	30.8	25.4	30.3	55.6	32	62	124	**99.7**
Copper	mg/kg	45	45	–	–	–	28.4	36.3	31.7	25.4	29.3	22.2	12.3	6.63	23.8	12.5	34.3	23.7	**23.9**
Lead	mg/kg	21	21	–	–	–	13.6	11.4	9.44	7.82	9.73	7.21	5.16	3.82	2.02	3.71	5.01	2.78	**3.02**
Mercury	mg/kg	0.20	0.20	–	–	–	0.0149 J	0.111	0.0835	0.0716	0.0531	0.46	0.0534	0.04	0.046	0.0181 J	0.157	0.0347	**0.0321**
Silver	mg/kg	0.30	0.30	–	–	–	0.05 J	0.17 J	0.11 J	0.11 J	0.08 J	0.08 J	0.06 J	0.05 J	0.05 J	0.03 J	0.1 J	0.07 J	**0.06 J**
Zinc	mg/kg	93	93	–	–	–	122	82.8	77.8	76.2	62	63.9	38.5	39.9	38.4	38.6	59.9	45.4	**47.4**
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Tributyltin Ion (bulk sediment)	µg/kg	73	73	–	–	–	16.7	118	17	8.97	382	119	15.9	3.08 J	2.05 J	0.838 J	23.1	4.92	3.81 U
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	–	–	–	9.1 J	17.8 J	24.2	21.6	21.2	24.2	13.7 J	18.5 J	14.2 J	19.9 U	8.3 J	19.9 U	19.9 U
Acenaphthene	µg/kg	4,800,000	67,000,000	–	–	–	19.9 U	10.7 J	24.9	10.8 J	17.9 J	23	17.1 J	9 J	13.9 J	19.9 U	19.9 U	19.9 U	19.9 U
Acenaphthylene	µg/kg	4,800,000	67,000,000	–	–	–	19.9 U	34.8	14.5 J	12.7 J	48.1	15.9 J	13.7 J	22.2	14.9 J	19.9 U	19.9 U	19.9 U	19.9 U
Anthracene	µg/kg	4,800,000	67,000,000	–	–	–	19.9 U	62.3	29.8	30.3	120	46.5	51.8	67.7	38.6	19.9 U	6.1 J	19.9 U	19.9 U
Fluorene	µg/kg	3,200,000	45,000,000	–	–	–	19.9 U	23	31.3	22.1	41.3	32	29.3	21.7	17.3 J	19.9 U	5 J	19.9 U	19.9 U
Naphthalene	µg/kg	1,600,000	22,000,000	–	–	–	19.9 U	30.6	23.9	37.7	65.8	80.2	102	67.8	65.1	7.7 J	34.5	19.9 U	19.9 U
Phenanthrene	µg/kg	4,800,000	67,000,000	–	–	–	7 J	146	77.1	69.5	201	89.3	161	133	88.8	19.9 U	20.1	6.2 J	**6 J**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**9.01**	4.98 U	–	6.2 J	193	57.9	62.3	366	82.1	80.5	170	64.5	19.9 U	11.5 J	19.9 U	19.9 U
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**6.83**	4.98 U	–	12.4 J	168	70.4	72.2	367	83	85	391	88	19.9 U	16 J	19.9 U	19.9 U
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**7.2 J**	4.98 U	–	28.4 J	788	209.0	217.0	816	202.0	175.0	989	600.0	39.8 U	42	39.8 U	39.8 U
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	**4.04 J**	4.98 U	–	15 J	81	41.2	39.3	165	47.2	32.9	162	78.6	19.9 U	13.6 J	19.9 U	**9.3 J**
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**11.4**	4.98 U	–	26.5	873	160	143	652	146	96	771	236	19.9 U	23.3	19.9 U	19.9 U
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**1.09 J**	4.98 U	–	19.9 U	33.9	17.9 J	18.2 J	75.8	19.5 J	13.7 J	77.2	33.8	19.9 U	19.9 U	19.9 U	19.9 U
Fluoranthene	µg/kg	3,200,000	45,000,000	–	–	–	11.3 J	1,480	182	100	1,060	218	189	450	123	4.6 J	34.2	19.9 U	19.9 U
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**2.98 J**	4.98 U	–	19.9 U	93.6	38.4	39.2	183	43.8	37	180	85.5	19.9 U	10.1 J	19.9 U	19.9 U
Pyrene	µg/kg	2,400,000	34,000,000	–	–	–	26.3	1,050	234	158	1,030	304	266	503	184	8.8 J	116	8.2 J	19.9 U
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**8.97**	7.02 Lmax	–	17.01 J	287.58	104.32	107.3	517.6	119.2	116.58	540.33	168.74	30.05 Lmax	23.39 J	30.05 Lmax	30.05 Lmax
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	–	–	–	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	–	–	–	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	–	–	–	5 U	5 U	5 U	5 U	5 U	1.7 J	1.1 J	5 U	5 U	5 U	5 U	5 U	5 U
Hexachlorobenzene	µg/kg	690	1,600	–	–	–	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	–	–	–	49.6 U	48.8 J	34.9 J	35.7 J	32.6 J	49.9 U	49.9 U	118	49.8 U	49.8 U	378	49.8 U	49.8 U
Butyl benzyl Phthalate	µg/kg	180,000	460,000	–	–	–	19.9 U	9.8 J	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	–	–	–	15 J	15.9 J	19.6 J	18.4 J	17.1 J	15.6 J	14.3 J	19.7 J	17.5 J	14.8 J	19.9 U	19.9 U	19.9 U
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	–	–	–	19.9 U	27.4	19.9 U	19.9 U	19.9 U	20 U	23.8	17.6 J	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Dimethyl Phthalate	µg/kg	NE	NE	–	–	–	19.9 U	26.3	19.9 U	8.3 J	19.9 U	8.5 J	20 U	183	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	–	–	–	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		LY-31	LY-31	LY-32	COA_01	COA_02	COA_03	COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	COA-SS-1
Sample Identification				LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118	COA_04_G_ 20201118	COA_05_G_ 20201119	COA_05-D_G_ 20201119	COA_06_G_ 20201120	COA_06-D_G_ 20201120	COA_07_G_ 20201118	COA_08_G_ 20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	COA-SS-1-6.5-8.5-20201116
Sample Date				01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20	11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	11/16/20
Sample Interval (dbm)				0 - 10 cm	1 -2 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 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	6.5 - 8.5 ft
Sample Type				Surface	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	Core
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	Native
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	--	--	--	19.9 U	**3 J**	**2.2 J**	19.9 U	19.9 U	**3.6 J**	**2.2 J**	**3.2 J**	**2.2 J**	19.9 U	19.9 U	19.9 U	99.5 U
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	--	--	--	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	--	--	--	19.9 U	**51.3**	**33.5**	**16.3 J**	**81.3**	**46**	**31.5**	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Pentachlorophenol	µg/kg	550	1,400	--	--	--	99.3 U	99.6 U	99.7 U	99.7 U	99.6 U	99.8 U	99.8 U	99.6 U	99.5 U	99.6 U	99.5 U	99.6 U	99.5 U
Phenol	µg/kg	18,000,000	260,000,000	--	--	--	19.9 U	**12.7 J**	**11.9 J**	**11.3 J**	**10 J**	**15 J**	**10.8 J**	**8.7 J**	19.9 U	19.9 U	19.9 U	19.9 U	**8.9 J**
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	--	--	--	19.9 U	**11.9 J**	**27.6**	**14.1 J**	**22**	**24.1**	**14.4 J**	**21.1**	**14.9 J**	19.9 U	**5.1 J**	19.9 U	19.9 U
Hexachlorobutadiene	µg/kg	14,000	33,000	--	--	--	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	19.9 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	--	--	--	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	--	--	--	**73.4 J**	199 U	199 U	199 U	199 U	200 U	200 U	199 U	199 U	199 U	199 U	199 U	199 U
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	--	--	--	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	1.6 U	1.6 U	1.6 U	**11.5 J**	**14.8 J**	**7.6 J**	**7.2 J**	**17.3**	**7**	**2.1 J**	**4.5 J**	**13.9**	1.6 U	**2.1**	1.6 U	1.6 U
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	--	--	--	**2.55 J**	**4.39 J**	**4.19**	**3.54 J**	**4.41**	**1.84 JL10**	**1.75 J**	**3.44**	**1.81 J**	**1.19 JL10**	**1.97 J**	**1.06 JL13**	**0.98 JL15**

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-3	COA-SS-3	COA-SS-3	COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre
Sample Identification				COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	COA-SS-2-7.5-9.5-20201118	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118	COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730
Sample Date				11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24
Sample Interval (dbm)				1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	7.5 - 9.5 ft	1 - 3 ft	3 -5 ft	5 -7 ft	7 - 9 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
Sample Type				Core	Core	Core	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Native	Native	Native	Recent	Native	Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	NE	NE	<5	Asent	Asent	Asent	Asent	Asent	Asent	Asent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Metals																			
Arsenic	mg/kg	11	11	3.96	6.05	6.37	4.9	3.78	5.02	1.14	2.82	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.80	0.80	0.11 J	0.05 J	0.08 J	0.13	0.25	0.09 J	0.11 U	0.07 J	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	62	23.3	40.2	38.2	73.5	23.6	81.5	39.3	79.4	--	--	--	--	--	--	--	--
Copper	mg/kg	45	45	19.5	41.2	41.3	37.4	8.34	21.3	9.48	26.5	--	--	--	--	--	--	--	--
Lead	mg/kg	21	21	2.99	4.73	4.87	3.95	2.41	2.42	0.87	2.81	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.20	0.20	0.0574	0.0377	0.0364	0.0317	0.019 J	0.0319	0.0307	0.0307	--	--	--	--	--	--	--	--
Silver	mg/kg	0.30	0.30	0.06 J	0.05 J	0.07 J	0.07 J	0.05 J	0.06 J	0.21 U	0.09 J	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	93	34.9	68.1	69.6	60.1	27.6	38.6	20.7	43.5	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	9.34	3.84 U	3.83 U	0.502 J	0.958 J	3.82 U	3.83 U	3.8 U	7.04	8.96	52.9	2.51 J	1.92 UJ	4.4 J	13.8	18.7
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	21.9	16.6	26.2	22.4	21.6	18.4	33.4	13 J
Acenaphthene	µg/kg	4,800,000	67,000,000	19.8 U	19.9 U	19.9 U	19.9 U	5.6 J	20 U	19.9 U	20 U	10.2 J	7.5 U	12.8 J	13.5 J	7.98 J	14.4 J	41.8	7.49 U
Acenaphthylene	µg/kg	4,800,000	67,000,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	9.28 J	7.5 U	11.2 J	13.3 J	7.83 J	7.5 UJ	69.4	7.49 U
Anthracene	µg/kg	4,800,000	67,000,000	19.8 U	19.9 U	19.9 U	19.9 U	15.8 J	20 U	19.9 U	20 U	28.5	21.2	38.1	93.8	44.2 J	13.2 J	184	17.3
Fluorene	µg/kg	3,200,000	45,000,000	19.8 U	19.9 U	19.9 U	19.9 U	7.6 J	20 U	19.9 U	20 U	12.6 J	8.44 J	16.5	20.1	13.3 J	12 J	65.3	8.95 J
Naphthalene	µg/kg	1,600,000	22,000,000	6.4 J	19.9 U	19.9 U	19.9 U	36.1	20 U	19.9 U	20 U	64.6	14.4 J	34.3	63.9	48.5	73.8	85.3	21.9
Phenanthrene	µg/kg	4,800,000	67,000,000	12.3 J	4.7 J	4.8 J	19.9 U	30	20 U	19.9 U	6 J	96.2	50.5	107	131	85.4 J	38.5 J	700	32.4
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	5.4 J	19.9 U	19.9 U	19.9 U	23.6	20 U	19.9 U	20 U	56.4	55.1	86.3	313	59.2 J	13.8 J	805	31.2
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	9.7 J	19.9 U	19.9 U	19.9 U	25.1	20 U	19.9 U	20 U	68.5	65.9	106	258	62.3 J	15.9 J	762	46.7
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	31.3 J	39.7 U	39.7 U	39.9 U	76.2	39.9 U	39.8 U	40 U	186	136	280	598	122 J	33.2 J	2,850	110
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	6.2 J	19.9 U	19.9 U	19.9 U	13.5 J	20 U	19.9 U	20 U	39	29.9	54	77.3	39.5 J	19.6 J	292	26.2
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	10.8 J	19.9 U	19.9 U	19.9 U	65.4	20 U	19.9 U	20 U	138	75.2	191	424	159 J	22.7 J	2,320	54.2
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	19.8 U	19.9 U	19.9 U	19.9 U	6.3 J	20 U	19.9 U	20 U	11.2 J	8.16 J	15.5	30.3	13.5 J	7.5 UJ	80	7.49 U
Fluoranthene	µg/kg	3,200,000	45,000,000	14.8 J	19.9 U	19.9 U	19.9 U	42	20 U	19.9 U	20 U	286	97.6	320	350	129 J	42.9 J	10,700	67.3
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	19.8 U	19.9 U	19.9 U	19.9 U	11.9 J	20 U	19.9 U	20 U	34.7	27.6	48.7	85.7	30.4 J	8.55 J	335	23.9
Pyrene	µg/kg	2,400,000	34,000,000	93.7	19.9 U	19.9 U	6.6 J	57	20 U	19.9 U	20 U	259	115	358	373	128 J	71.1 J	8,220	138
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	14.13 J	30.04 Lmax	30.04 Lmax	30.06 Lmax	37.55	30.19 Lmax	30.05 Lmax	30.20 Lmax	98.71	89.34 J	150.96	364.94	86.4 J	21.91 J	1192.17	64.29
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	690	1,600	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	49.6 U	49.7 U	49.6 U	49.8 U	49.4 J	49.9 U	219	50 U	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	25.9	19.9 U	26.8	19.9 U	31.6	33.7	26	20 U	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	NE	NE	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-3	COA-SS-3	COA-SS-3	COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre
Sample Identification				COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	COA-SS-2-7.5-9.5-20201118	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118	COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730
Sample Date				11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24
Sample Interval (dbm)				1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	7.5 - 9.5 ft	1 - 3 ft	3 -5 ft	5 -7 ft	7 - 9 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
Sample Type				Core	Core	Core	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Native	Native	Native	Recent	Native	Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	19.8 U	19.9 U	99.3 U	19.9 U	20 U	20 U	99.6 U	20 U	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	550	1,400	99.2 U	99.4 U	99.3 U	99.7 U	99.8 U	99.8 U	99.6 U	99.9 U	--	--	--	--	--	--	--	--
Phenol	µg/kg	18,000,000	260,000,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	19.8 U	19.9 U	19.9 U	19.9 U	**6.9 J**	20 U	19.9 U	20 U	**12.5 J**	**7.95 J**	**16.3**	**17.6**	**11.8 J**	**14.9 J**	**34.9**	**9.51 J**
Hexachlorobutadiene	µg/kg	14,000	33,000	5 U	5 U	19.9 U	19.9 U	5 U	5 U	5 U	5 U	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	198 U	199 U	199 U	199 U	200 U	200 U	199 U	200 U	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U	20 U	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	**1.8 J**	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	**1.3**	**24.5 J**	**13.1 J**	**22.1 J**	**12.8 J**	**8.8**	**10.2 J**	**22.9 J**	**17.7 J**
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	**1.19 J**	**1.03 JL15**	**1.04 JL15**	**1.14 JL13**	**1.26 JL12**	**0.96 JL15**	**1.03 JL13**	**0.96 JL15**	**1.35 L11**	**1.33 L11**	**2.82**	**2.10 JL9**	**0.39 JL13**	**0.55 JL11**	**33.03**	**1.21L10**

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural backg

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post	PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post
Sample Identification				COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	COA_PP-01-POST_20241002DUP	COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002
Sample Date				07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)				0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	NE	NE	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Metals																			
Arsenic	mg/kg	11	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.80	0.80	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.30	0.30	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	3.28 J	14.6	11.4	18.1	19.1	23	21.2 J	4.0 J	1.9 UJ	11.7 J	8.0 J	47.3 J	31.8 J	8.9 J	1.9 UJ	7.4 J
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)																			
2-Methylnaphthalene	µg/kg	320,000	4,500,000	13.7 J	38.7	17.2	7.47 U	18.9	22.8	15.7	11.1	9.2	33.9	9.9	9.5	113	23.3	7.3	11.3
Acenaphthene	µg/kg	4,800,000	67,000,000	7.48 U	44	7.49 U	7.47 U	11.7 J	11.7 J	6.7	5.9	4.3 J	43.3	3.2 J	13.5	40	17.2	10.3	8
Acenaphthylene	µg/kg	4,800,000	67,000,000	7.48 U	25.1	7.49 U	7.47 U	11.8 J	12.1 J	6.2 J	8.9	3.1 J	100.0 J	4.3 J	5.5 J	62.7 J	6.8 J	2.5 U	8.9 J
Anthracene	µg/kg	4,800,000	67,000,000	13.6 J	119	10.7 J	7.47 U	48.8	45.7	20	27.4 J	11.6 J	160.0	12.7	46.3 J	123	40.4	7.9	29.5
Fluorene	µg/kg	3,200,000	45,000,000	8.11 J	42.7	7.49 U	7.47 U	16.3	20.2	11.4	12.7	6.8	94	7.1	16.4	88.2	26.8	9.3	11.2
Naphthalene	µg/kg	1,600,000	22,000,000	66	76.3	23.8	25.8	69.9	61.6	39.8 J	21.2 J	22.7	59.2	12.7	51.6	78.4	27.9	8.2	37.6
Phenanthrene	µg/kg	4,800,000	67,000,000	45.2 J	267	29.1	10.7 J	104	83.2	40.8	57.5 J	23.6 J	1130	23.5	117.0 J	912	98	22.4	45.9
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)																			
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	32.6	307	24.7	7.47 U	89.3	161	55.2	59.6 J	16.4 J	1030	31.9	114	434	73.5	5.2	60.9
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	34.8	341	29.7	7.47 U	129	129	56.2	48.6	19	933	28.9	85.4	261	62	9.7	73.7
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	77.5	807	70	22.4 U	317	438	140 J	154.0 J	41.3 J	4200	86.8 J	188.0 J	703 J	165 J	33.3 J	239 J
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	22.8	131	16.6	7.47 U	63	52	26.3	25.3	13	407 J	13.3	41.2	102	27.4	3.9 J	28.5
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	71.8 J	524	46.1	9.6 J	195	366	69.6	115 J	23.0 J	2670	66.8	119	846	109	8.6	138
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	7.48 U	46.2	7.49 U	7.47 U	19.6	17	6.5 J	6.6	2.7 J	103 J	3.3 J	13.4 J	35.0 J	7.5 J	2.5 U	6.5 J
Fluoranthene	µg/kg	3,200,000	45,000,000	148 J	751	73.1	18	290	605	87.4 J	344 J	42.6 J	14,500	64.1	202 J	1490	156	26.9	138
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	16.6	140	13.7 J	7.47 U	60.7	51.6	20.7 J	22.2	9.4 J	444 J	11.0 J	36.1 J	102 J	24.9 J	3.3 J	26.5 J
Pyrene	µg/kg	2,400,000	34,000,000	132 J	861	103	22.8	263	486	199 J	319 J	60.4 J	11,400	136 J	200 J	1,600 J	230 J	34.2 J	180 J
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	48.91	476.26	41.46	7.95 J[L5]	179.61	199.42	79.14	73.99	25.91	1,537.4	42.87	121.74	396.86	90.18	14.05	108.37
Chlorinated Hydrocarbons																			
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	690	1,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	NE	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post	PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post
Sample Identification				COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	COA_PP-01-POST_20241002DUP	COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002
Sample Date				07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)				0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type				Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone				Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Phenols																			
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	550	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	18,000,000	260,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables																			
Dibenzofuran	µg/kg	170,000	2,000,000	7.48 U	35.2	7.79 J	7.47 U	17.2	15 J	8.3	9.7	5.7	63.6 J	6	9.9	33.5	18.4	14.9	9.7
Hexachlorobutadiene	µg/kg	14,000	33,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs)																			
Total PCBs Aroclors	µg/kg	3.5	3.5	36.7 J	2 U	79.4 J	8.8	39.1 J	19.5 J	22.1	6.4	2.0 UJ	41.5 J	26.9 J	15.5 J	54.8 J	30.8 J	2.0 U	12.8 J
Total PCBs Congeners	µg/kg	3.5	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)																			
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	0.31 JL14	3.77L10	1.88 L9	0.25 JL14	1.34 L11	4.83	1.63 JL11	0.57 JL11	517.93	186.70	0.66 J	0.48 JL12	5.15	2.57	0.72 J	1.80

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specil

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 7

Summary of Sediment Analytical Results for the Protection of Human Health and Higher Trophic Level Ecological Receptors

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		Proposed Sediment Cleanup Level[2]		PP-10-Post
Sample Identification				COA_PP-10-POST_20241002
Sample Date				10/02/24
Sample Interval (dbm)				0-10 cm
Sample Type				Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent
Tidal Zone				Subtidal
Field Screening				
Sheen	n/a	NE	NE	--
Visual Wood Content[3]	%	NE	NE	Absent
Metals				
Arsenic	mg/kg	11	11	--
Cadmium	mg/kg	0.80	0.80	--
Chromium	mg/kg	62	62	--
Copper	mg/kg	45	45	--
Lead	mg/kg	21	21	--
Mercury	mg/kg	0.20	0.20	--
Silver	mg/kg	0.30	0.30	--
Zinc	mg/kg	93	93	--
Organometallic Compounds				
Tributyltin Ion (interstitial water)	µg/L	0.15	0.15	--
Tributyltin Ion (bulk sediment)	µg/kg	73	73	**20.2 J**
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)				
2-Methylnaphthalene	µg/kg	320,000	4,500,000	**8.6**
Acenaphthene	µg/kg	4,800,000	67,000,000	**6.7**
Acenaphthylene	µg/kg	4,800,000	67,000,000	**4.2 J**
Anthracene	µg/kg	4,800,000	67,000,000	**22**
Fluorene	µg/kg	3,200,000	45,000,000	**11.2**
Naphthalene	µg/kg	1,600,000	22,000,000	**15**
Phenanthrene	µg/kg	4,800,000	67,000,000	**56.2**
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)				
Benzo(a)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**59.4**
Benzo(a)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**49.3**
Benzofluoranthenes[4] (Total)	µg/kg	See cPAH TEQ	See cPAH TEQ	**119 J**
Benzo(g,h,i)perylene	µg/kg	See cPAH TEQ	See cPAH TEQ	**20.7**
Chrysene	µg/kg	See cPAH TEQ	See cPAH TEQ	**68.1**
Dibenzo(a,h)anthracene	µg/kg	See cPAH TEQ	See cPAH TEQ	**4.1 J**
Fluoranthene	µg/kg	3,200,000	45,000,000	**136**
Indeno(1,2,3-c,d)pyrene	µg/kg	See cPAH TEQ	See cPAH TEQ	**18.0 J**
Pyrene	µg/kg	2,400,000	34,000,000	**162 J**
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)				
Total cPAHs TEQ[5] (KM)	µg/kg	21	21	**70.03**
Chlorinated Hydrocarbons				
1,2,4-Trichlorobenzene	µg/kg	38,000	88,000	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	21,000,000	230,000,000	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	200,000	470,000	--
Hexachlorobenzene	µg/kg	690	1,600	--
Phthalates				
Bis(2-Ethylhexyl) Phthalate	µg/kg	24,000	63,000	--
Butyl benzyl Phthalate	µg/kg	180,000	460,000	--
Dibutyl Phthalate	µg/kg	6,100,000	88,000,000	--
Diethyl Phthalate	µg/kg	49,000,000	700,000,000	--
Dimethyl Phthalate	µg/kg	NE	NE	--
Di-N-Octyl Phthalate	µg/kg	610,000	8,800,000	--

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Sample Location[1]		Proposed Sediment Cleanup Level[2]		PP-10-Post
Sample Identification				C0A_PP-10-POST_20241002
Sample Date				10/02/24
Sample Interval (dbm)				0-10 cm
Sample Type				Surface
Stratigraphic Unit		Intertidal Zone	Sutidal Zone	Recent
Tidal Zone				Subtidal
Phenols				
2,4-Dimethylphenol	µg/kg	1,200,000	18,000,000	--
2-methylphenol (o-Cresol)	µg/kg	3,000,000	44,000,000	--
4-methylphenol (p-Cresol)	µg/kg	6,100,000	88,000,000	--
Pentachlorophenol	µg/kg	550	1,400	--
Phenol	µg/kg	18,000,000	260,000,000	--
Miscellaneous Extractables				
Dibenzofuran	µg/kg	170,000	2,000,000	**7.6**
Hexachlorobutadiene	µg/kg	14,000	33,000	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	70,000	180,000	--
Benzoic Acid	µg/kg	240,000,000	3,500,000,000	--
Benzyl Alcohol	µg/kg	6,100,000	88,000,000	--
Polychlorinated Biphenyls (PCBs)				
Total PCBs Aroclors	µg/kg	3.5	3.5	**7.1**
Total PCBs Congeners	µg/kg	3.5	3.5	--
Dioxin-Like Polychlorinated Biphenyls (PCBs)				
Total Dioxin-like PCB Congeners TEQ[6] (KM)	ng/kg	0.20	0.20	--
Dioxins and Furans				
Total Dioxin and Furan TEQ[7] (KM)	ng/kg	5.0	5.0	**1.32 L9**

Notes:

[1] Sample locations shown on Figure 6.

[2] Proposed cleanup levels (PCULs) are presented in Table 3. Screening levels are based on the exposure pathways specific to intertidal sediment (i.e., beach play, clamming and net fishing) and subtidal sediment (i.e., net fishing) and is the risk-based value adjusted for natural background and PQL, whichever is higher.

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[5] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[6] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[7] Total dioxin/furan TEQs were calculated using United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

µg/L = microgram per liter

mg/kg = milligram per kilogram

µg/kg = microgram per kilogram

ng/kg = nanogram per kilogram

U = The analyte was not detected at a concentration greater than the value identified.

J = The analyte was detected and the detected concentration is considered an estimate.

L = Indicates the upper bound estimate of the TEQ total.

KM = Kaplan-Meier approach for summing TEQs.

cm = centimeter

ft = feet

n/a = not applicable

NE = not established

dbm = depth below mudline

-- = not analyzed

Bold font type indicates the analyte was detected at the reported concentration.

Yellow shading indicates exceedance of the PCUL.

Blue shading indicates that the practical quantitation limit (PQL) exceeds the preliminary cleanup level.

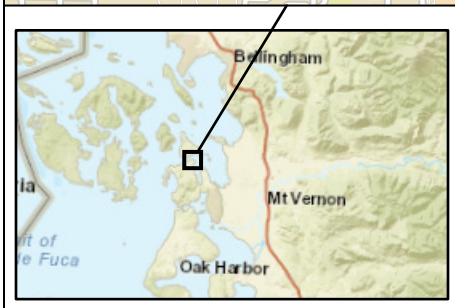
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Figures

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N

0 100

Feet

Notes:

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2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI Streets Map, 2023

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 1

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016608_F01_VicinityMap Date Exported: 05/19/25 by maugust



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Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

N

0 100

Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Site Plan

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 2

P:\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F02_SitePlan Date Exported: 05/28/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Parcel Boundary
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

N

0 100

Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Parcel Boundaries

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 3

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F03_ParcelBoundaries Date Exported: 05/28/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Storm Drain
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- New City of Anacortes Waste Water Treatment Plan Outfall
- Pier 2 Terminal Stormwater Network
- T Avenue Stormwater Network

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

N

0 100

Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Stormwater Network and Outfalls

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 4

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F04_StormwaterOutfalls Date Exported: 05/28/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Harbor Line
- Outfall

Habitats

- Approximate Eel Grass Boundary
- Mixed Microalgae Zone
- *Gracilaria and Chondracanthus* Zone
- *Ulva* Zone

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

N

0 100

Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Eelgrass and Macroalgae Habitat

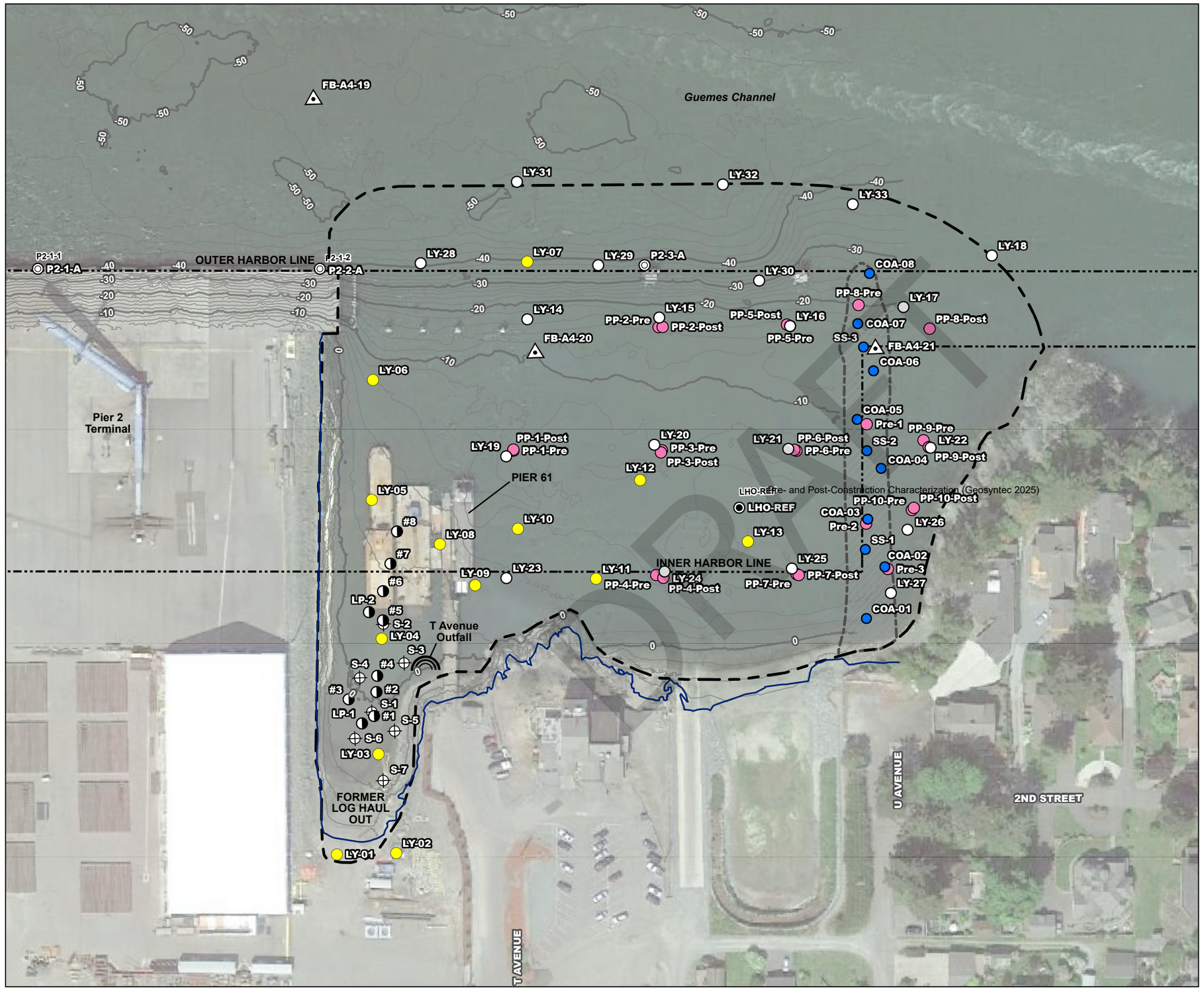
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 5

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F05_EelgrassMacroalgaeHabitat Date Exported: 05/28/25 by maugust



Legend

- Anacortes Log Yard Site
- Mean Higher High Water (MHHW)
- Harbor Line
- City of Anacortes Outfall
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area
- Pre- and Post-Construction Characterization (Geosyntec 2025)
- Supplemental Sediment Investigation (GeoEngineers 2021-23)
- Nearshore Sediment Characterization Study (DOF 2020)
- RI/FS Investigation (GeoEngineers 2016)
- Dredged Material Characterization Study (GeoEngineers 2012)
- Supplemental Sediment Characterization Study (GeoEngineers 2012)
- Sediment Characterization Study (GeoEngineers 2010)
- Fidalgo Bay Sediment Investigation (SAIC 2008)
- Pier 2 Log Haul Out Facility Due Diligence Study (Floyd|Snyder 2004)

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

N

0 100

Feet

Sediment Investigations

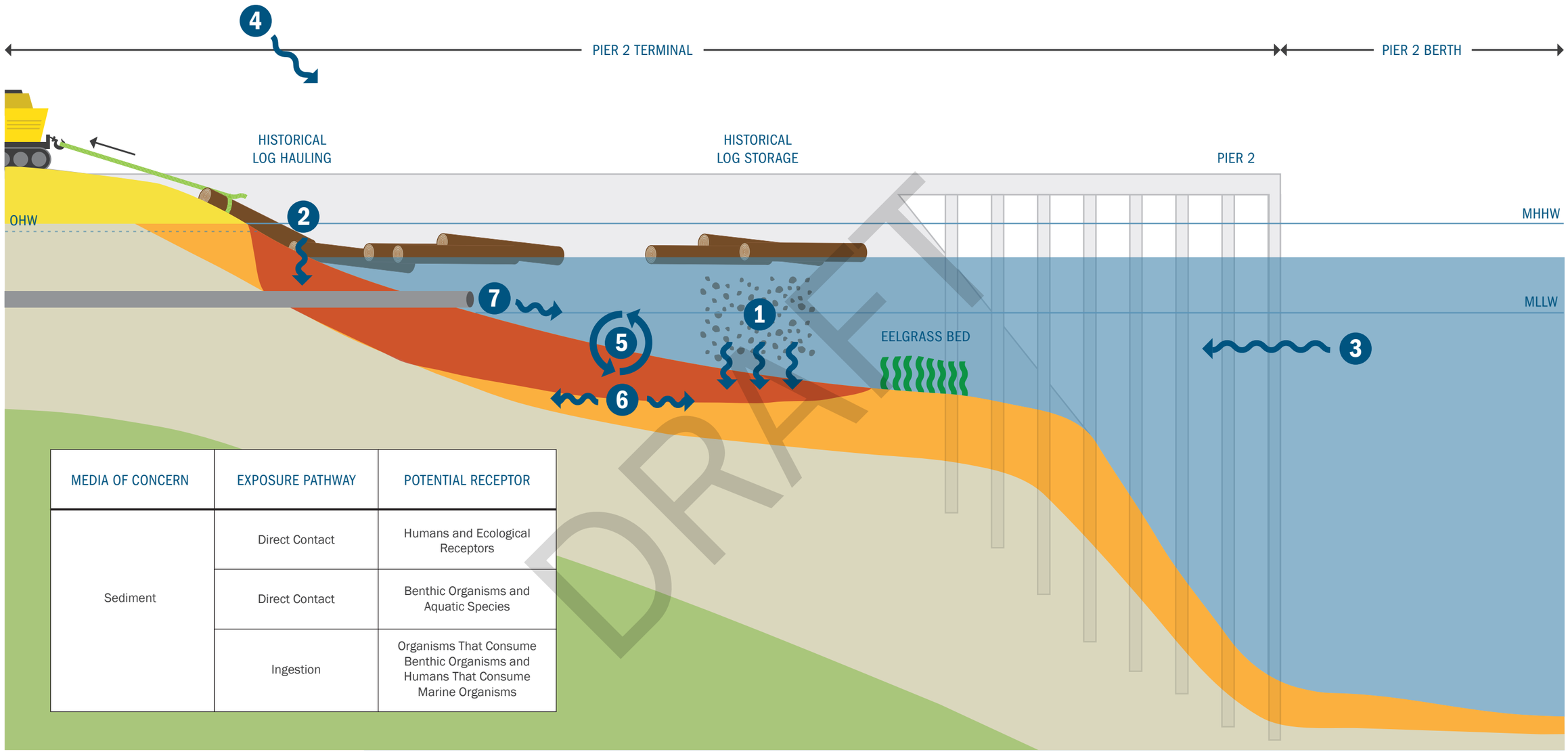
Anacortes Port Log Yard
Anacortes, Washington

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Figure 6

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MEDIA OF CONCERN	EXPOSURE PATHWAY	POTENTIAL RECEPTOR
Sediment	Direct Contact	Humans and Ecological Receptors
	Direct Contact	Benthic Organisms and Aquatic Species
	Ingestion	Organisms That Consume Benthic Organisms and Humans That Consume Marine Organisms

Legend

- Potential Contaminant Transport Pathway
- MHHW Mean Higher High Water
- MLLW Mean Lower Low Water
- OHW Ordinary High Water

Stratigraphy

- Artificial Upland Fill
- Pier 2 Terminal Fill with Armored Slopes
- Wood Debris
- Recent Sediment Deposits
- Glaciomarine Drift Deposits
- Bedrock

Release and Transport Pathway

1. Direct Deposition to Sediment Surface from Rafted Logs
2. Direct Deposition to Sediment Surface as Logs Came Into Contact During Historical Log Haul Out Operations
3. Deposition to Sediment from Off-Site Source(s)
4. Atmospheric Deposition from Historical Industrial Pyrogenic Sources (i.e., Coal, Wood, Grass and Fossil Fuel Combustion)
5. Suspension and Re-Deposition of Sediment and Wood Debris Through Bioturbation and Marine Disturbances
6. Wood Degradation
7. Direct Deposition from City of Anacortes Outfall Discharge

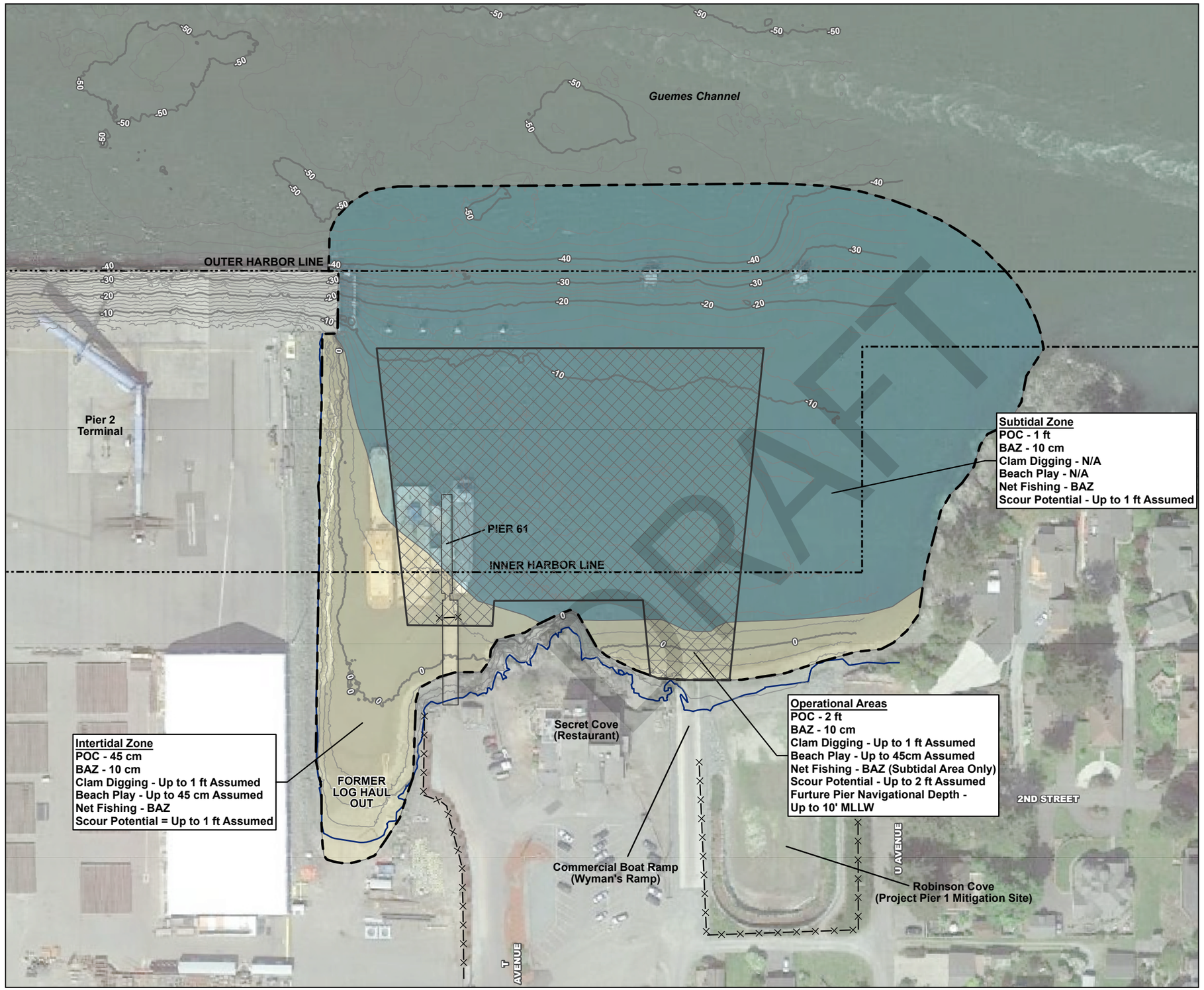
Conceptual Site Model

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 7

P:\5\5147016\Graphics_Misc\5147016l07 Fig 8 Conceptual Site Model.ai Date Exported: 1/3/18 by spride



Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

Sediment Compliance Area

- Intertidal Zone
- Subtidal Zone
- Operational Area (Anticipated Future Extent)

POC = Point of Compliance
bml = Below Mudline
ft =Feet
cm = Centimeter
BAZ = Biologically Active Zone
N/A = Not Applicable
MLLW = Mean Low Lower Water

N

0 100

Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

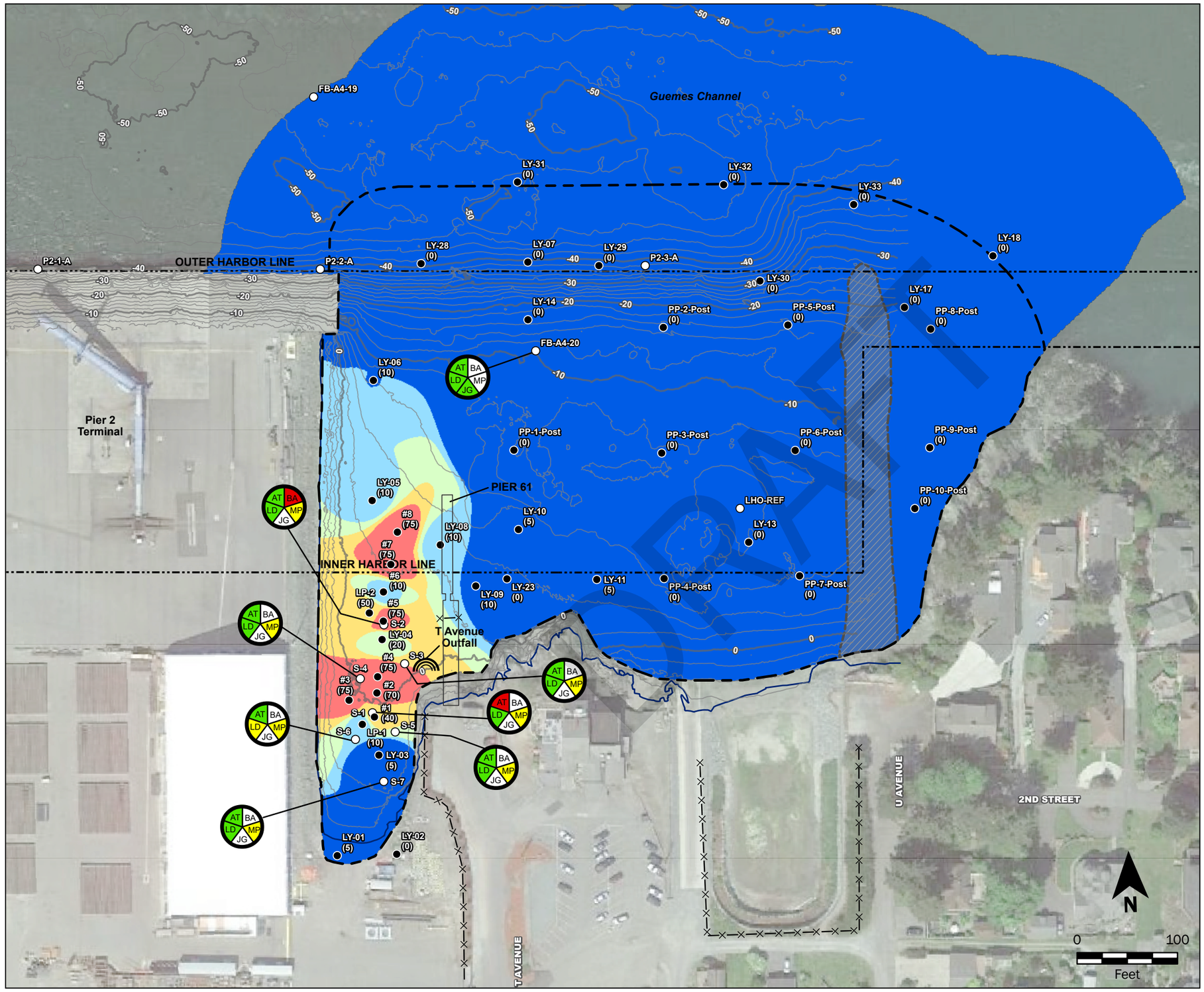
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 8

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_SedimentComplianceInterval Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

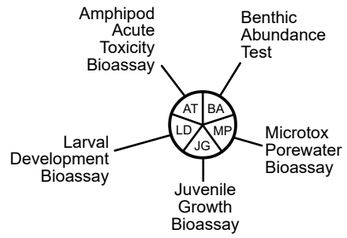
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Wood Debris**

<10%	15 - 35%	>60%
10 - 15%	35 - 60%	

**At each location, the highest concentration is shown.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
% = Percent
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

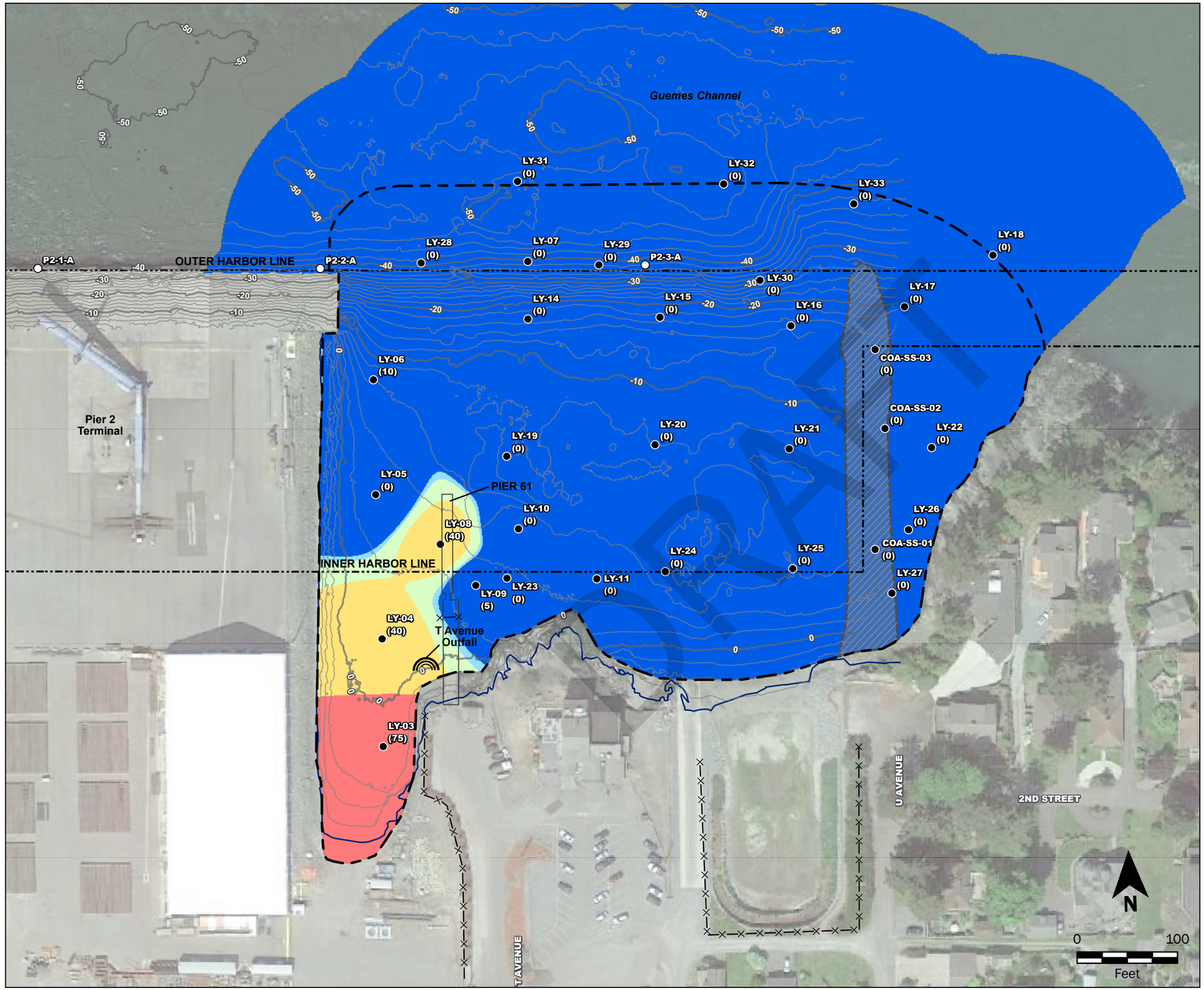
Observed Wood Content Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers | **Figure 9**

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\514701608_F09_ObservedWoodContentPOC Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Wood Debris**

<10%	15 - 35%	>60%
10 - 15%	35 - 60%	

**At each location, the highest concentration is shown.

ft = Feet
% = Percent

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

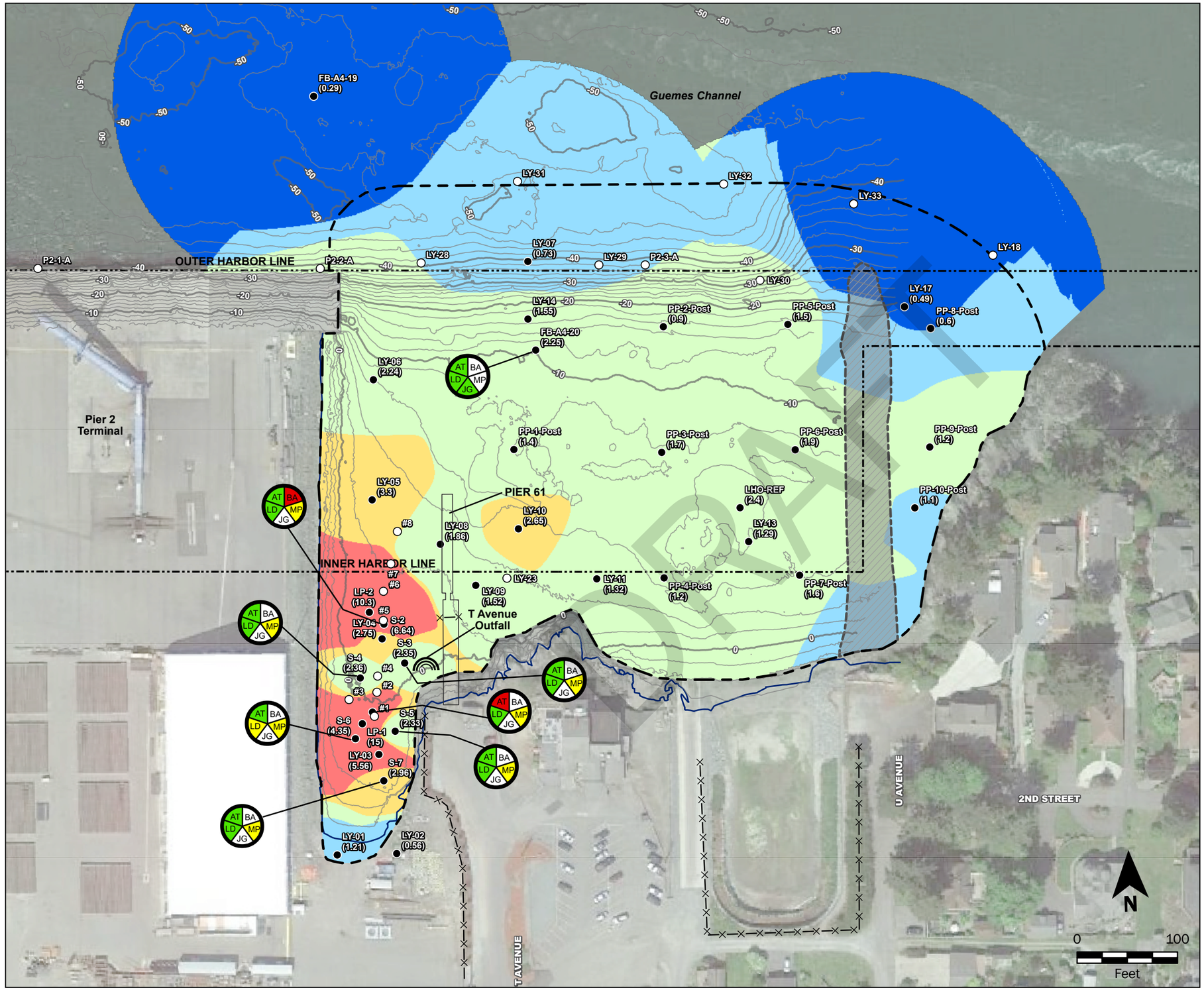
Observed Wood Content Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 10

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F10_ObservedWoodContentSubsurf Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

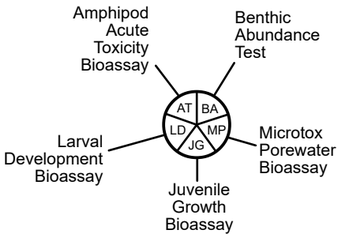
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Total Organic Carbon (TOC)**

- <0.5%
- 0.5 - 1.25%
- 1.25 - 2.5%
- 2.5 - 3.5%
- >3.5%

**At each location, the highest concentration is shown.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
% = Percent
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Total Organic Carbon Sediment Compliance Interval

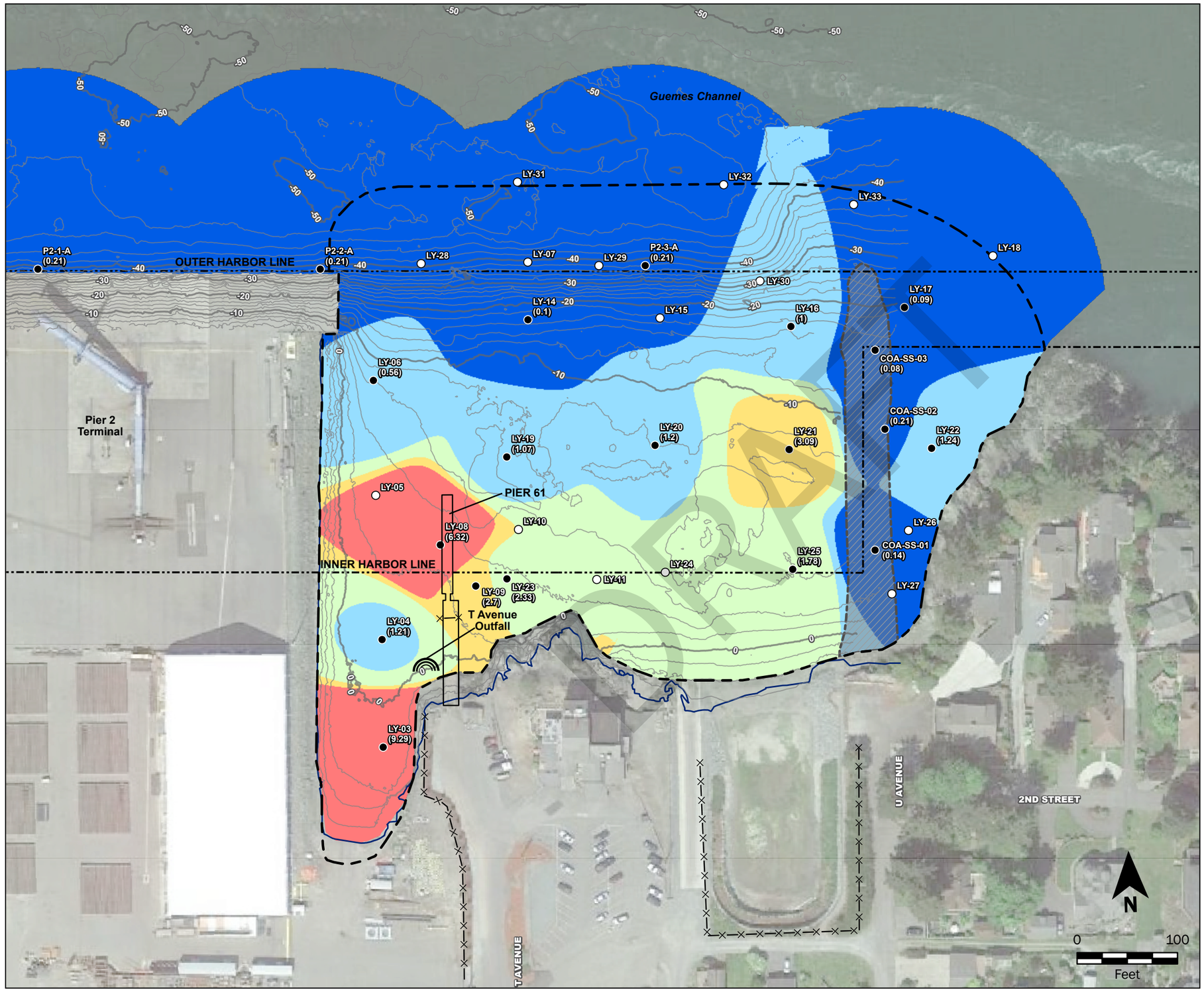
Anacortes Port Log Yard
Anacortes, Washington

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Figure 11

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F11_TotalOrganicCarbonPOC Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Total Organic Carbon (TOC)**

- <0.5%
- 0.5 - 1.25%
- 1.25 - 2.5%
- 2.5 - 3.5%
- >3.5%

**At each location, the highest concentration is shown.

ft = Feet
% = Percent

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Total Organic Carbon Subsurface Sediment

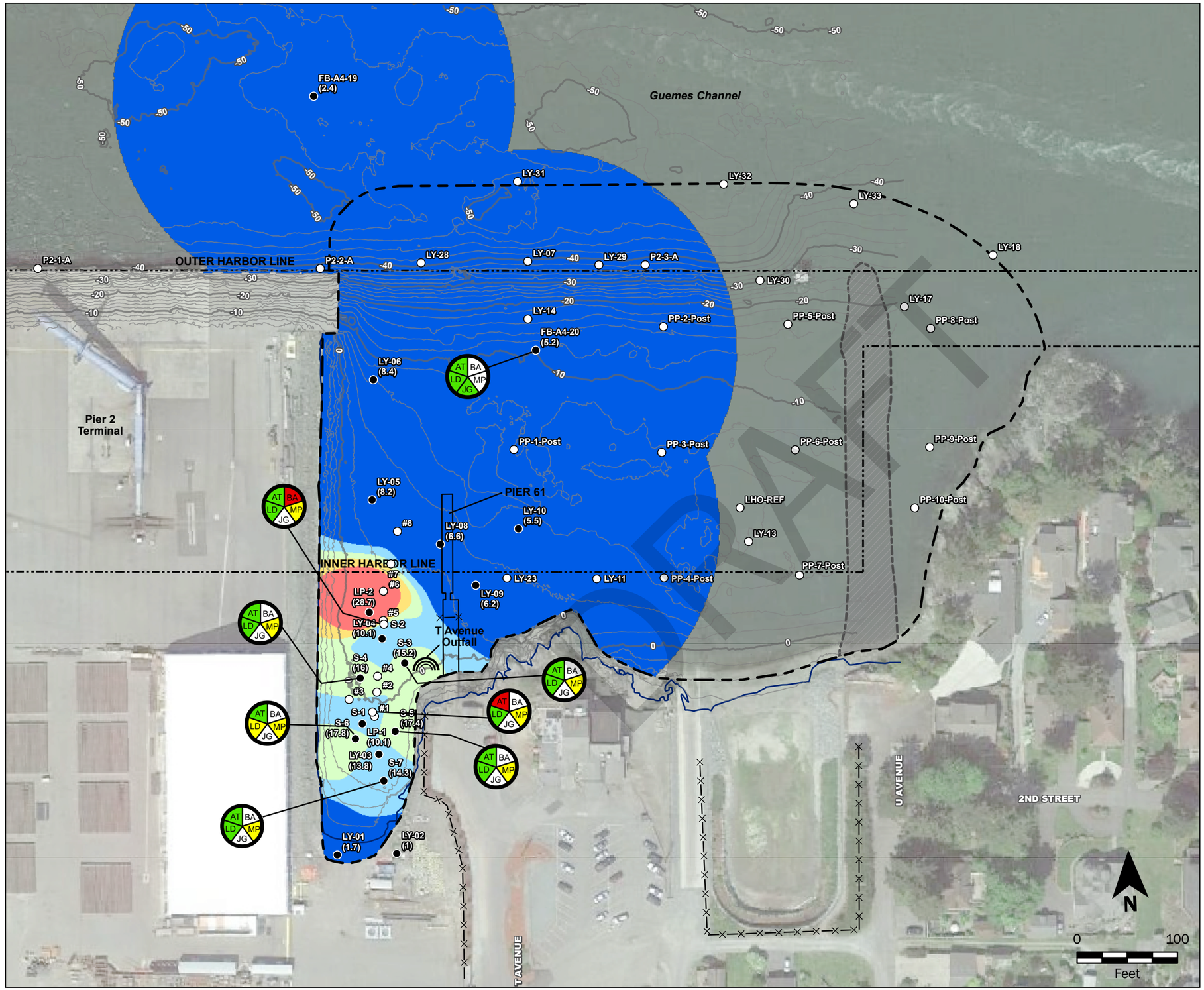
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 12

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F12_TotalOrganicCarbonSubsurf Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

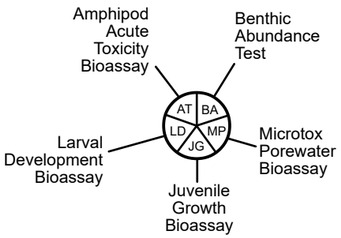
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Total Volatile Solids (TVS)**

- <10%
- 10 - 15%
- 15 - 20%
- 20 - 25%
- >25%

**At each location, the highest concentration is shown.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
% = Percent
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Total Volatile Solids
Sediment Compliance Interval

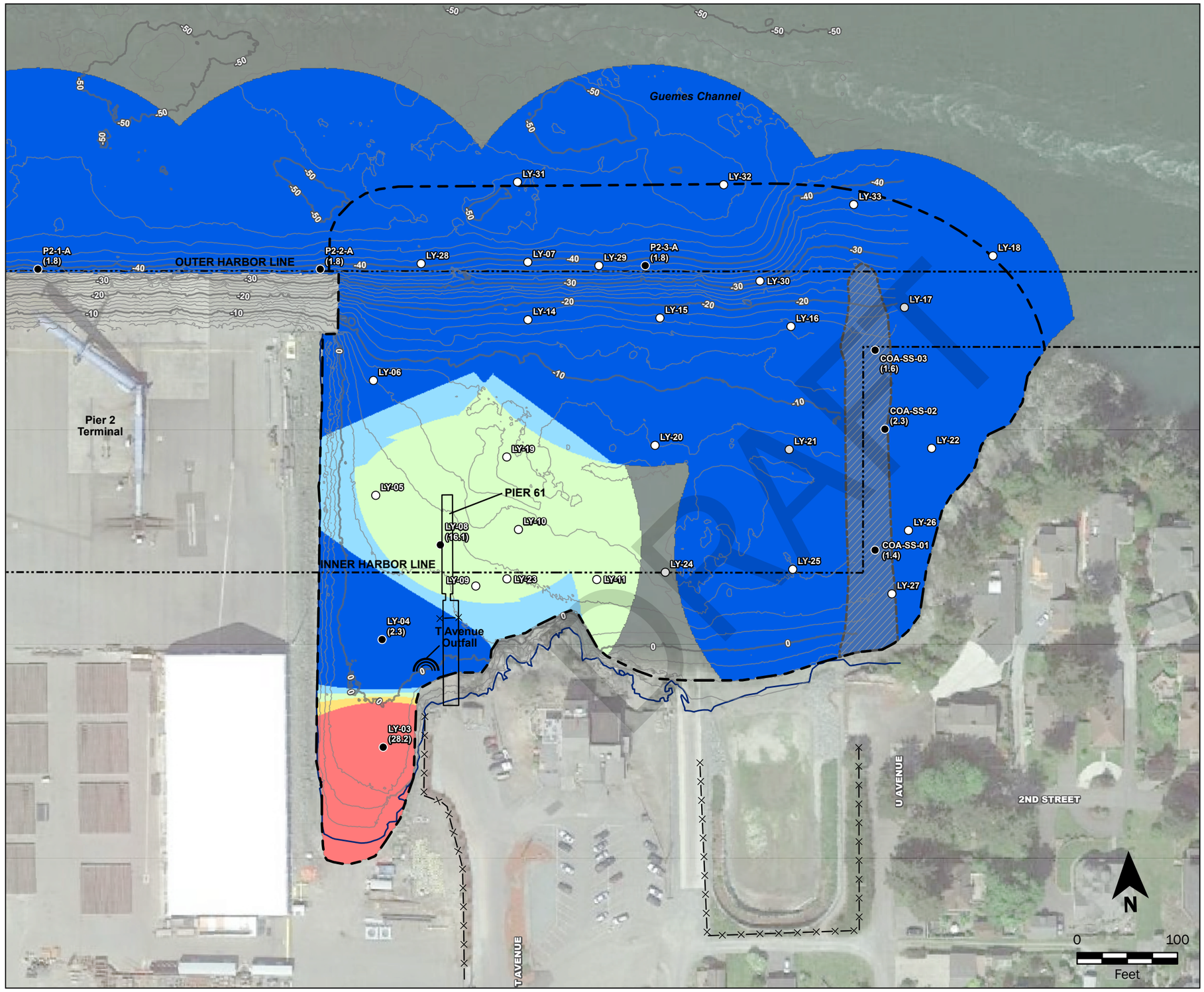
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 13

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F13_TotalVolatileSolidsPOC Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Total Volatile Solids (TVS)*

<10%	15 - 20%	>25%
10 - 15%	20 - 25%	

**At each location, the highest concentration is shown.

ft = Feet
% = Percent

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

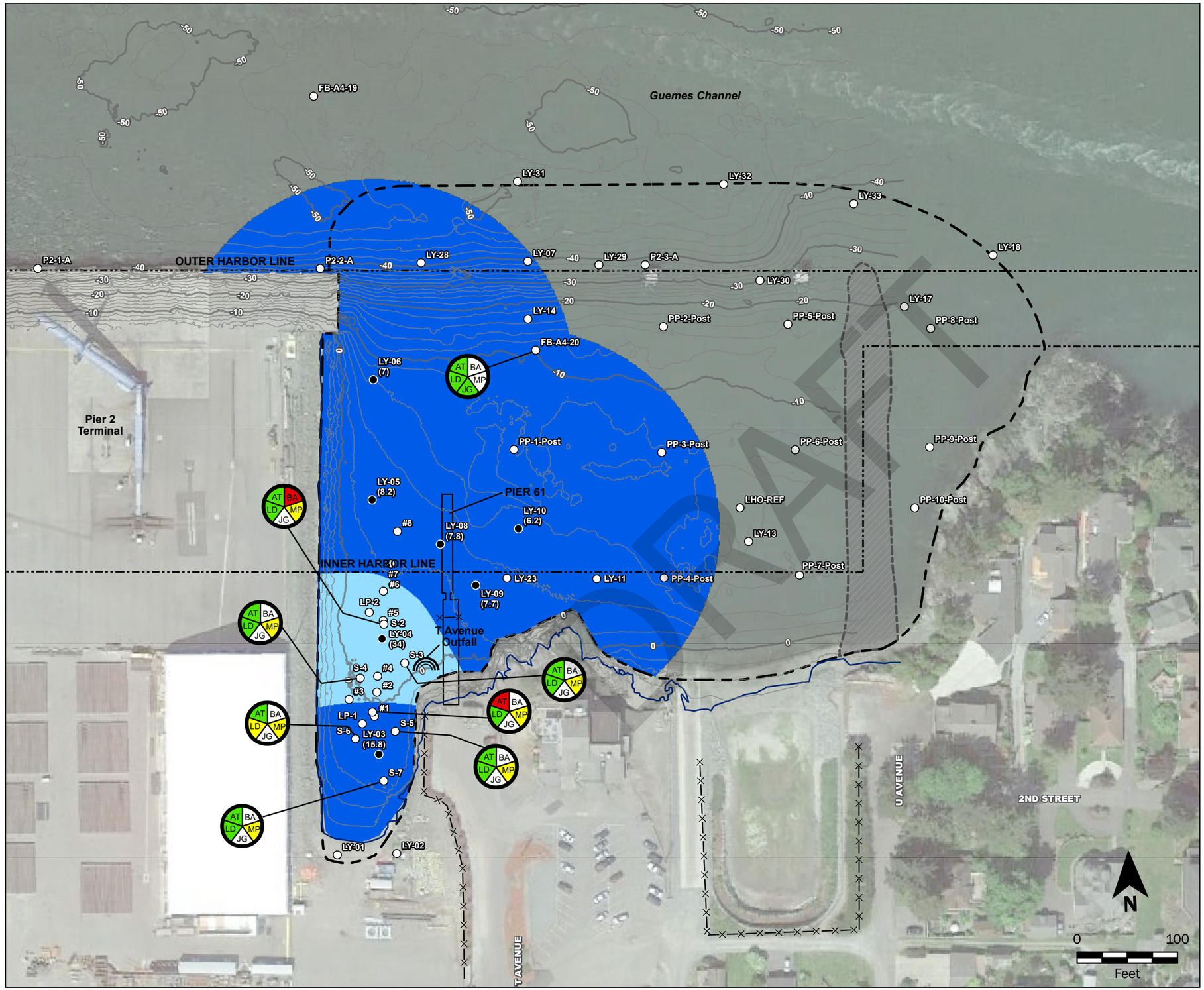
Total Volatile Solids
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 14

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F14_TotalOrganicVolatileSolidsSubsurf Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2ft)

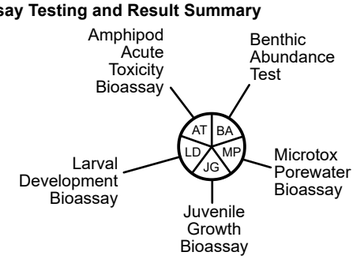
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Porewater Ammonia (mg-N/L)*

<20	40 - 60	>80
20 - 4	60 - 80	

**At each location, the highest concentration is shown.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
mg-N/L = Milligram Nitrogen per Liter
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Porewater Ammonia Sediment Compliance Interval

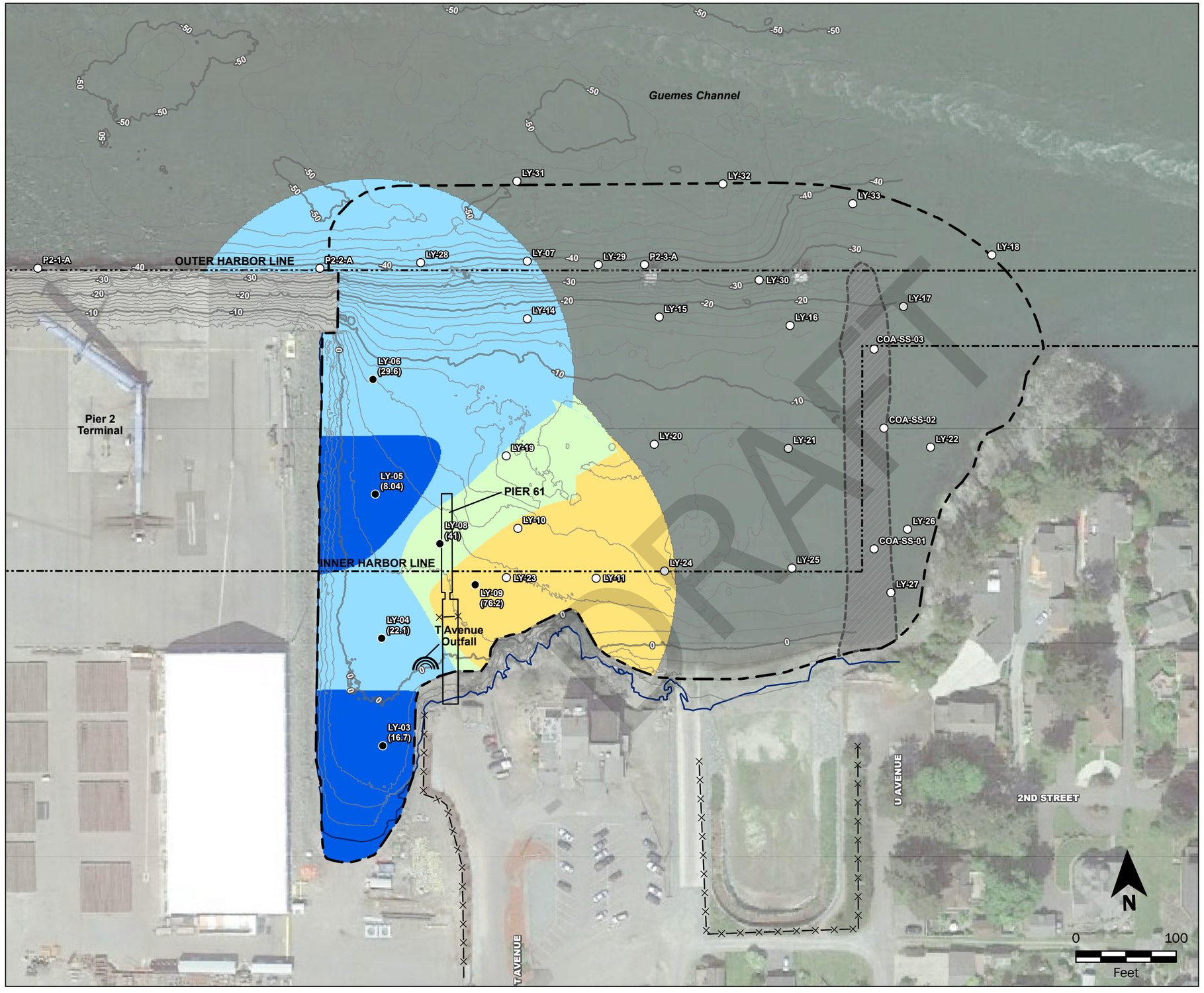
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 15

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F15_PorewaterAmmoniaPOC Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Porewater Ammonia (mg-N/L)**

<20	40 - 60	>80
20 - 40	60 - 80	

**At each location, the highest concentration is shown.

ft = Feet
mg-N/L = Milligram Nitrogen per Liter

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Porewater Ammonia Subsurface Sediment

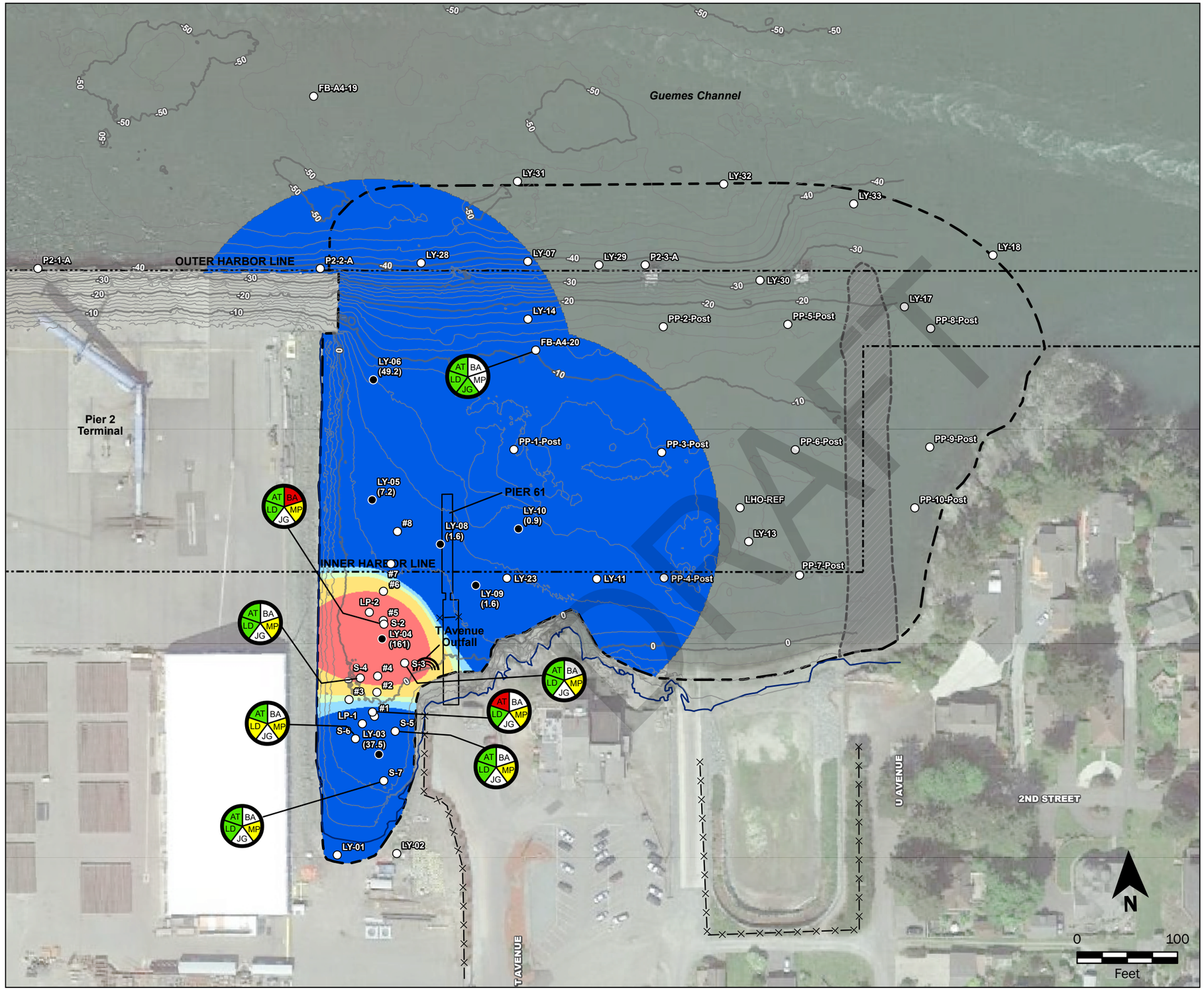
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 16

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F16_PorewaterAmmoniaSubsurf Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

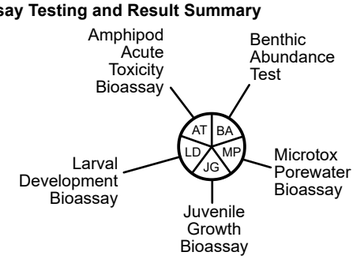
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Porewater Sulfides (mg/L)**

<20	40 - 60	>80
20 - 40	60 - 80	

**At each location, the highest concentration is shown.

Bioassay Testing and Result Summary



Meets SQS and CSL Criteria	Failure of CSL Criteria
Failure of SQS Criteria	No Result

ft = Feet
mg/L = Milligram per Liter
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Porewater Sulfides
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 17

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F17_PorewaterSulfidesPOC Date Exported: 12/23/25 by maugust

Guemes Channel

OUTER HARBOR LINE

INNER HARBOR LINE

Pier 2 Terminal

PIER 61

T Avenue Outfall

U AVENUE

T AVENUE

2ND STREET

LY-31 LY-32 LY-33 LY-18 LY-17 LY-16 LY-15 LY-14 LY-30 LY-29 LY-28 LY-07 LY-06 (16.2) LY-05 LY-08 (8.26) LY-10 LY-19 LY-20 LY-21 LY-22 LY-26 LY-27 LY-25 LY-24 LY-23 LY-11 LY-09 (0.335) LY-04 LY-03 (44)

P2-1-A P2-2-A P2-3-A

COA-SS-03 COA-SS-02 COA-SS-01

N

0 100

Feet

DRAFT

Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Interpolated Distribution of Porewater Sulfides (mg/L)**

<20	40 - 60	>80
20-40	60-80	

**At each location, the highest concentration is shown.

ft = Feet
mg/L = Milligram per Liter

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

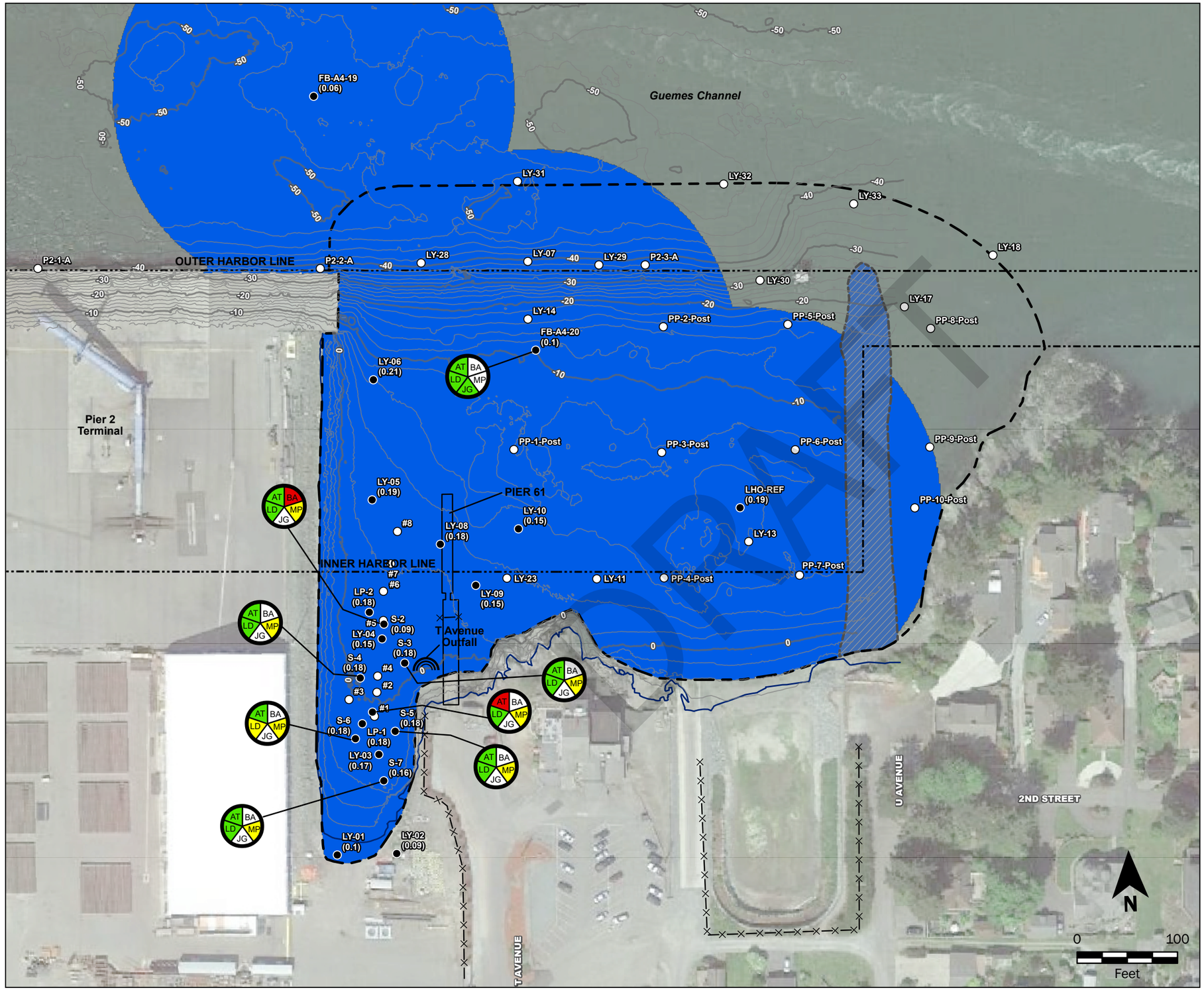
Porewater Sulfides Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 18

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F18_PorewaterSulfidesSubsurf Date Exported: 12/23/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

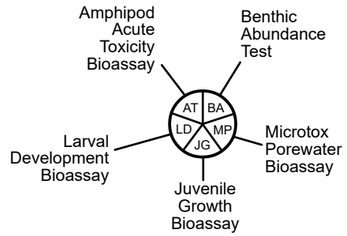
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Arsenic Results (Benthic)
Sediment Compliance Interval

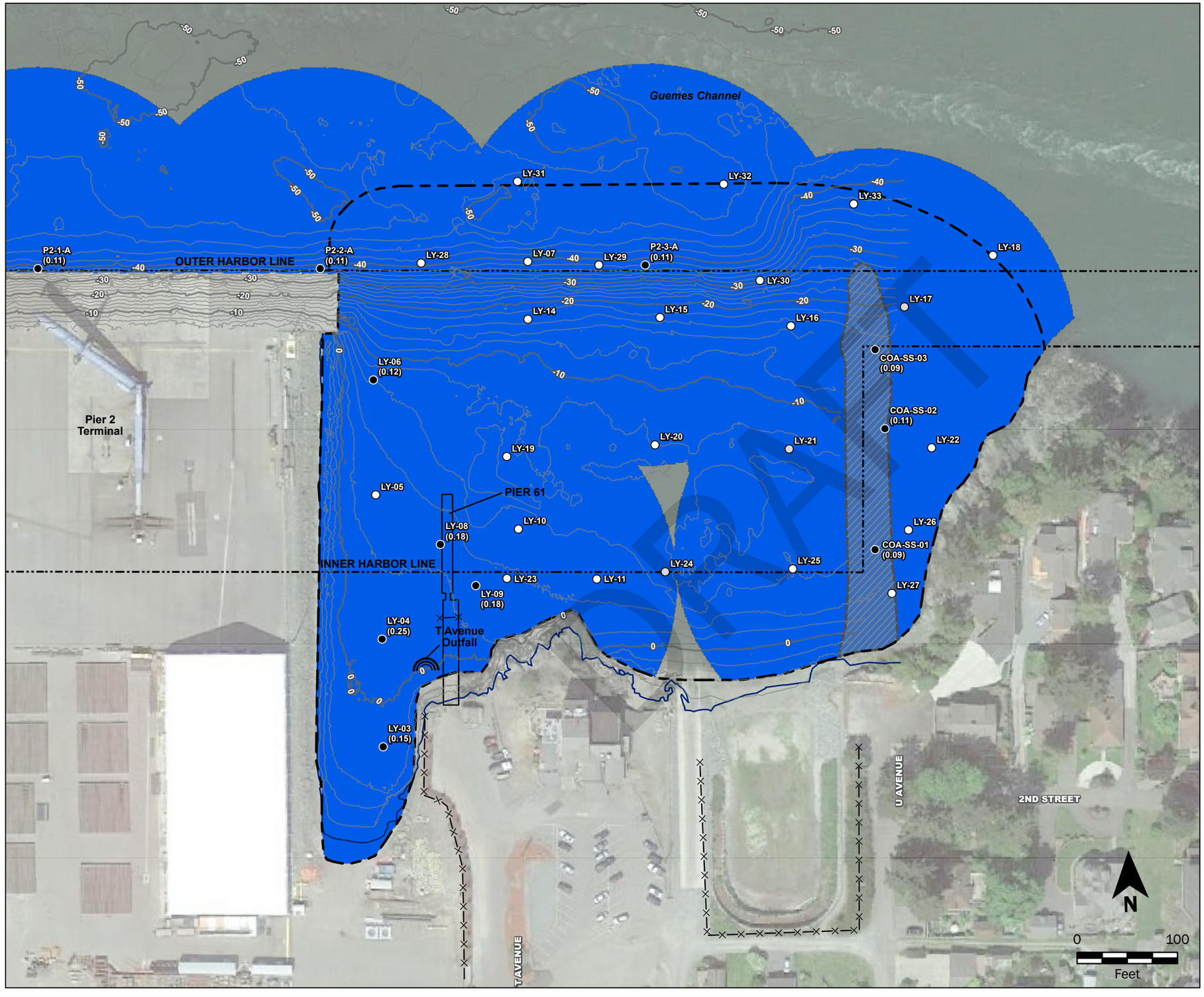
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 19

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\514701608_F19_ArsenicResultsPOC Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

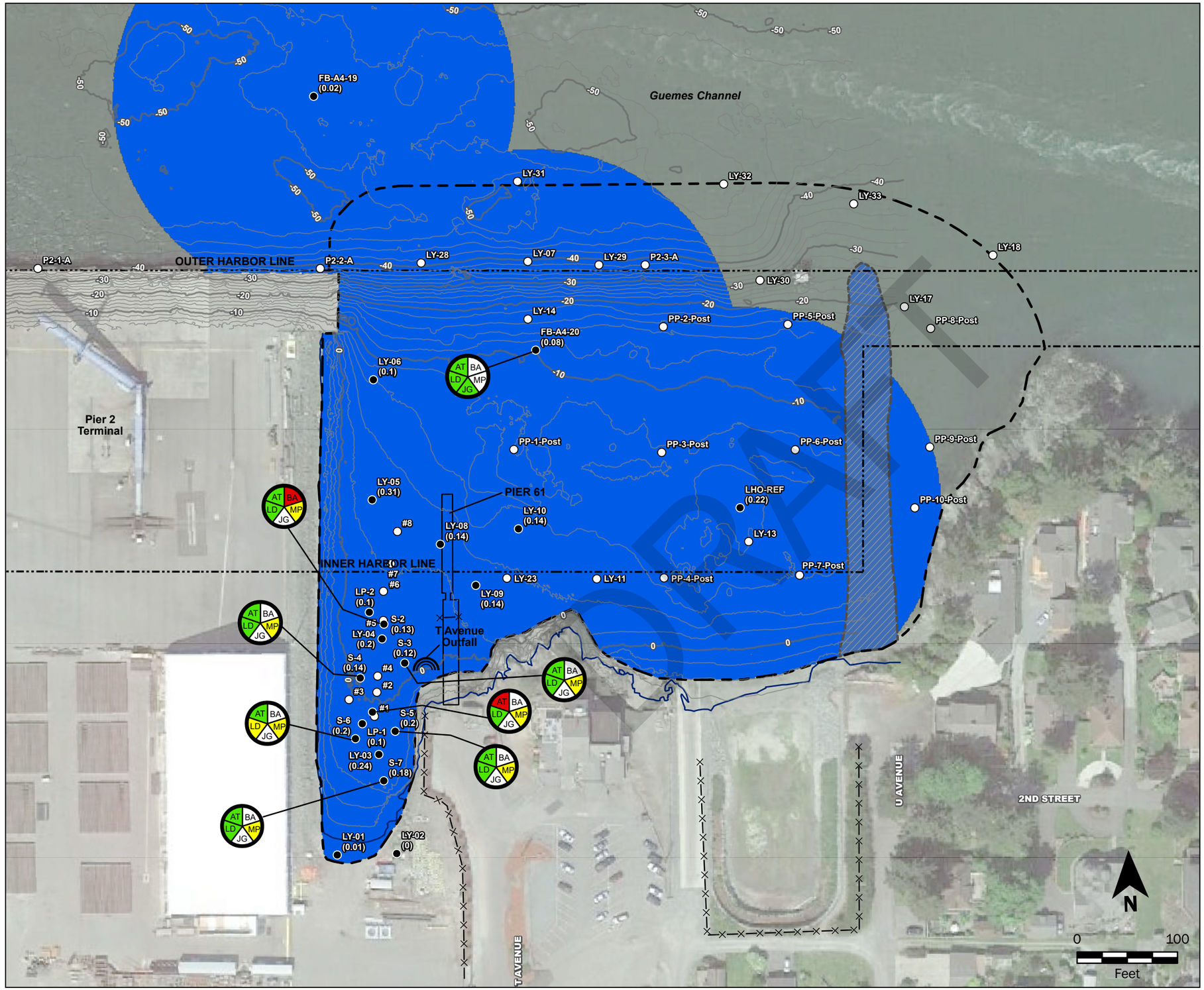
Arsenic Results (Benthic)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 20

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F20_ArsenicResultsSubsurf Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

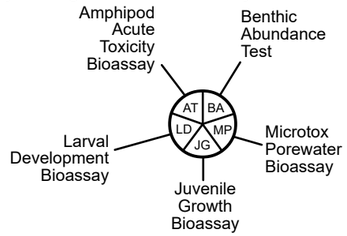
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

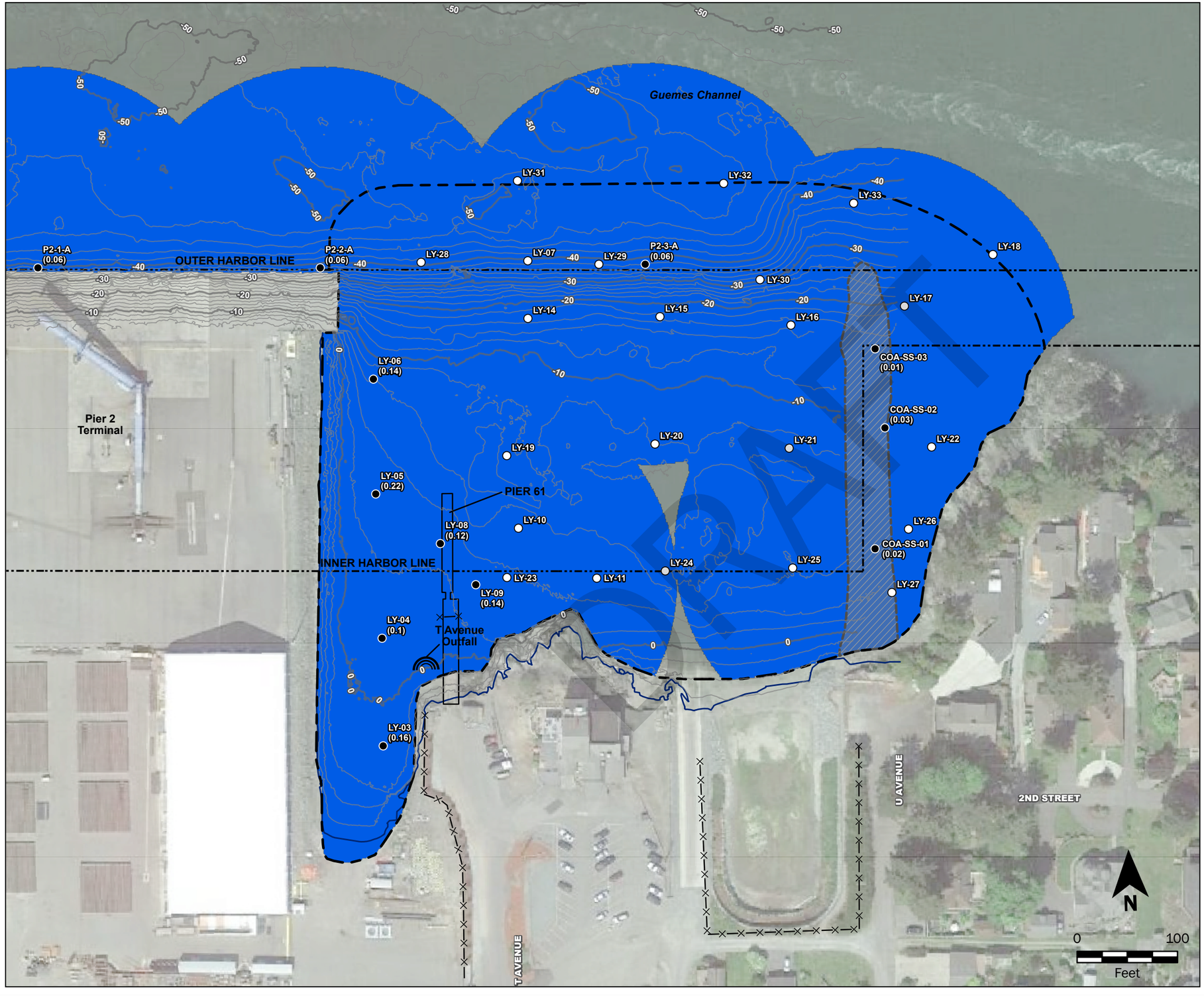
Cadmium Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 21

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_P21_CadmiumResultsPOC Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

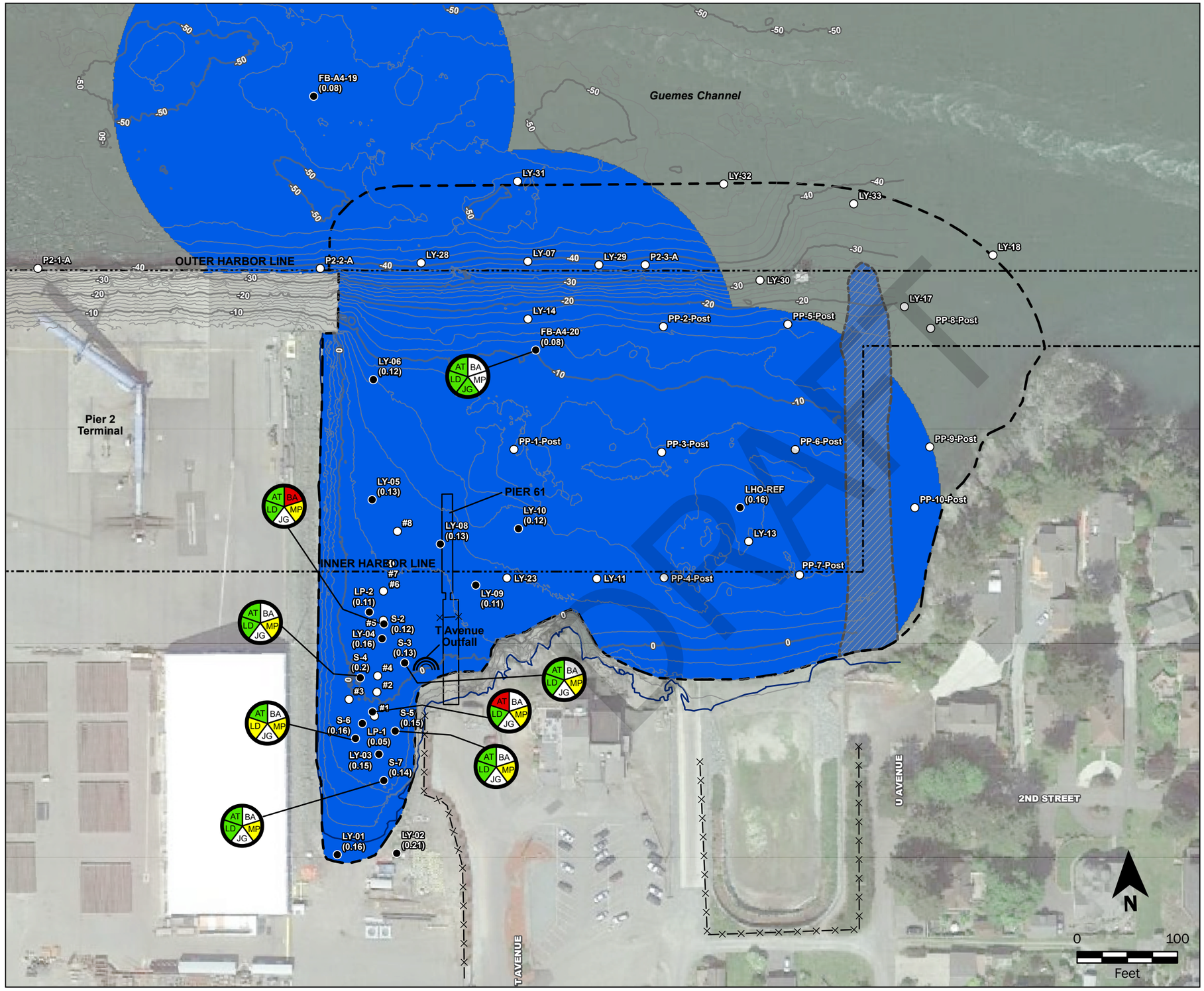
Cadmium Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 22

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F22_CadmiumResultsSubsurf Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

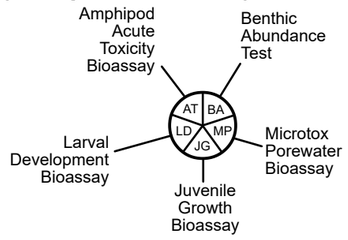
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Chromium Results (Benthic)
Sediment Compliance Interval

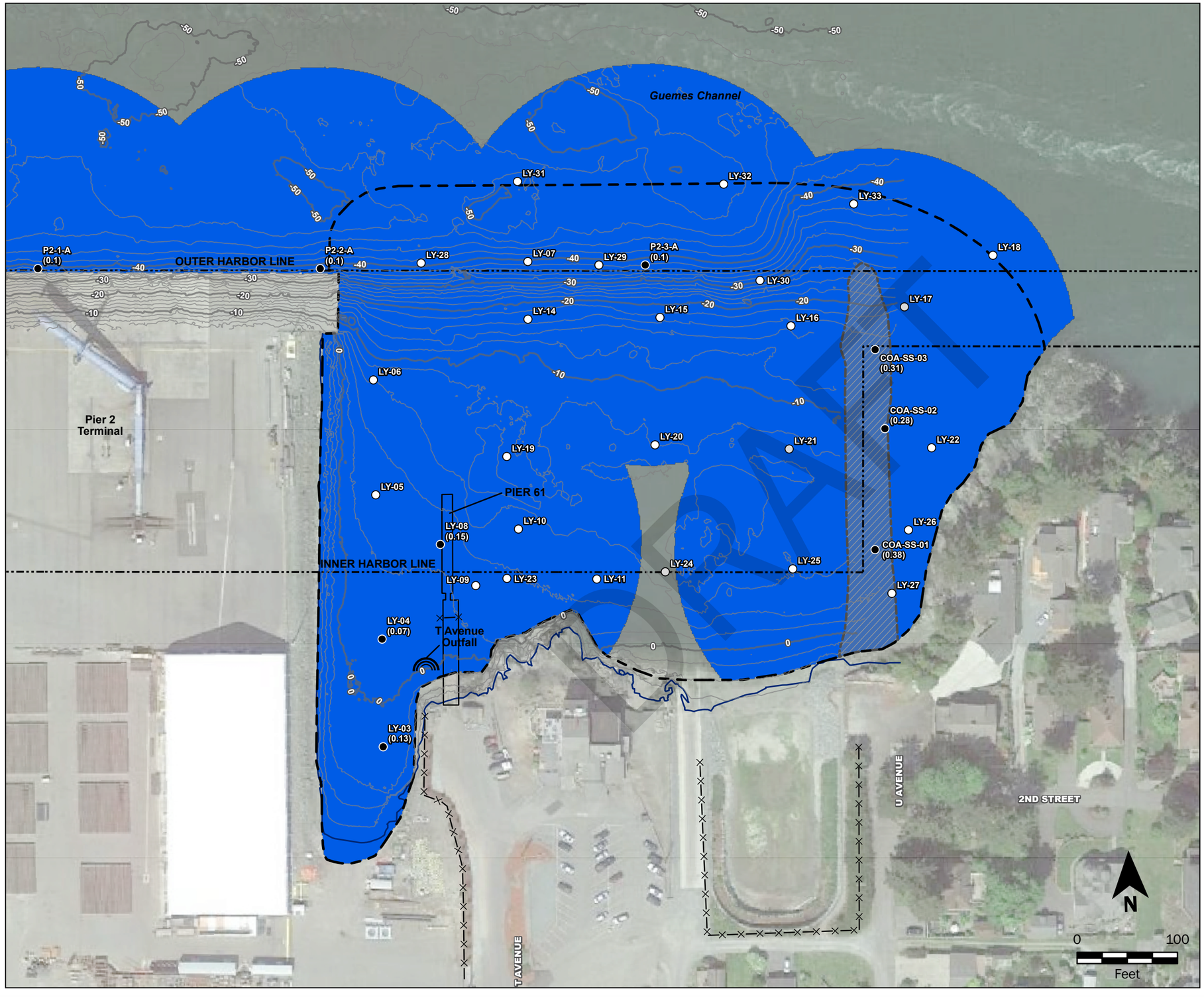
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 23

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_P23_ChromiumResultsPOC Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

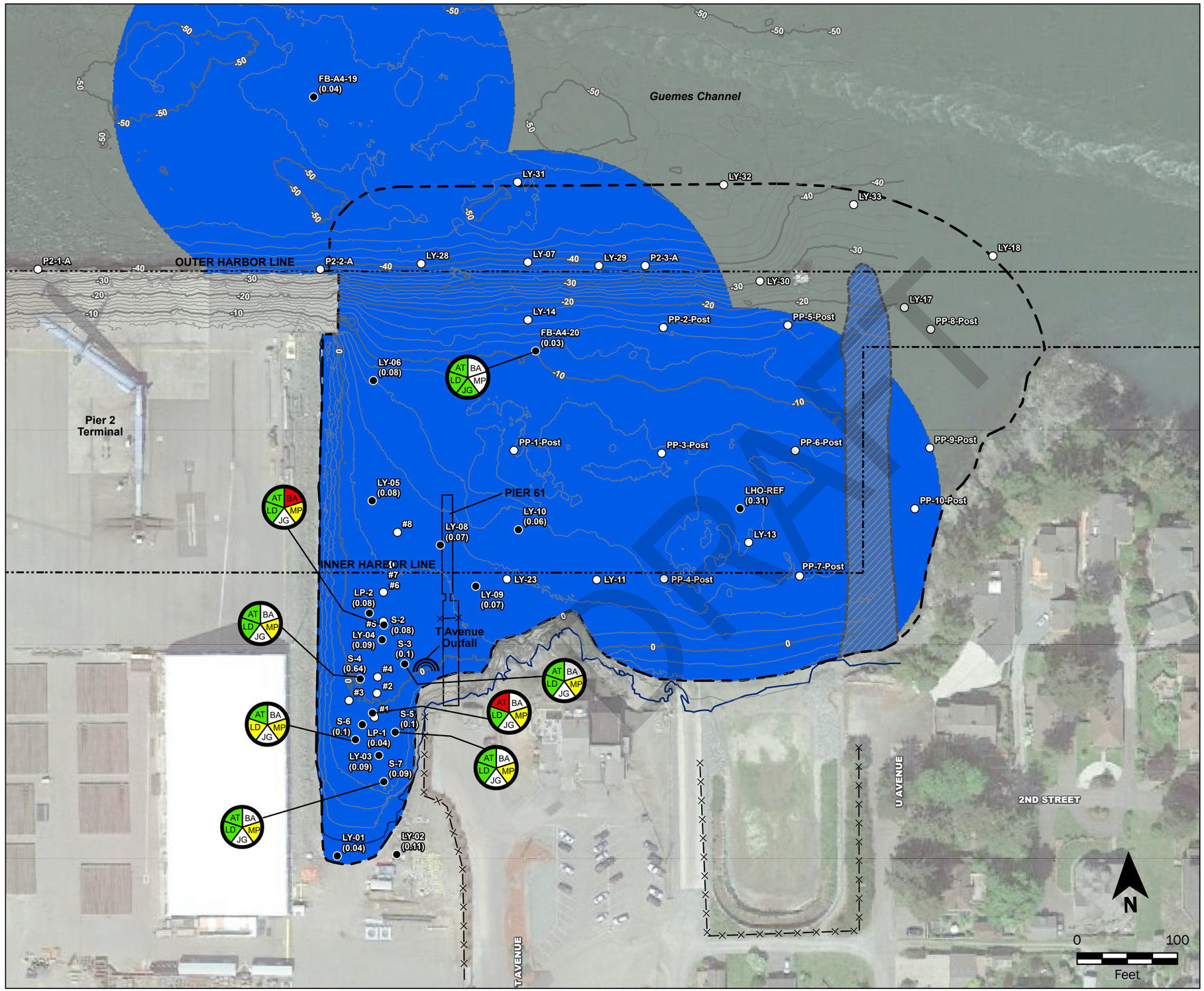
Chromium Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 24

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016O8_F24_ChromiumResultsSubsurf Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

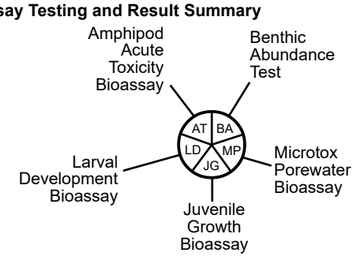
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

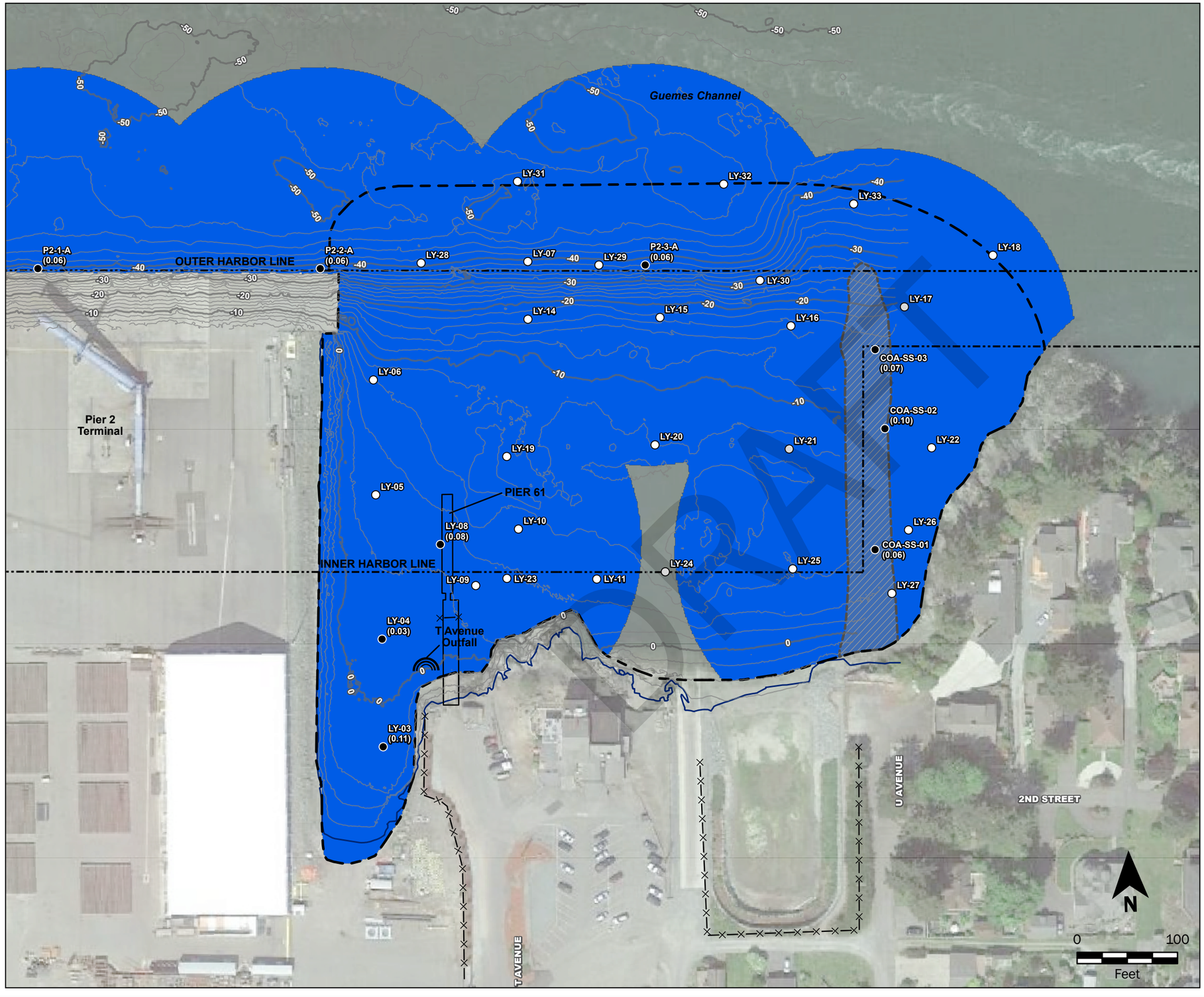
Copper Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 25

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F25_CopperResultsPOC Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

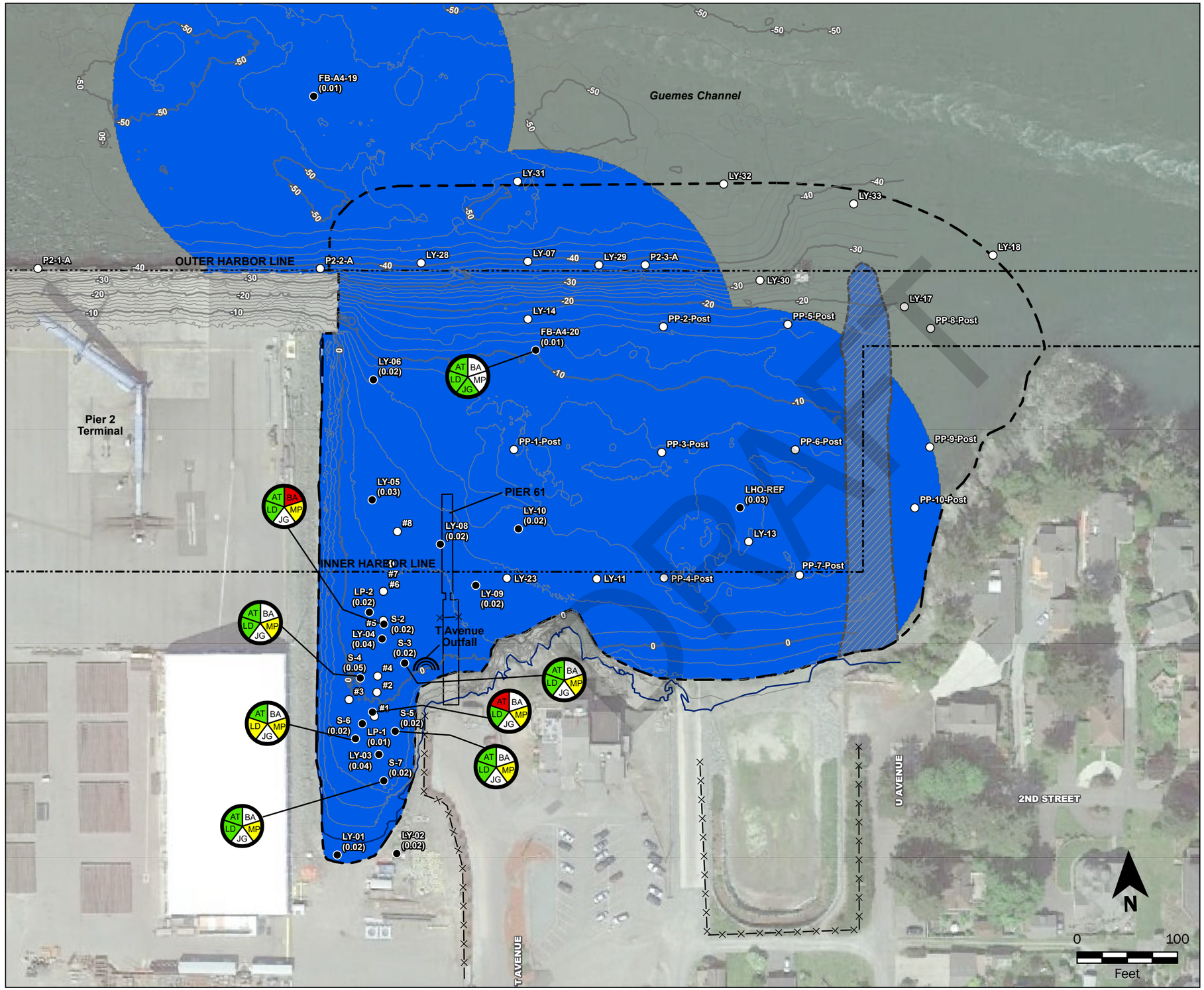
Copper Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 26

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F26_CopperResultsSubsurf Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

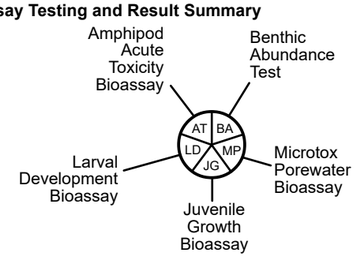
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

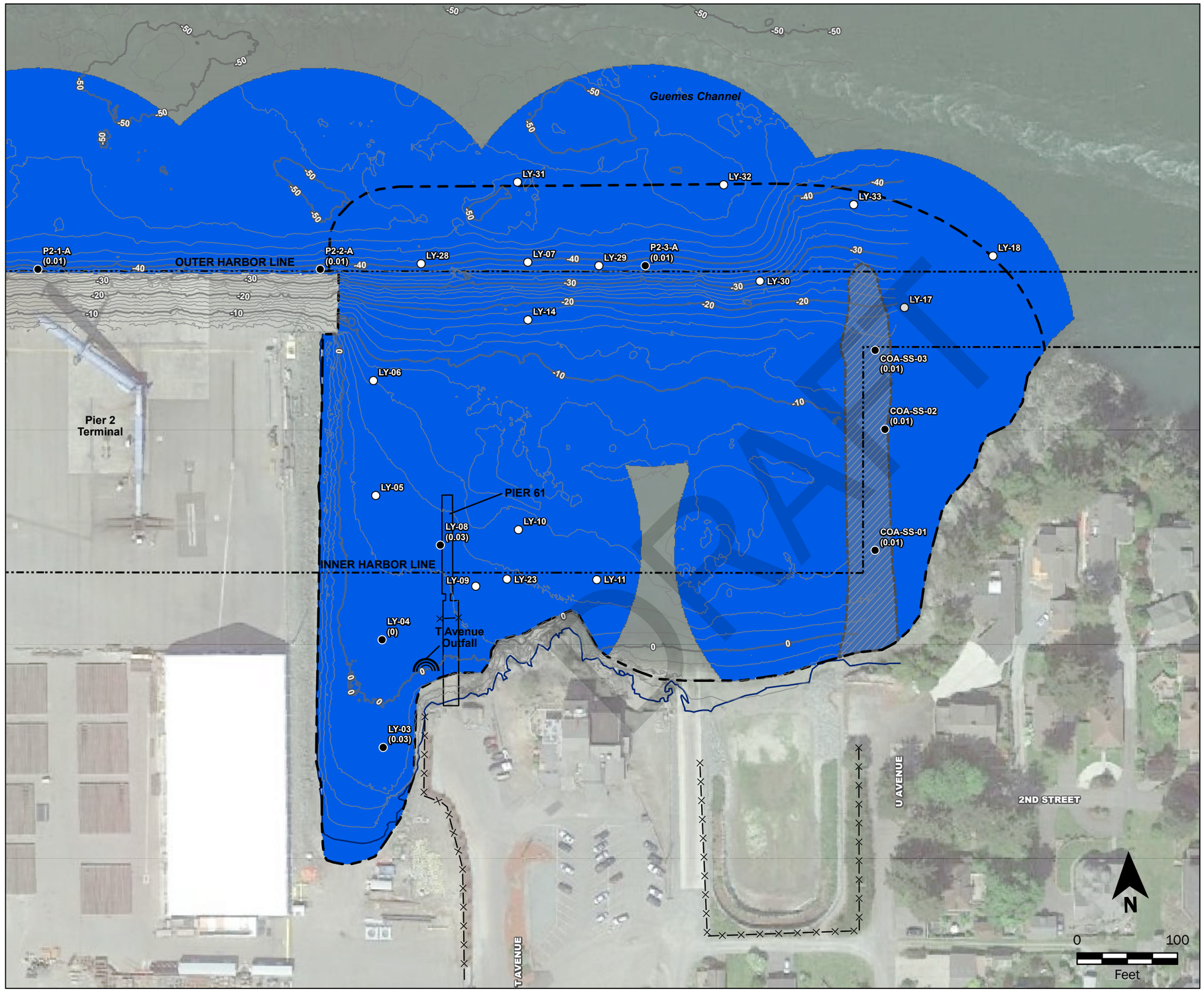
Lead Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 27

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F27_LeadResultsPOC Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Lead Results (Benthic) Subsurface Sediment

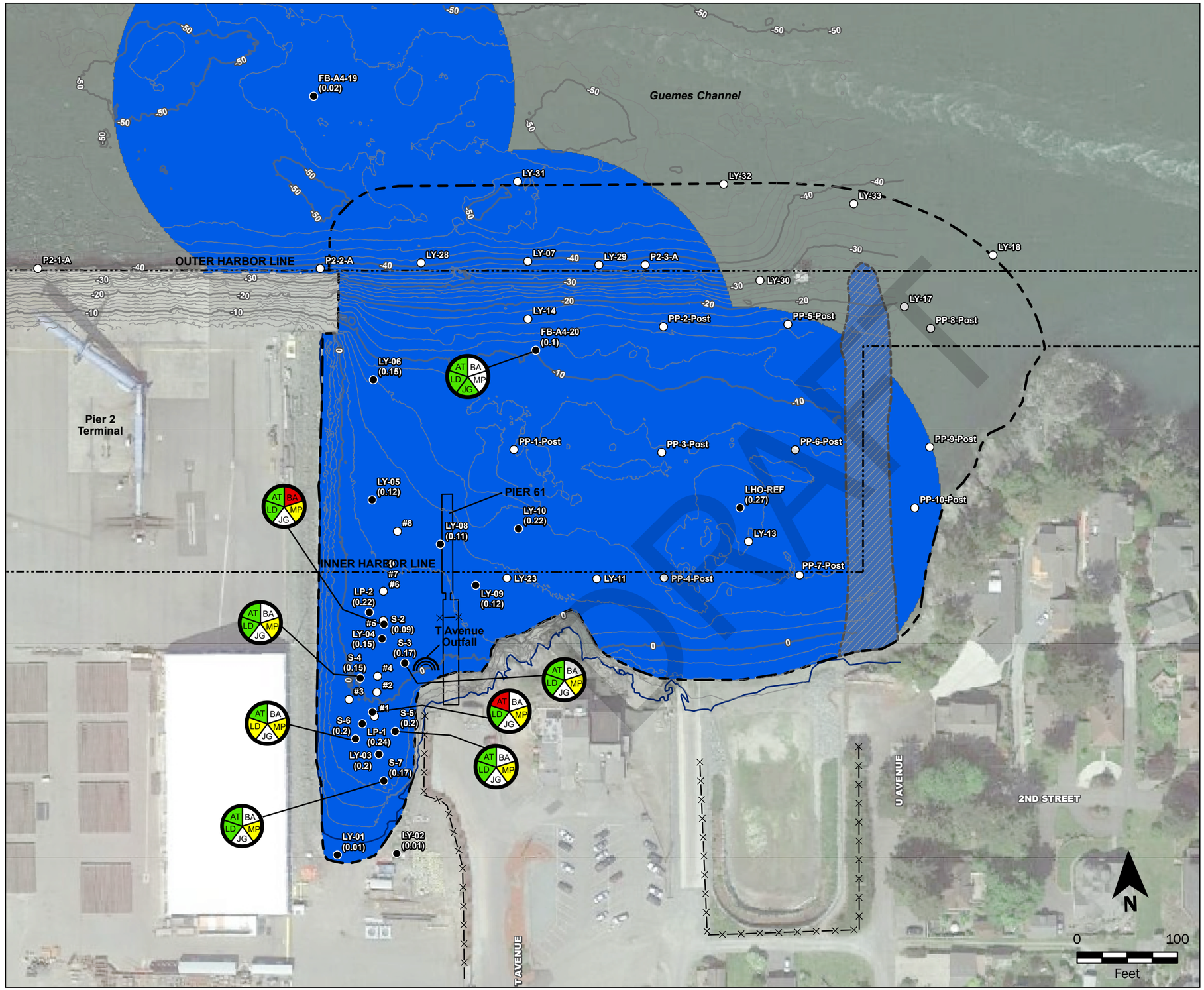
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 28

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F28_LeadResultsSubsurf Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

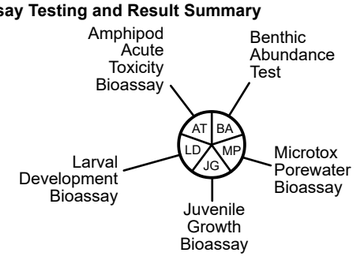
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

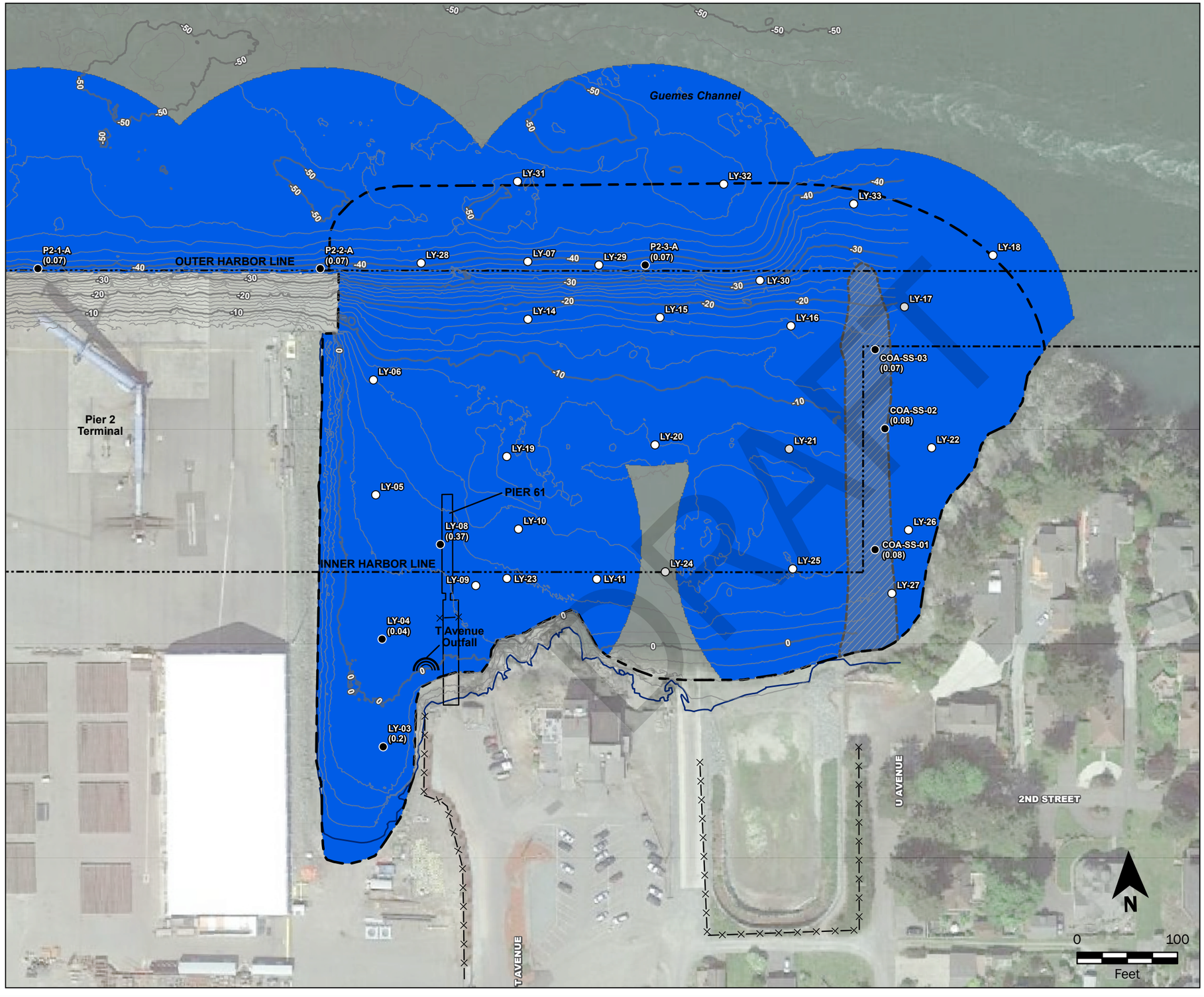
Mercury Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 29

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F29_MercuryResultsPOC Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

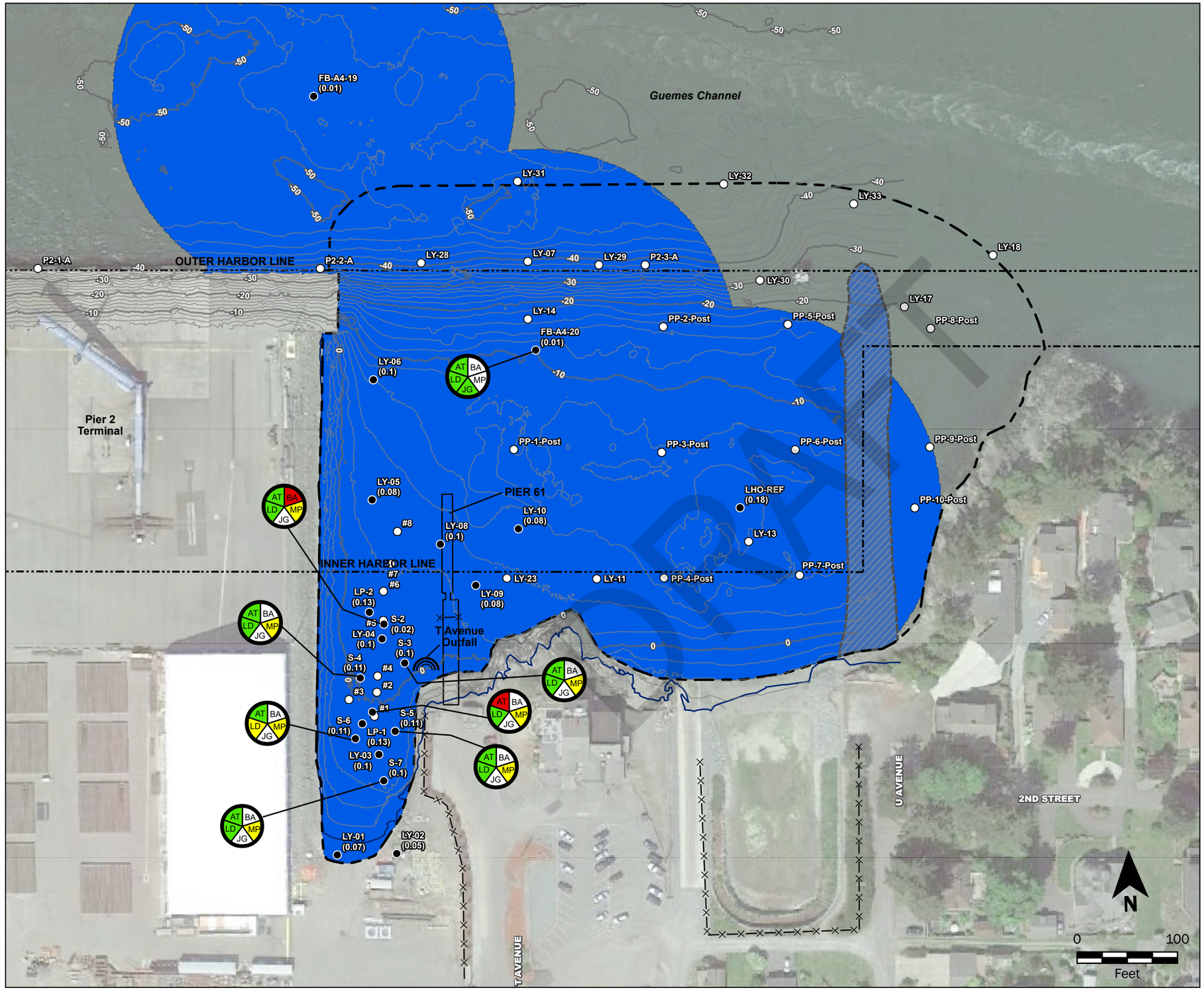
Mercury Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 30

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F30_MercuryResultsSubsurf Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

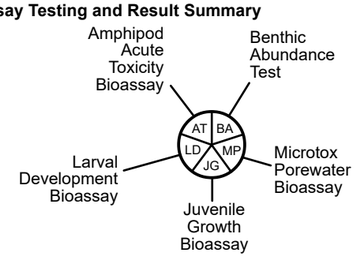
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Silver Results (Benthic)
Sediment Compliance Interval

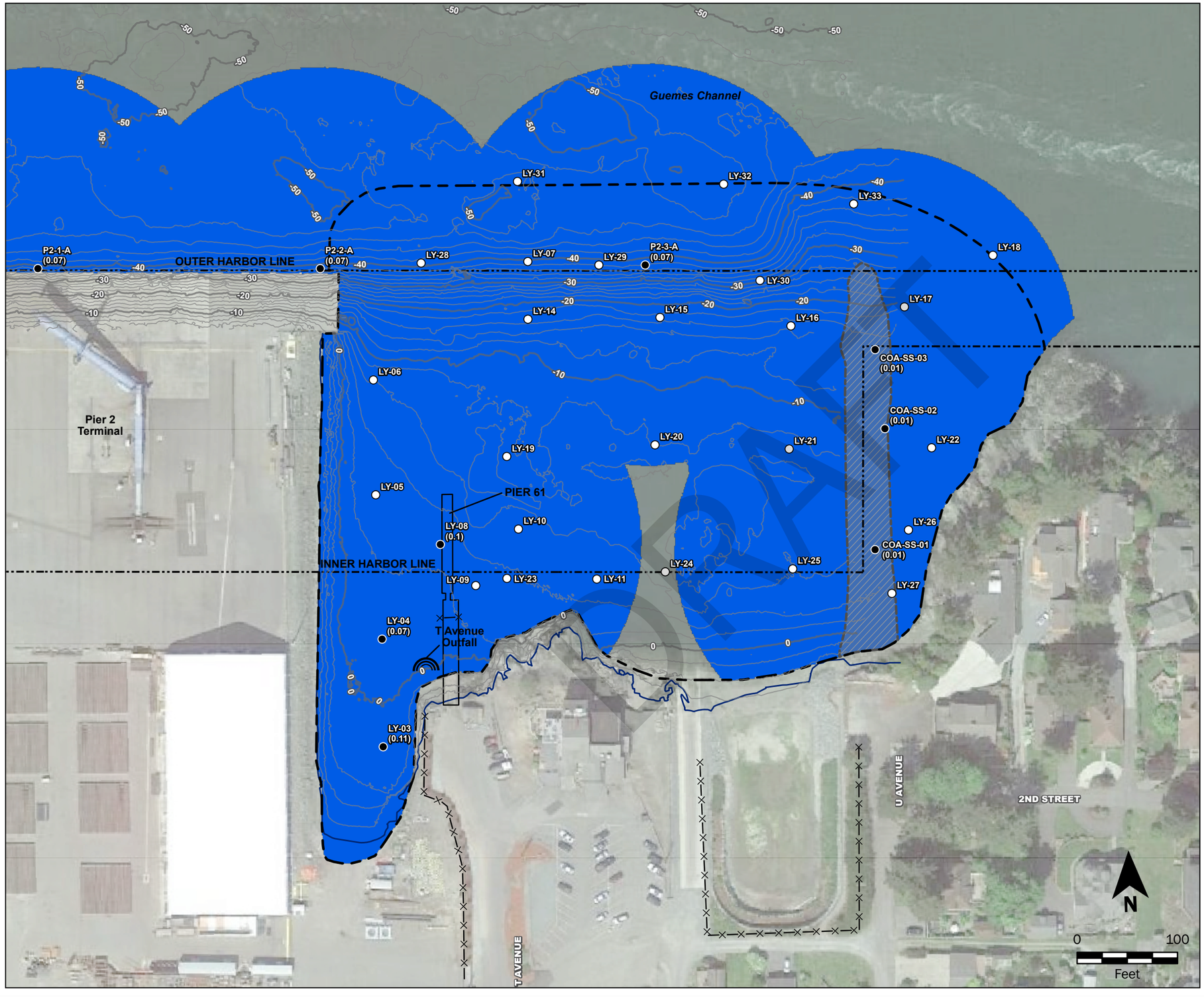
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 31

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

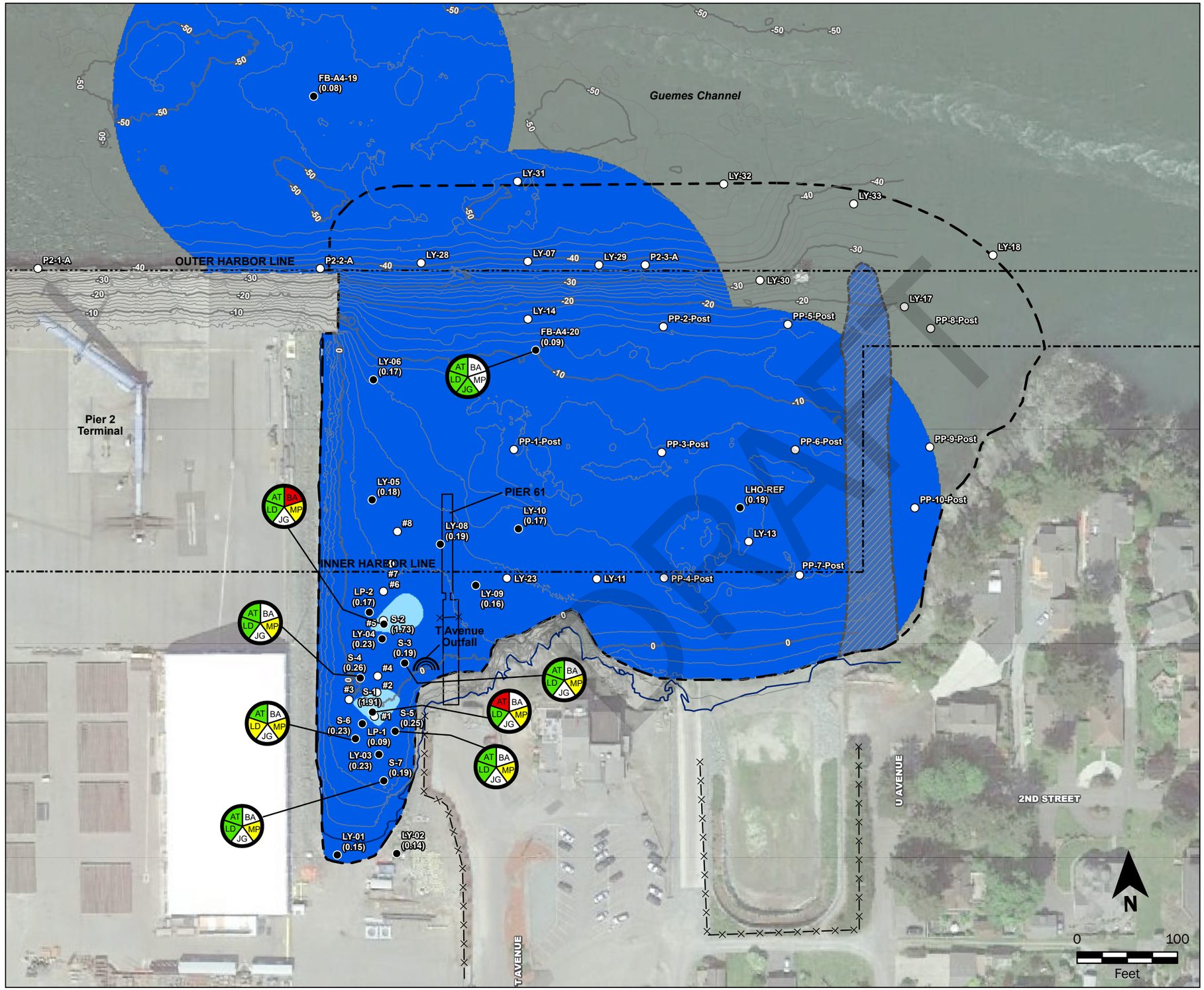
Silver Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 32

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F32_SilverResultsSubsurf Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

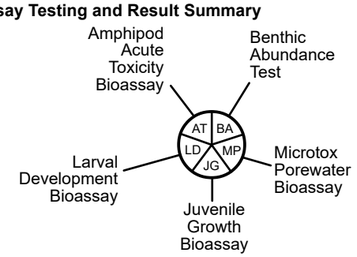
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

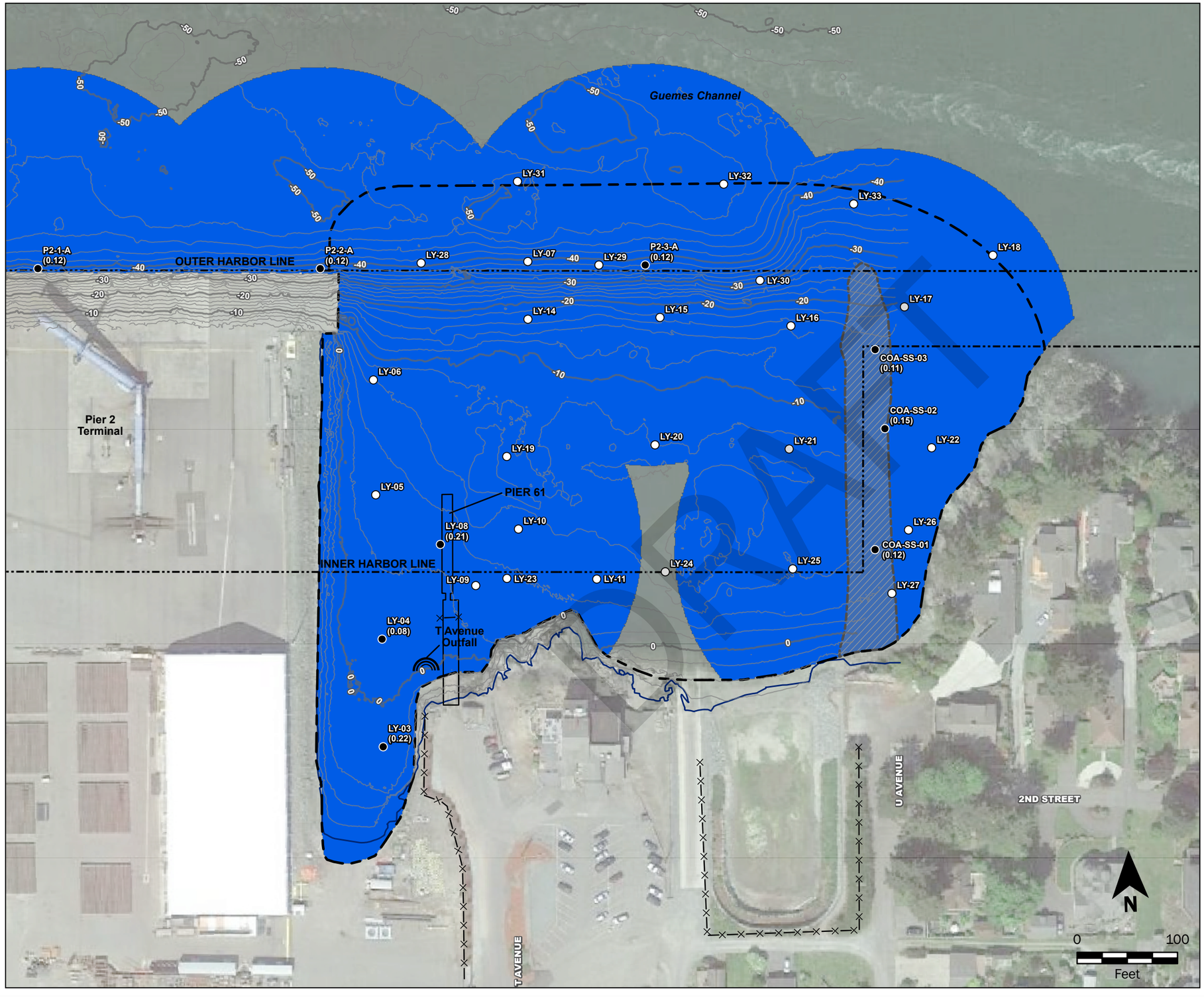
Zinc Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 33

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F33_ZincResultsPOC Date Exported: 12/29/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

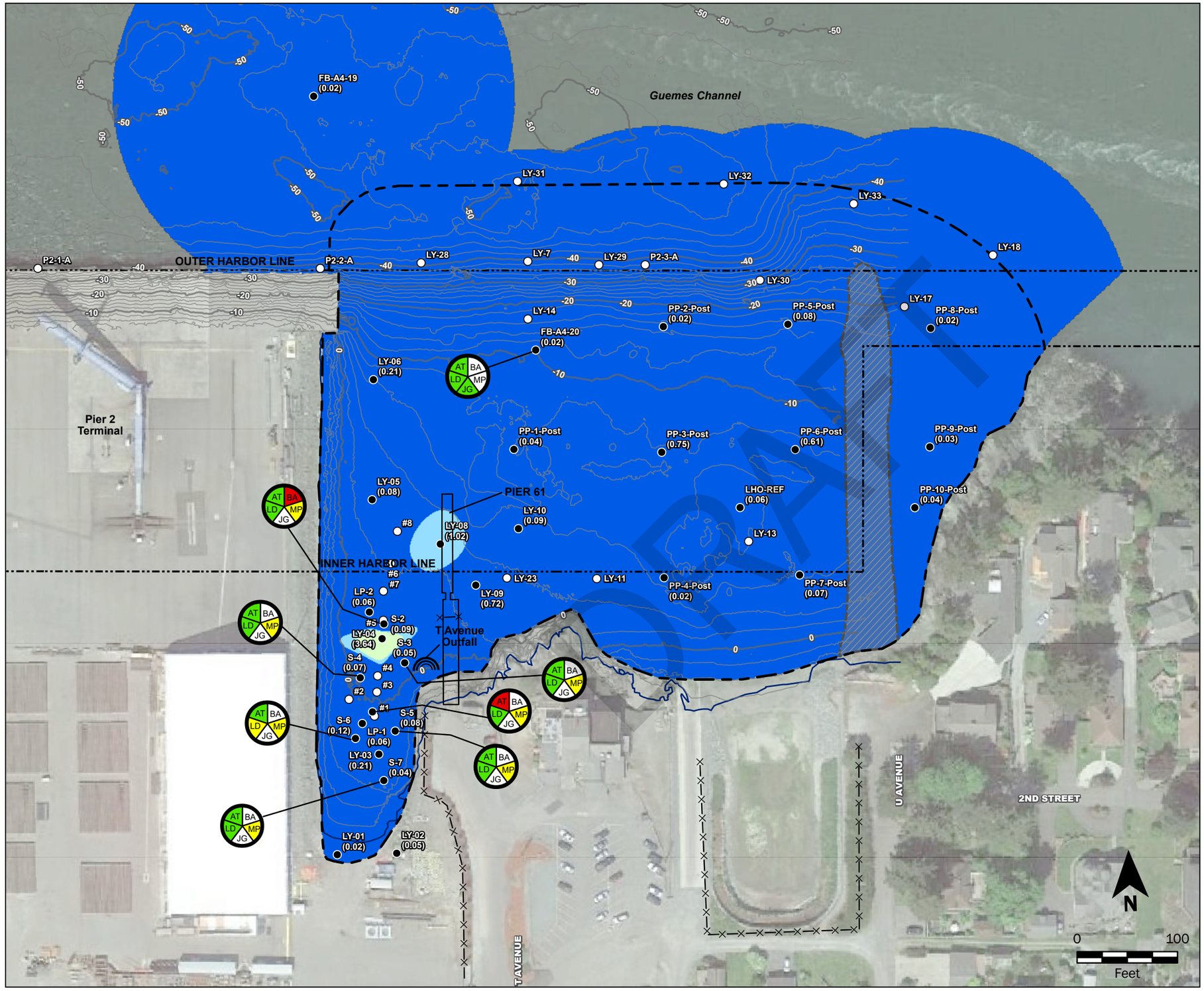
Zinc Results (Benthic)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 34

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

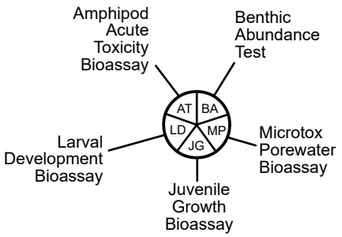
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

LPAH Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 35

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

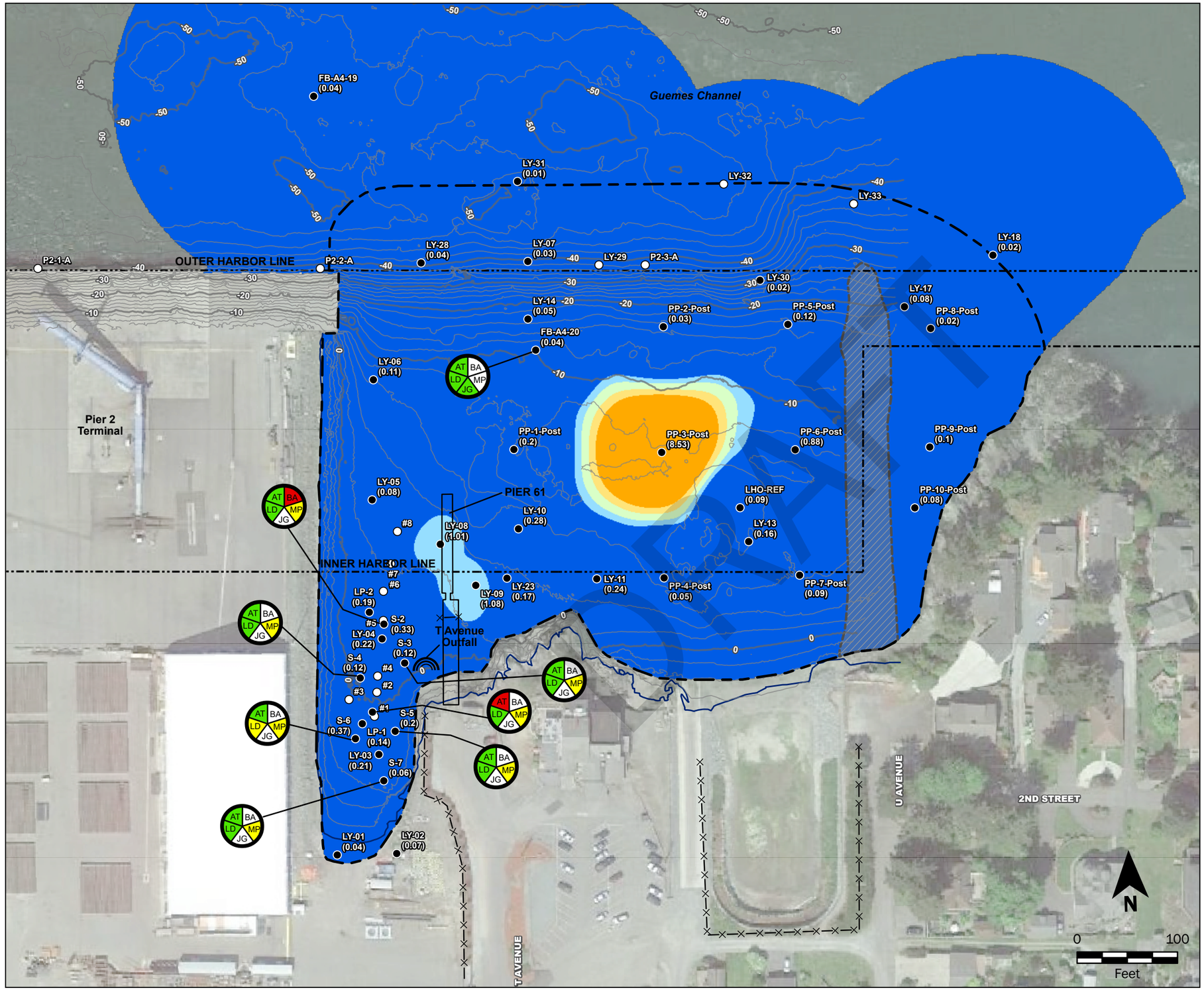
LPAH Results (Benthic)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 36

P:\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F36_LPAHSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

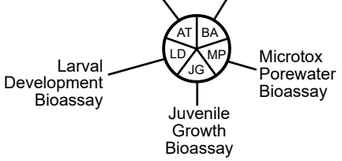
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



Meets SQS and CSL Criteria	Failure of CSL Criteria
Failure of SQS Criteria	No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

HPAH Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 37

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F37_HPAHPOC Date Exported: 12/30/25 by maugust

Guemes Channel

Pier 2 Terminal

OUTER HARBOR LINE

INNER HARBOR LINE

PIER 61

T Avenue Outfall

U AVENUE

T AVENUE

2ND STREET

LY-31 (0.02)
LY-32
LY-33
LY-18
P2-1-A (0.1)
P2-2-A (0.1)
LY-28 (0.18)
LY-07
LY-29
P2-3-A (0.1)
LY-30 (0.02)
LY-17 (0.46)
LY-14
LY-15
LY-16 (0.04)
LY-06 (0.07)
COA-SS-03 (0.09)
COA-SS-02 (0.09)
LY-22 (0.12)
LY-21 (0.09)
LY-20
LY-19
LY-05
LY-08 (2.06)
LY-10
LY-26
COA-SS-01 (0.09)
LY-25 (0.18)
LY-24
LY-11
LY-23 (0.18)
LY-09 (0.67)
LY-27
LY-04 (0.05)
LY-03 (0.71)

-50 -40 -30 -20 -10 0

N

0 100
Feet

Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

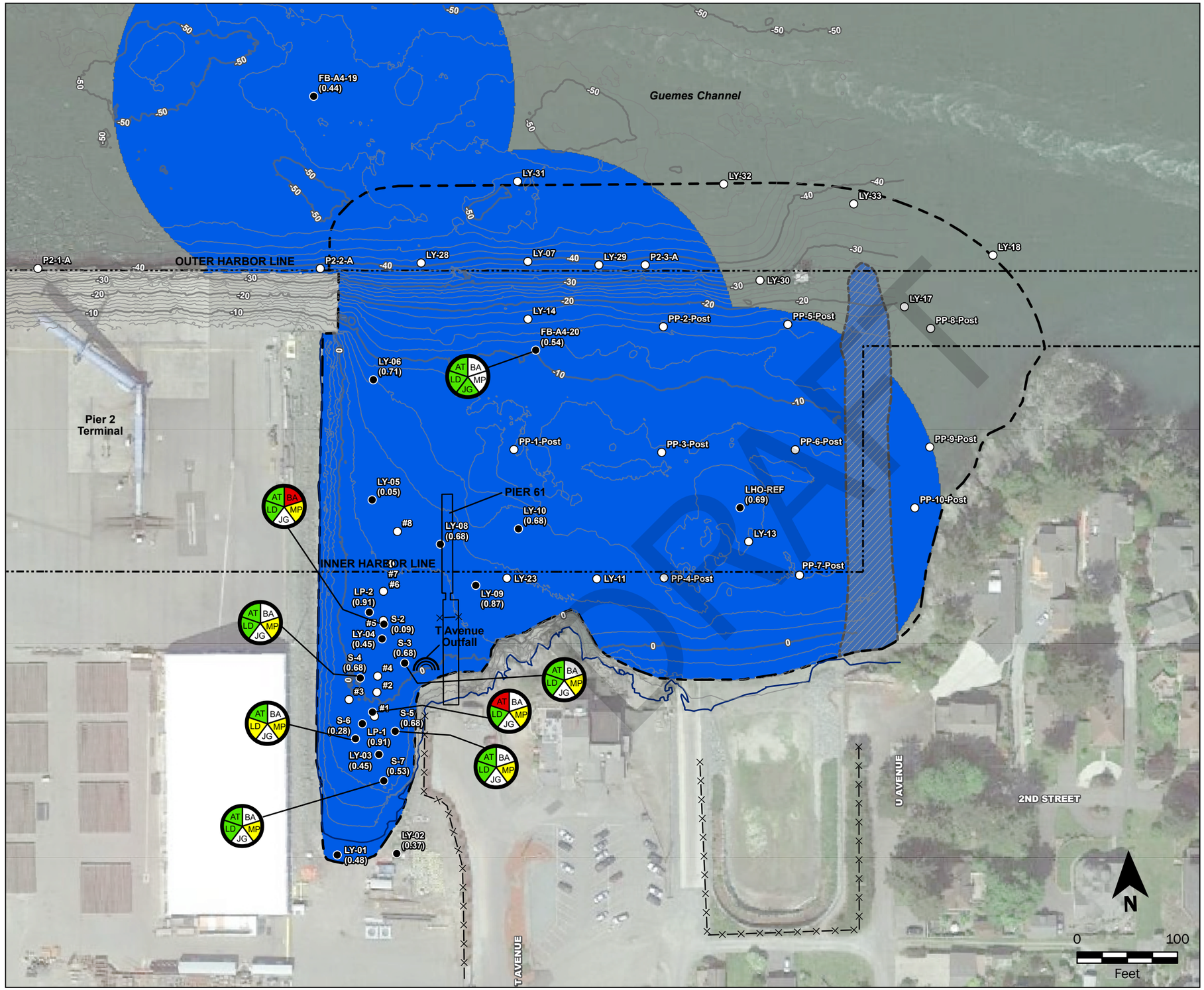
HPAH Results (Benthic)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 38

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F38_HPAHSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

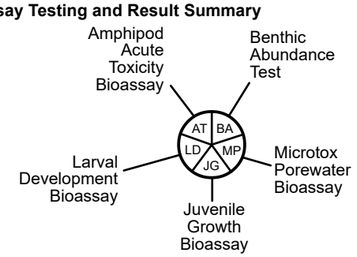
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Chlorinated Hydrocarbon Results (Benthic) Sediment Compliance Interval

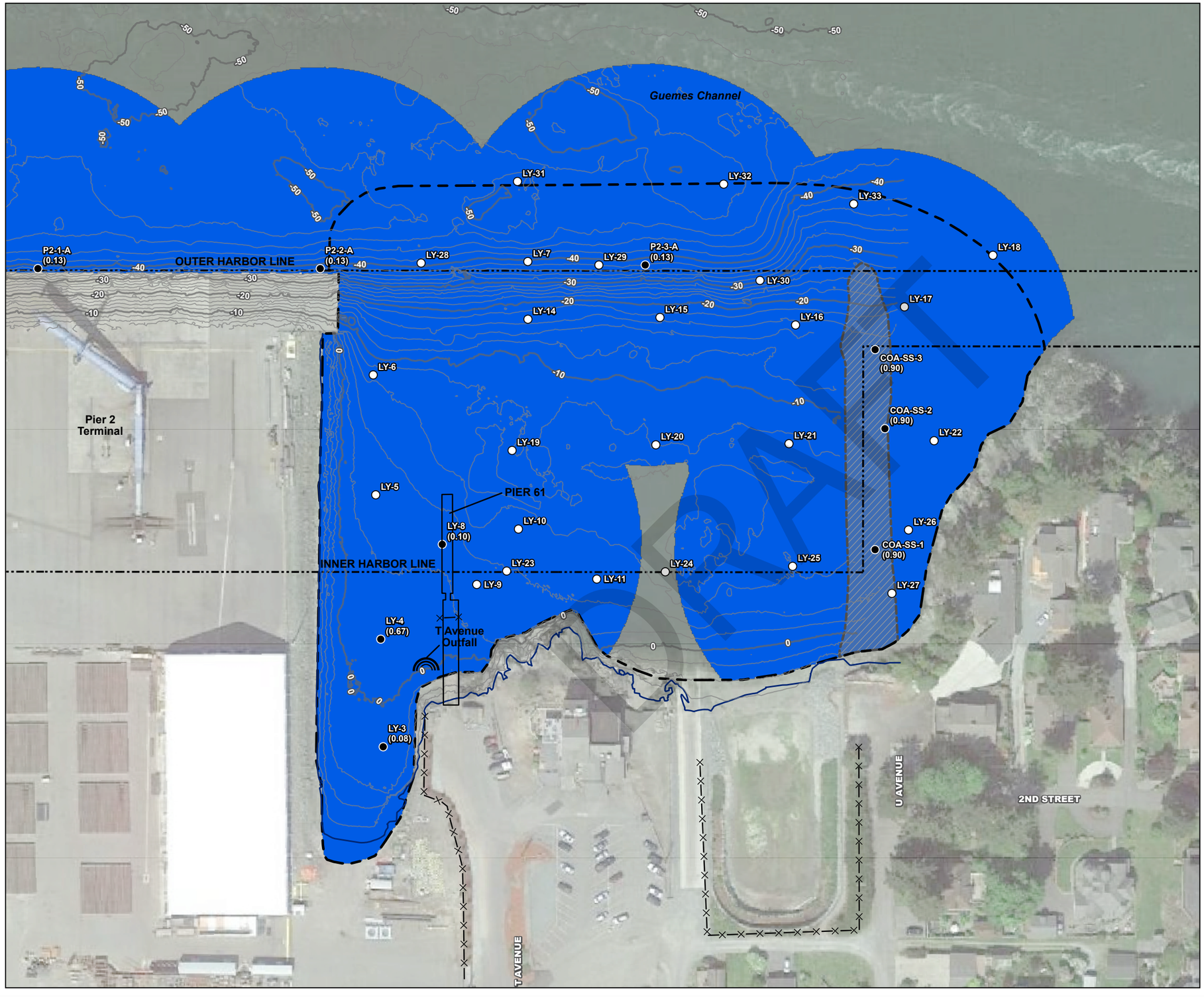
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 39

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F39_ChlorinatedHydrocarbonsPOC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

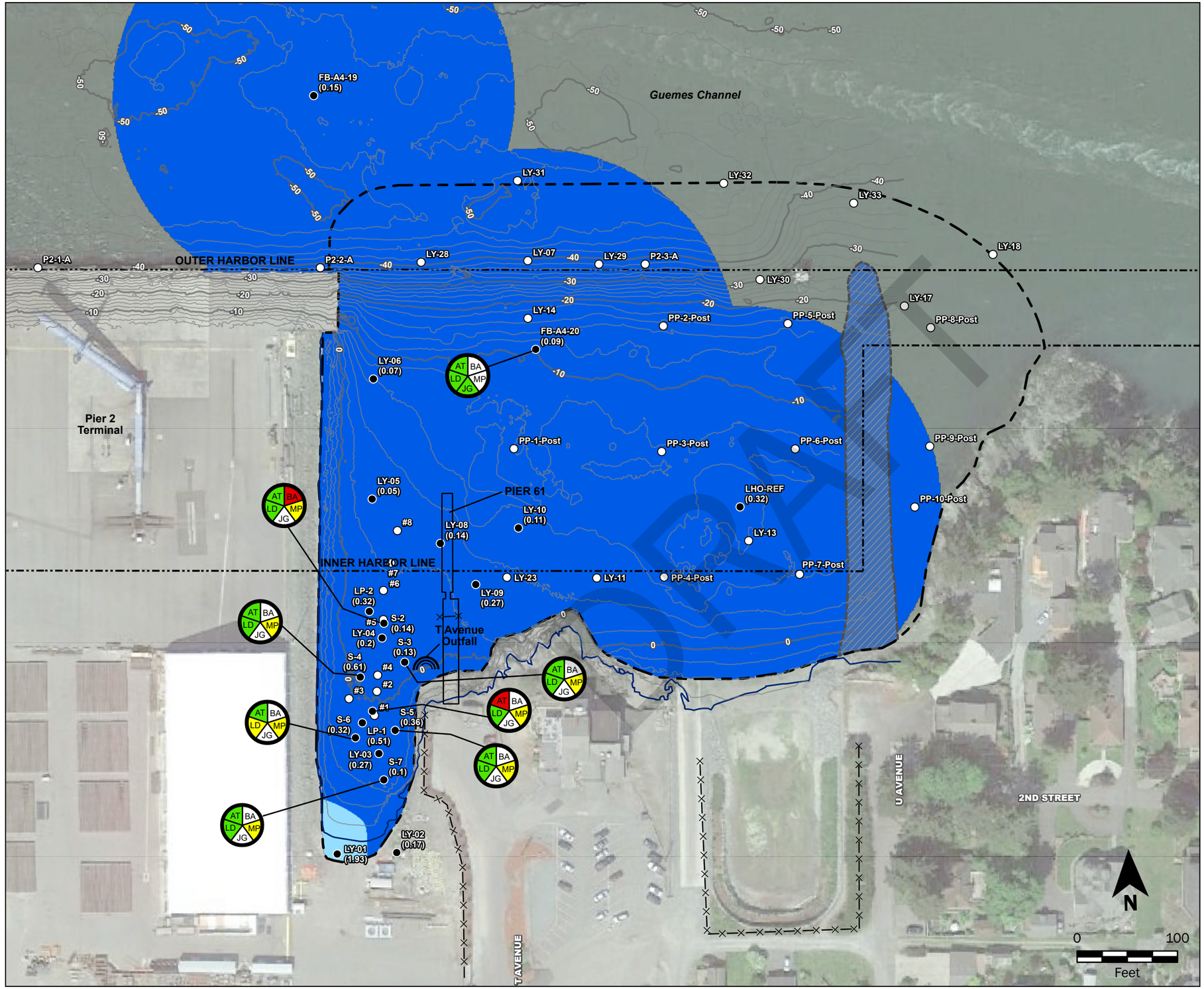
Chlorinated Hydrocarbon Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 40

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016O8_F40_ChloronatedHydrocarbonsSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

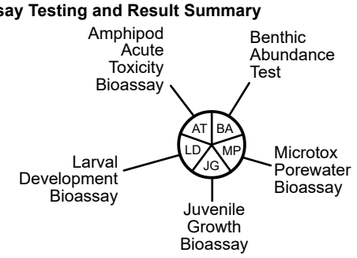
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Phthalate Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 41

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F41_PhthalatePOC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

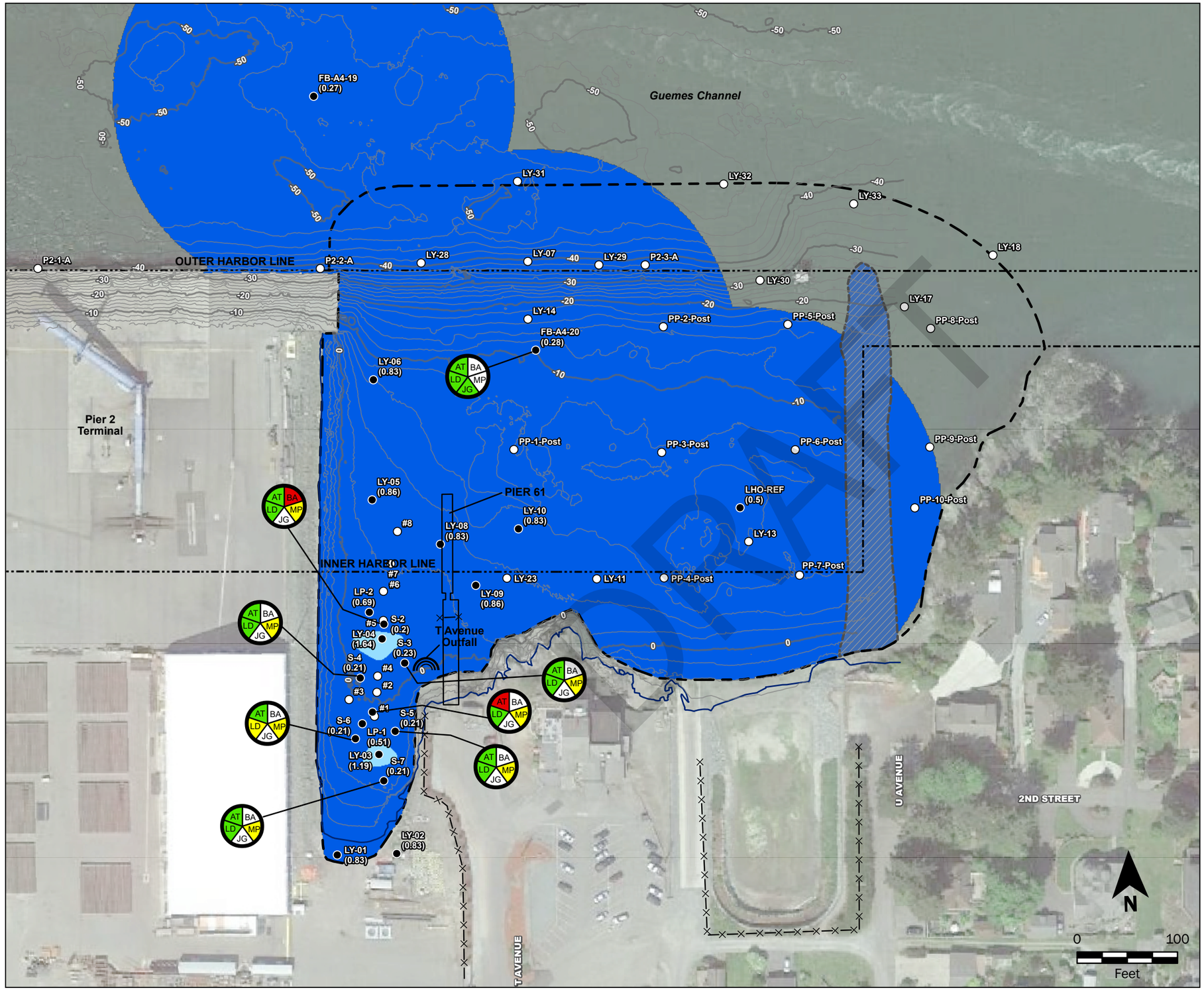
Phthalate Results (Benthic)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 42

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F42_PhthalateSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

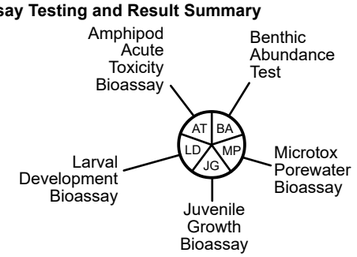
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Phenol Results (Benthic)
Sediment Compliance Interval

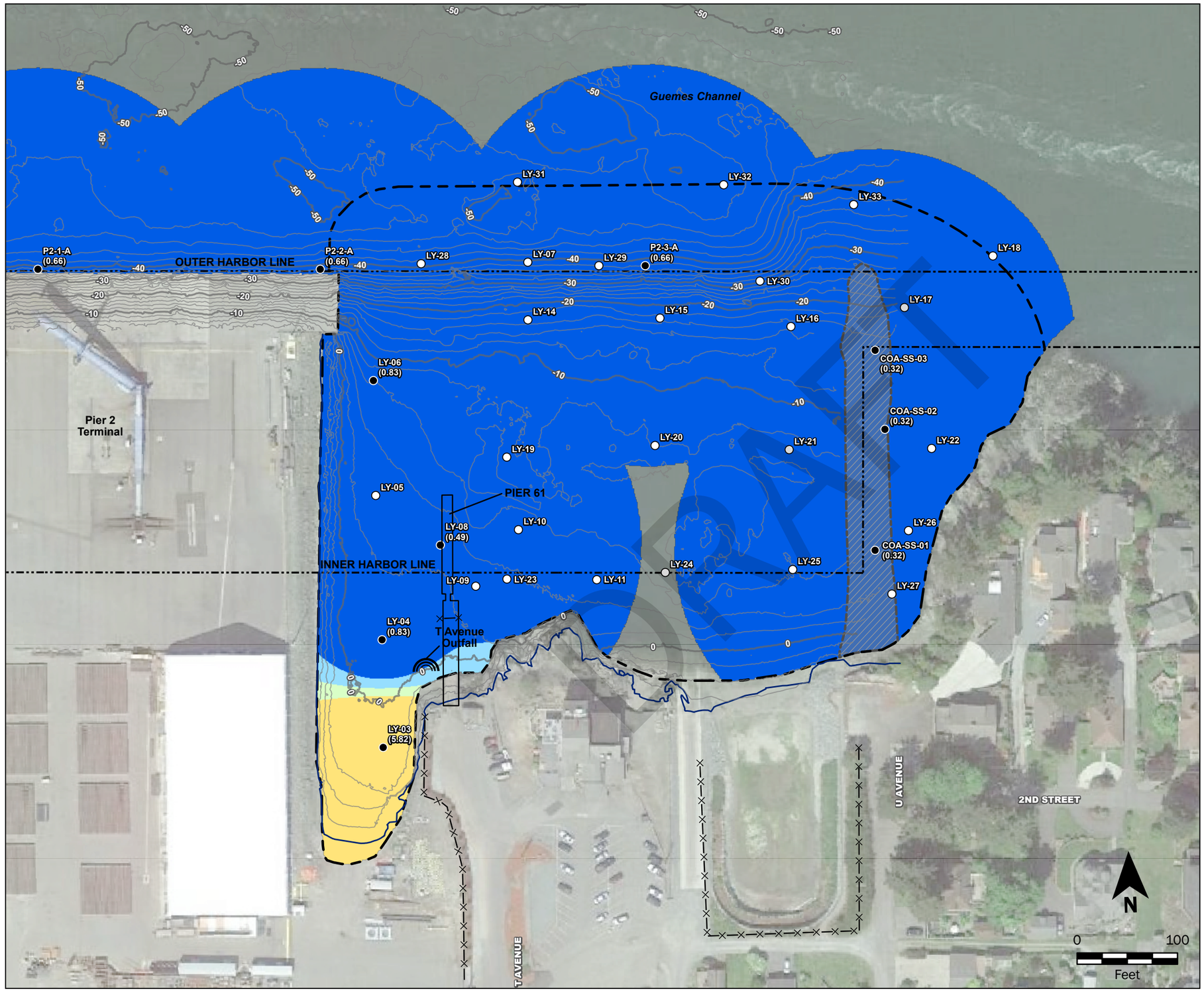
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 43

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P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F43_PhenolPOC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

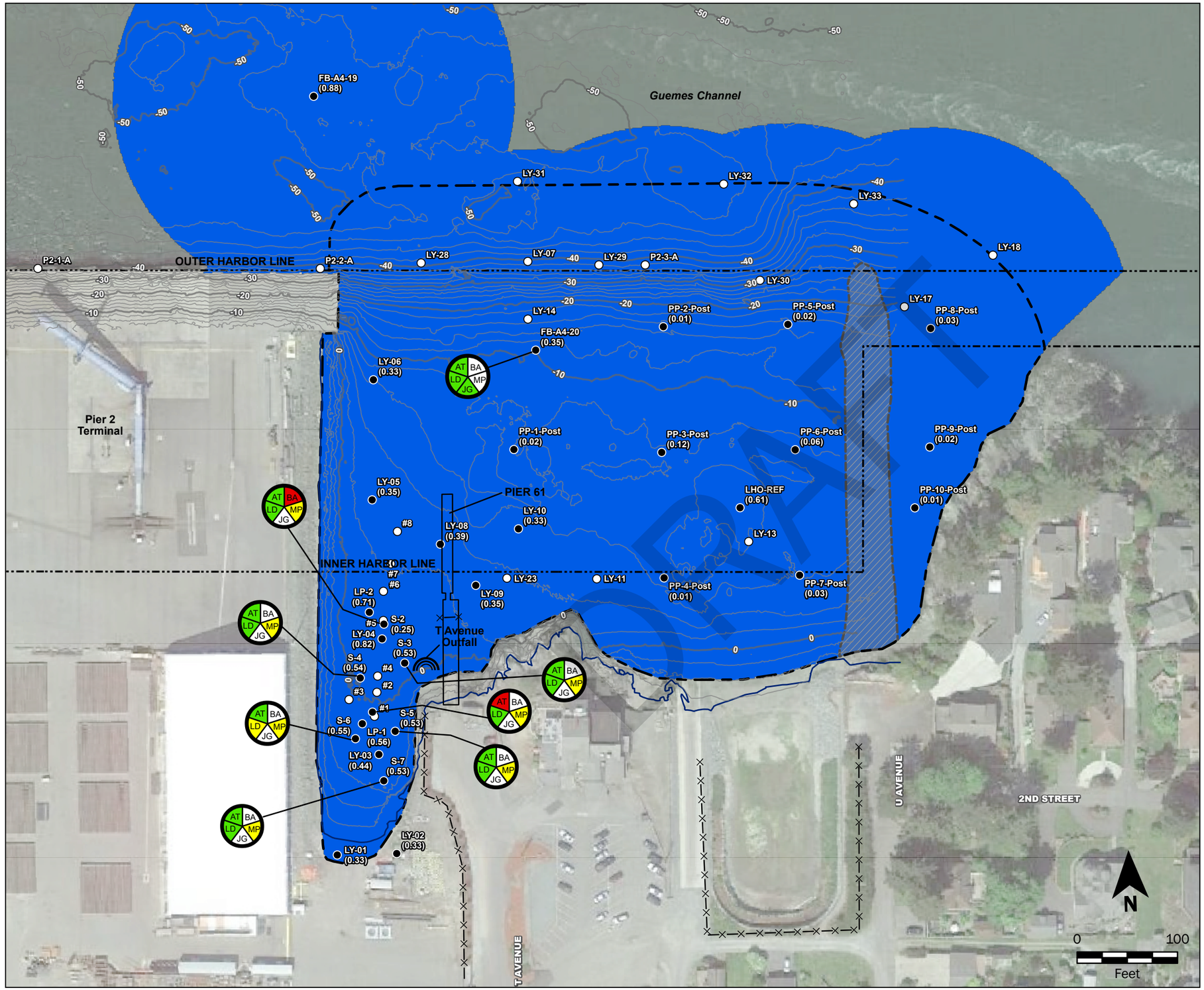
Phenol Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 44

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F44_PhenolSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

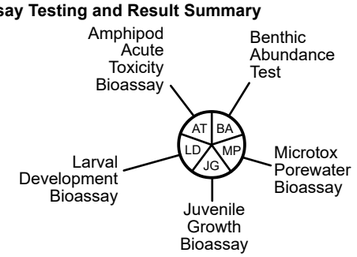
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

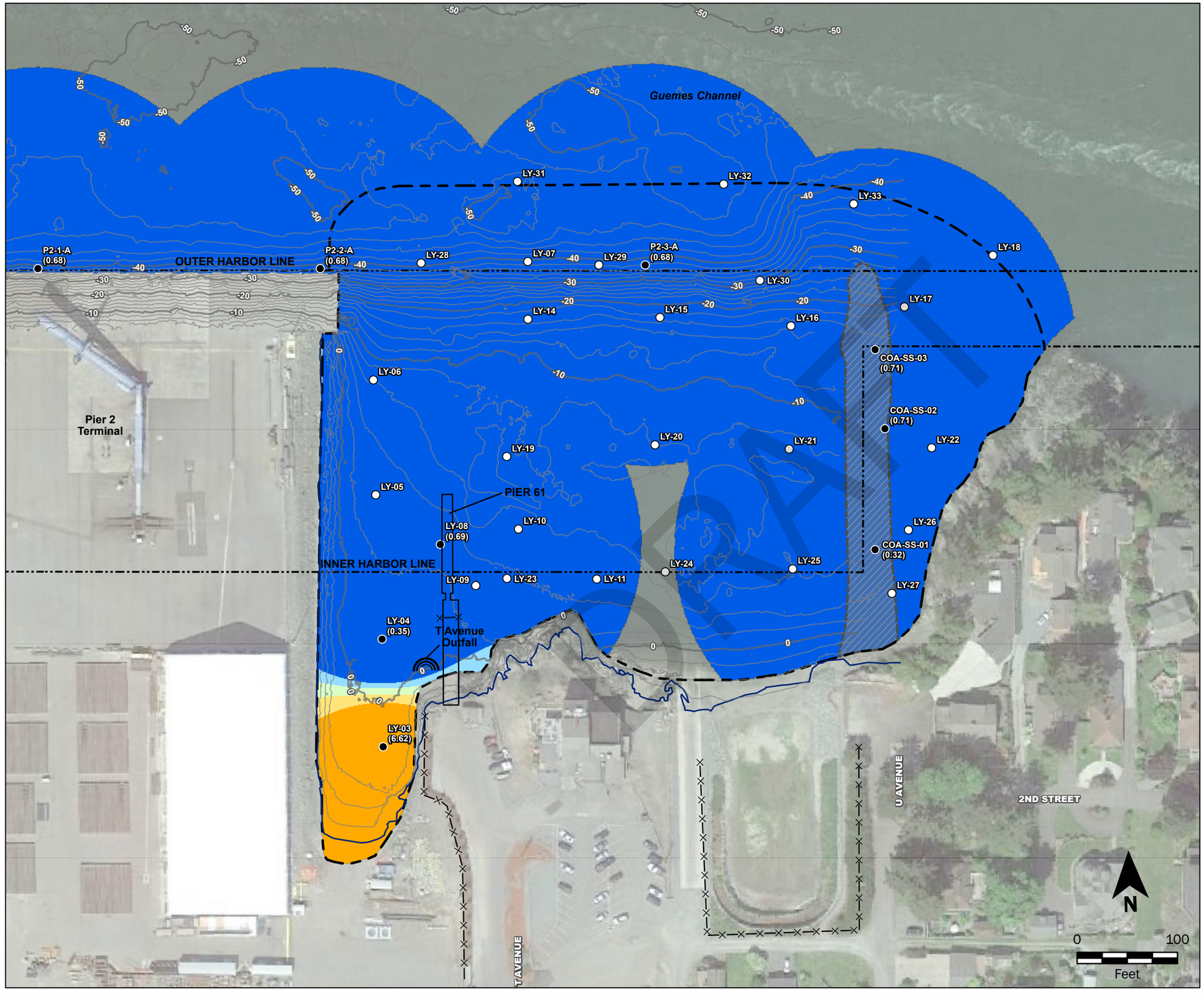
Miscellaneous Extractable Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 45

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F45_MiscExtractablesPOC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

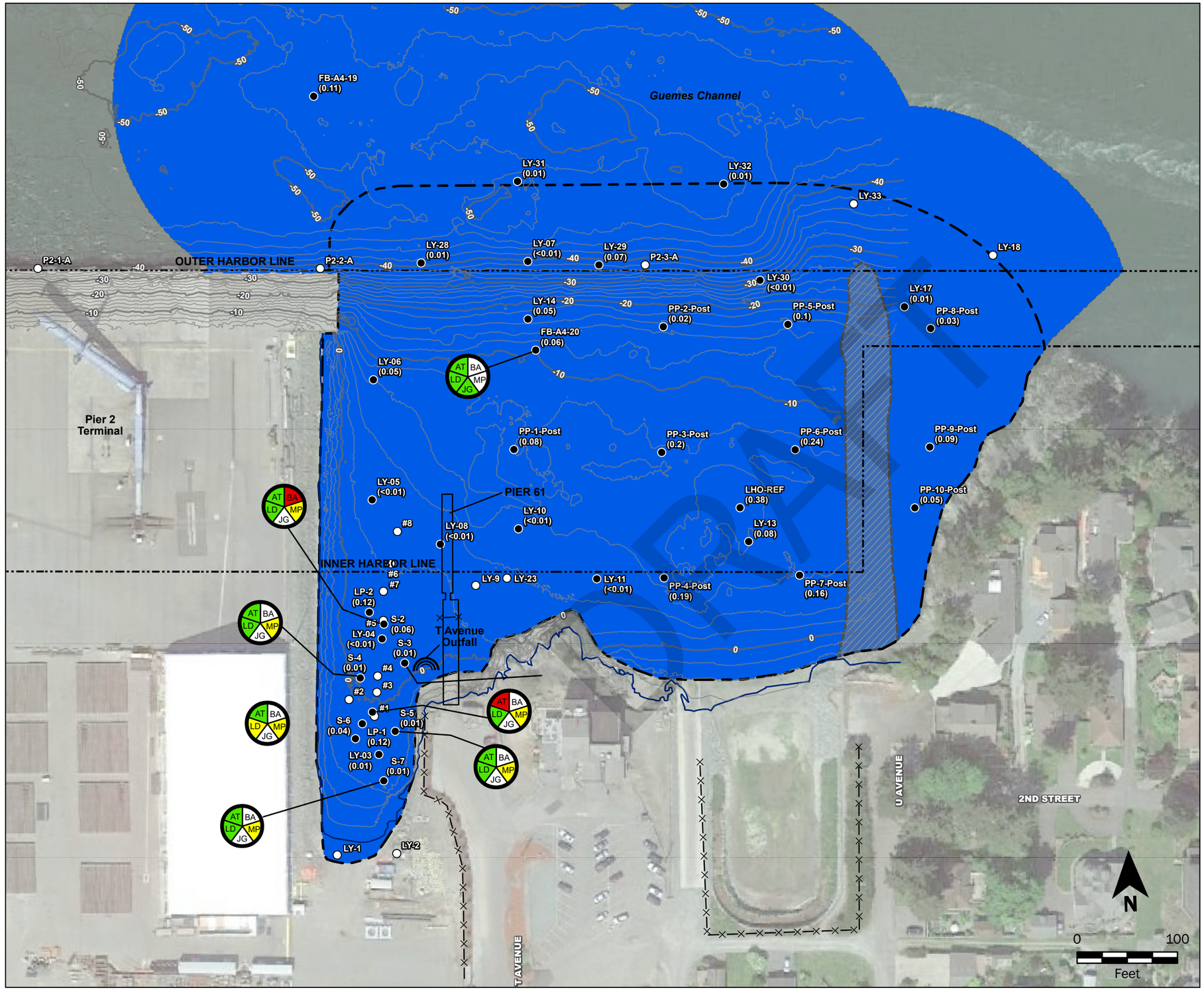
Miscellaneous Extractable Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 46

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016\08_F46_MiscExtractablesSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

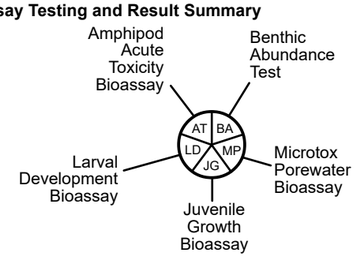
*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

Bioassay Testing and Result Summary



- Meets SQS and CSL Criteria
- Failure of CSL Criteria
- Failure of SQS Criteria
- No Result

ft = Feet
SQS = Sediment Quality Objective
CSL = Cleanup Screening Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

PCB Results (Benthic)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 47

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F47_PCBPOC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

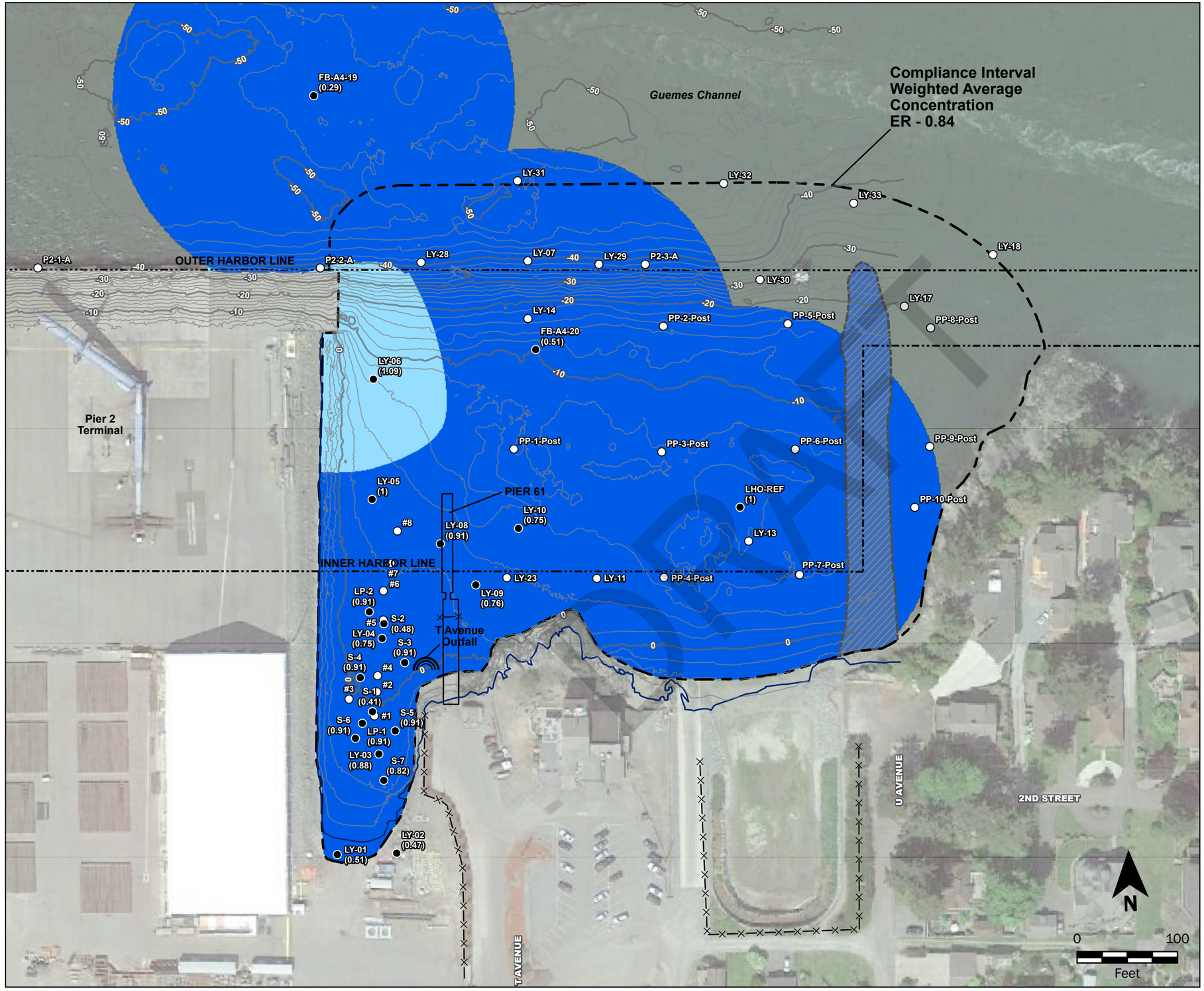
PCB Results (Benthic) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 48

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F48_PCBSubsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Arsenic Results (Human Health)
Sediment Compliance Interval

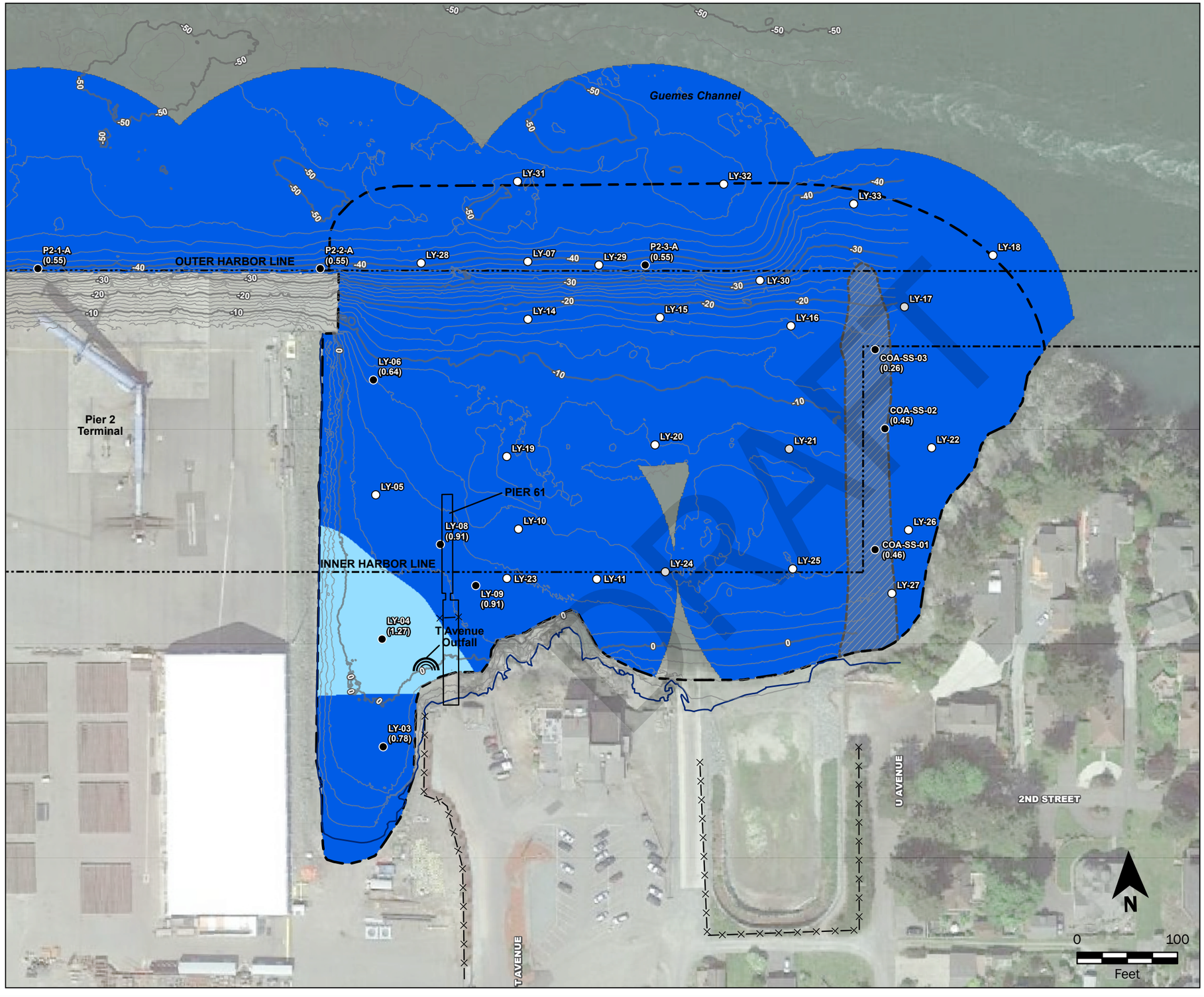
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 49

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F49_Arsenic_HH_POC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

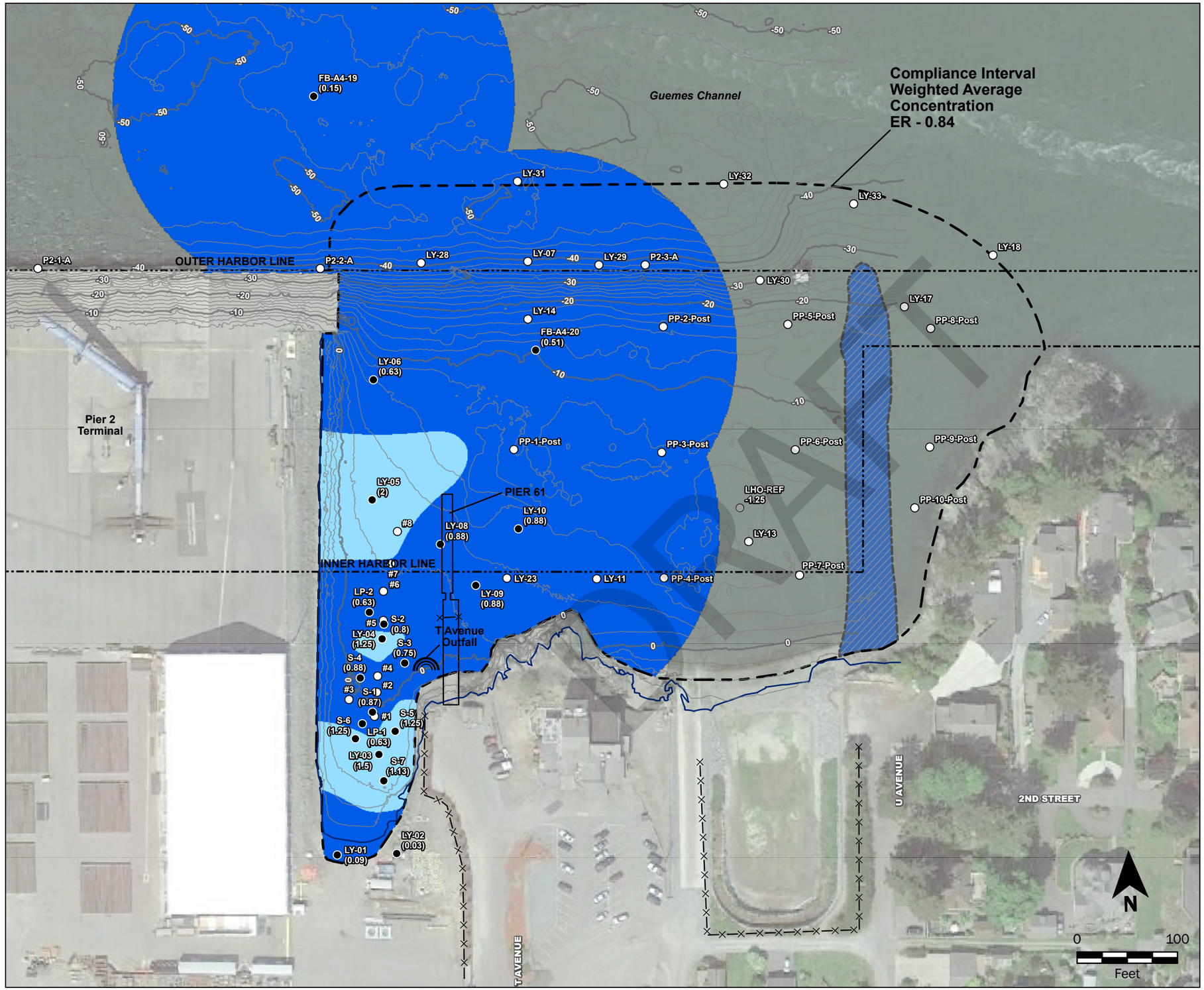
Arsenic Results (Human Health)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 50

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F50_Arsenic_HH_Subsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Sample Location - Non-Detect Result Greater than Proposed Cleanup Level (PCUL)
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) (denoted as a negative result) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Cadmium Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 51

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016B_F51_Cadmium_HH_POC Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

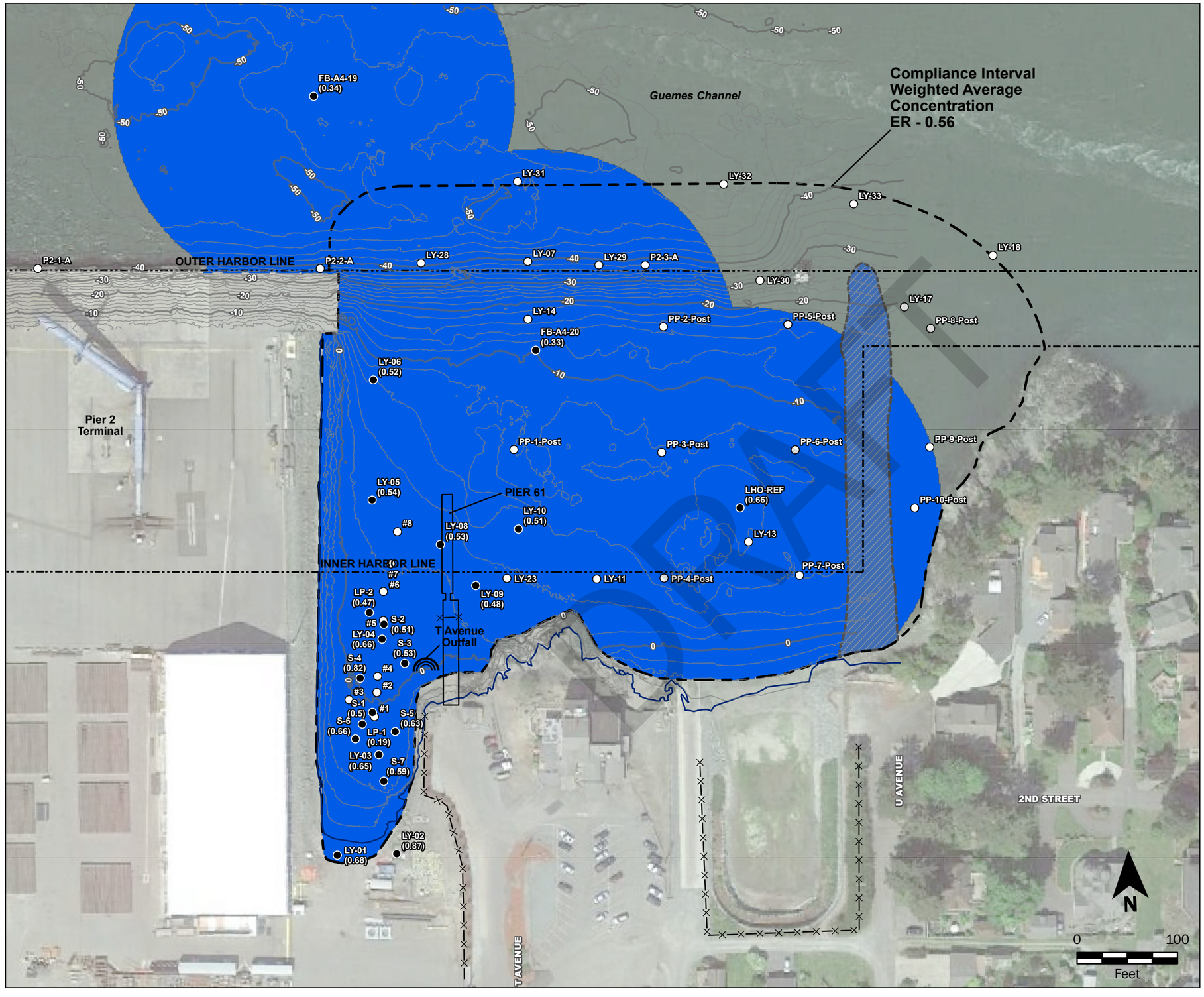
Cadmium Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 52

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F52_Cadmium_HH_Subsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

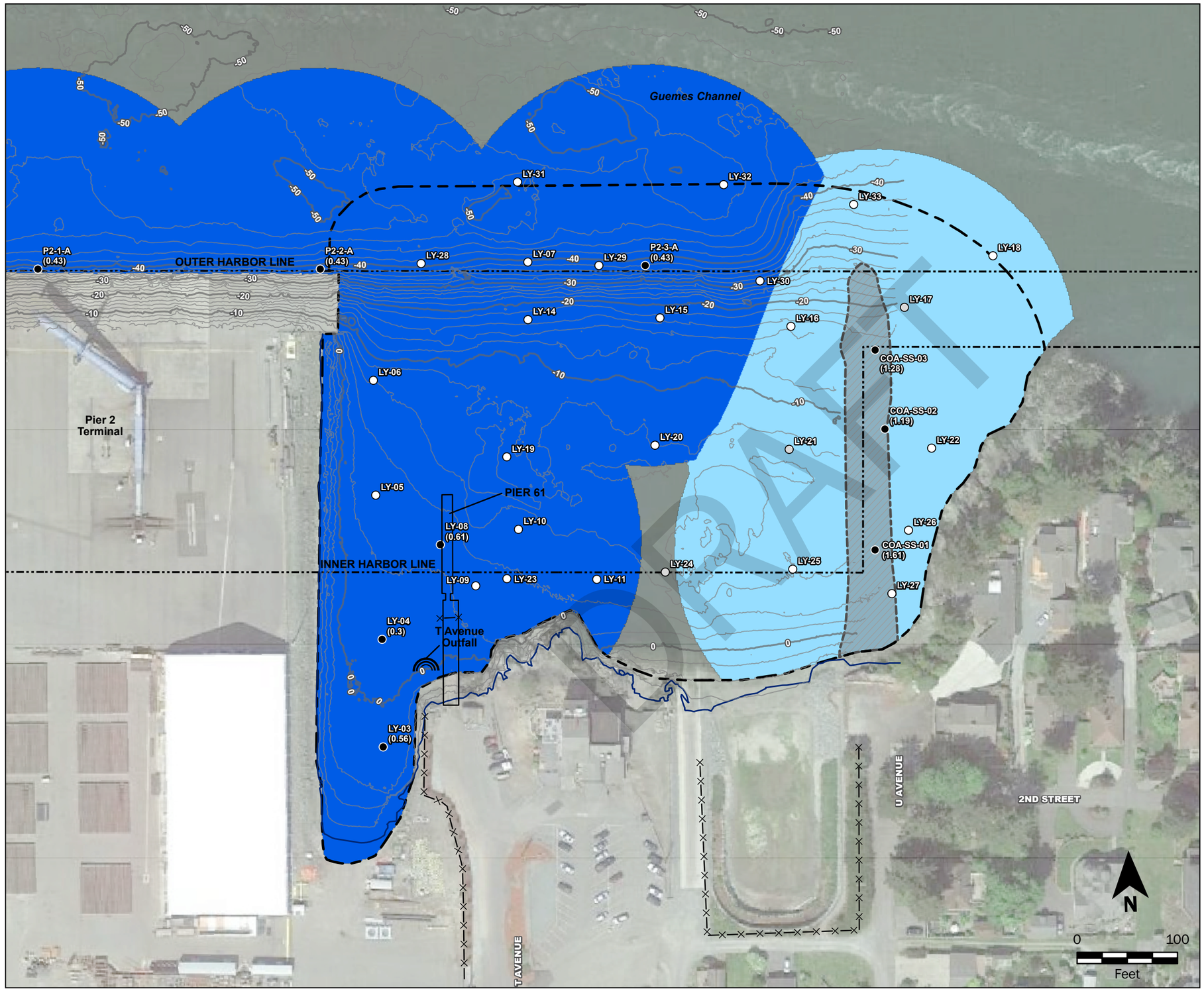
Chromium Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 53

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F53_Chromium_HH_POC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Chromium Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 54

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Compliance Interval
Weighted Average
Concentration
ER - 1.29

Guemes Channel

OUTER HARBOR LINE

INNER HARBOR LINE

Pier 2
Terminal

PIER 61

T Avenue
Outfall

T AVENUE

U AVENUE

2ND STREET

FB-A4-19 (0.34)
LY-31
LY-32
LY-33
LY-18
P2-1-A
P2-2-A
LY-28
LY-07
LY-29
P2-3-A
LY-30
LY-17
LY-14
PP-2-Post
PP-5-Post
PP-8-Post
FB-A4-20 (0.28)
LY-06 (0.7)
PP-1-Post
PP-3-Post
PP-6-Post
PP-9-Post
LY-05 (0.67)
LHO-REF (2.67)
LY-10 (0.49)
LY-08 (0.57)
LY-13
PP-10-Post
#8
#7
#6
LP-2 (0.7)
LY-23
LY-11
PP-4-Post
PP-7-Post
LY-09 (0.6)
#5
S-2 (0.66)
LY-04 (0.75)
S-3 (0.91)
S-4 (5.51)
#4
#3
#2
S-1 (0.63)
#1
S-5 (0.85)
S-6 (0.88)
LP-1 (0.38)
LY-03 (0.82)
S-7 (0.75)
LY-02 (0.94)
LY-01 (0.38)

-50 -40 -30 -20 -10 0

N

0 100
Feet

Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

**Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio****

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

**Copper Results (Human Health)
Sediment Compliance Interval**

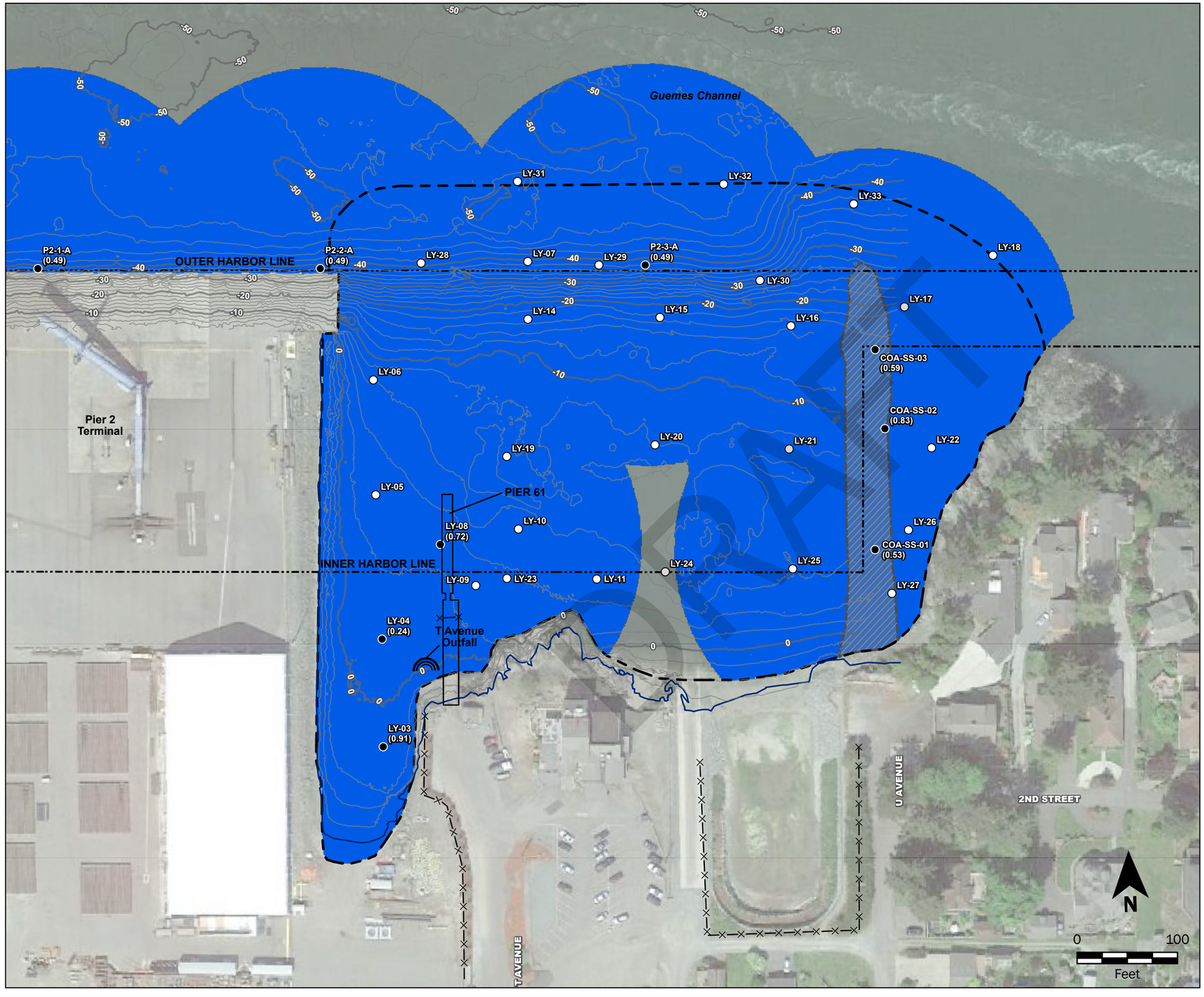
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 55

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F55_Copper_HH_POC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

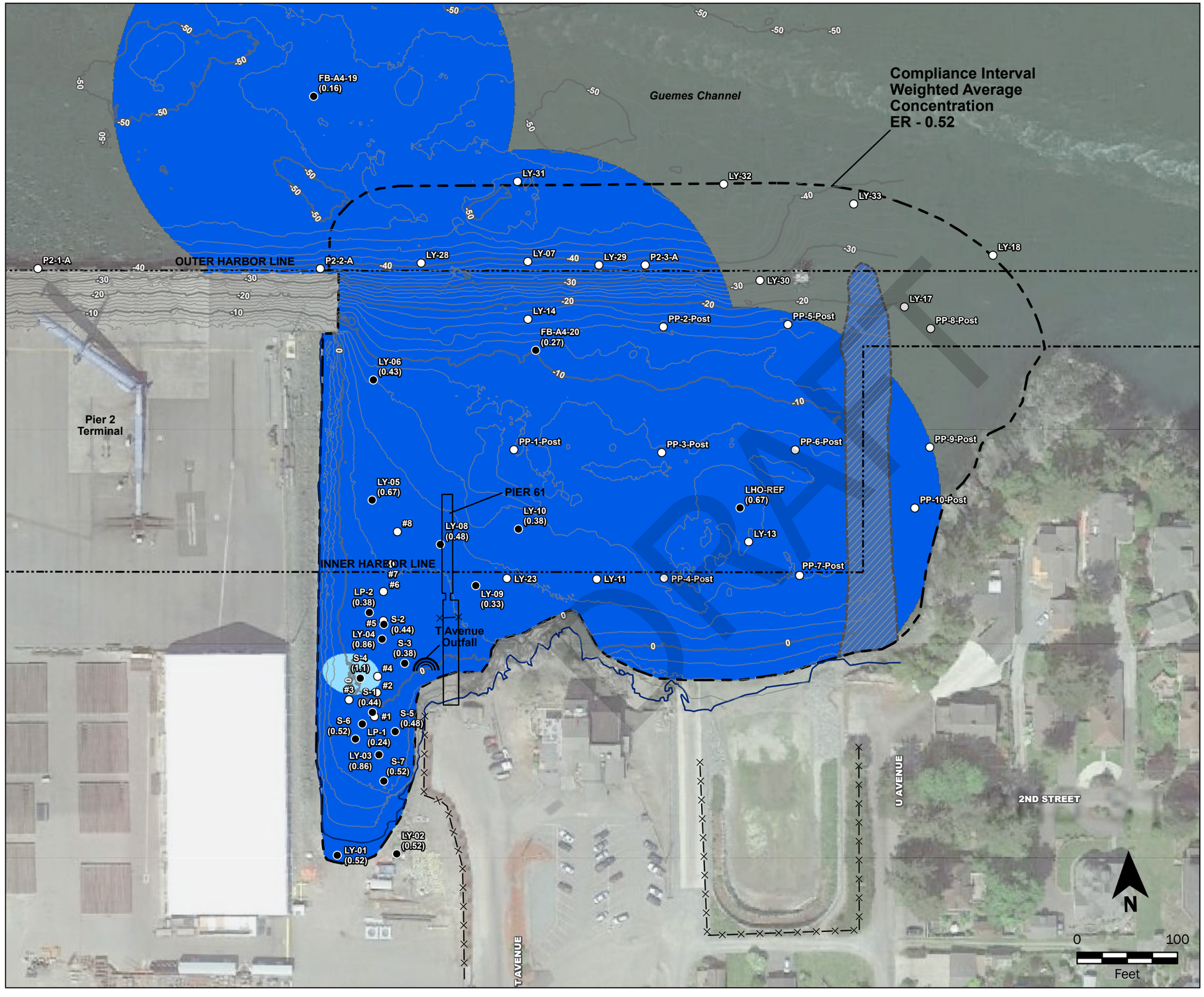
Copper Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 56

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016008_F56_Copper_HH_Subsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

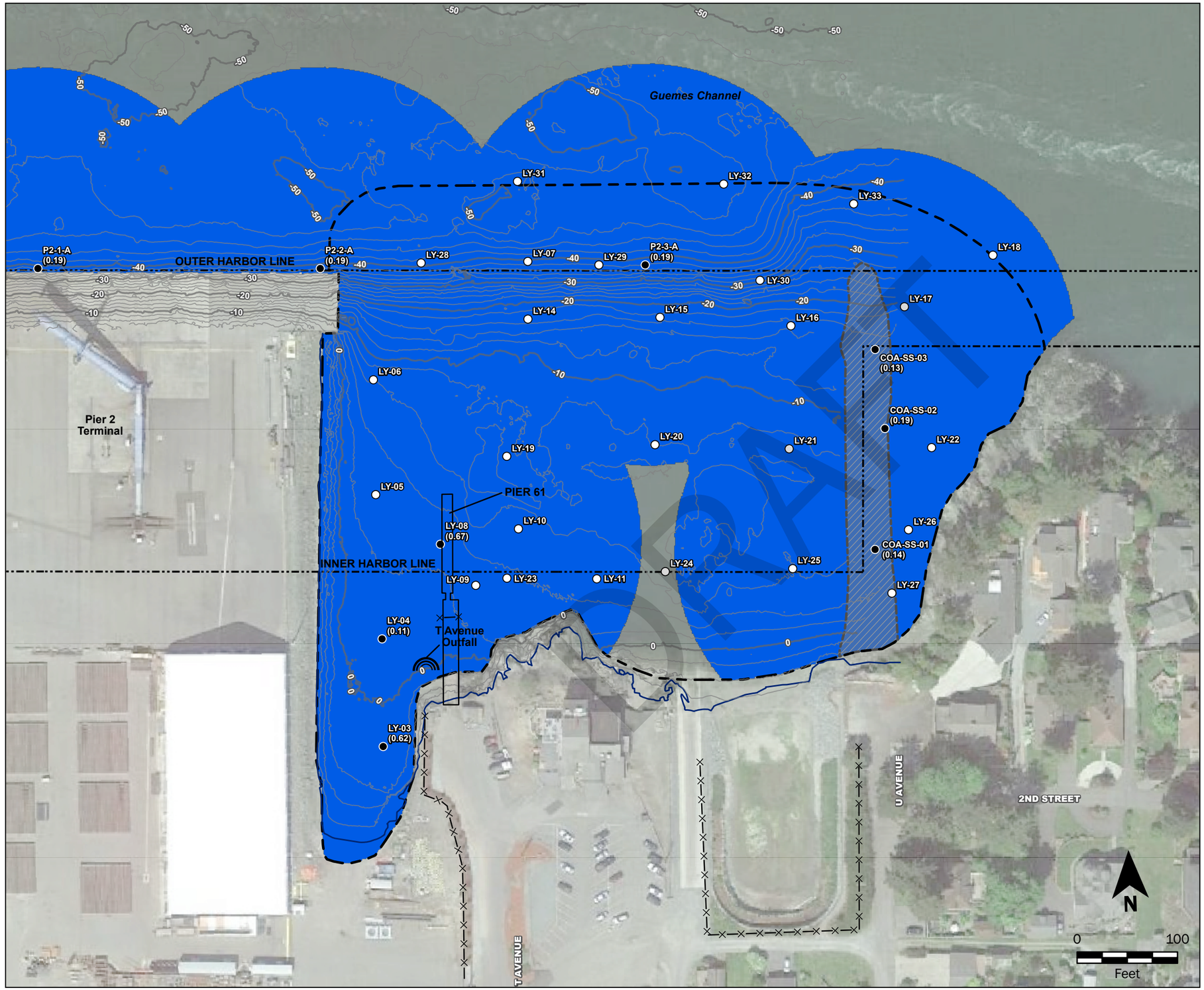
Lead Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 57

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F57_Lead_HH_POC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

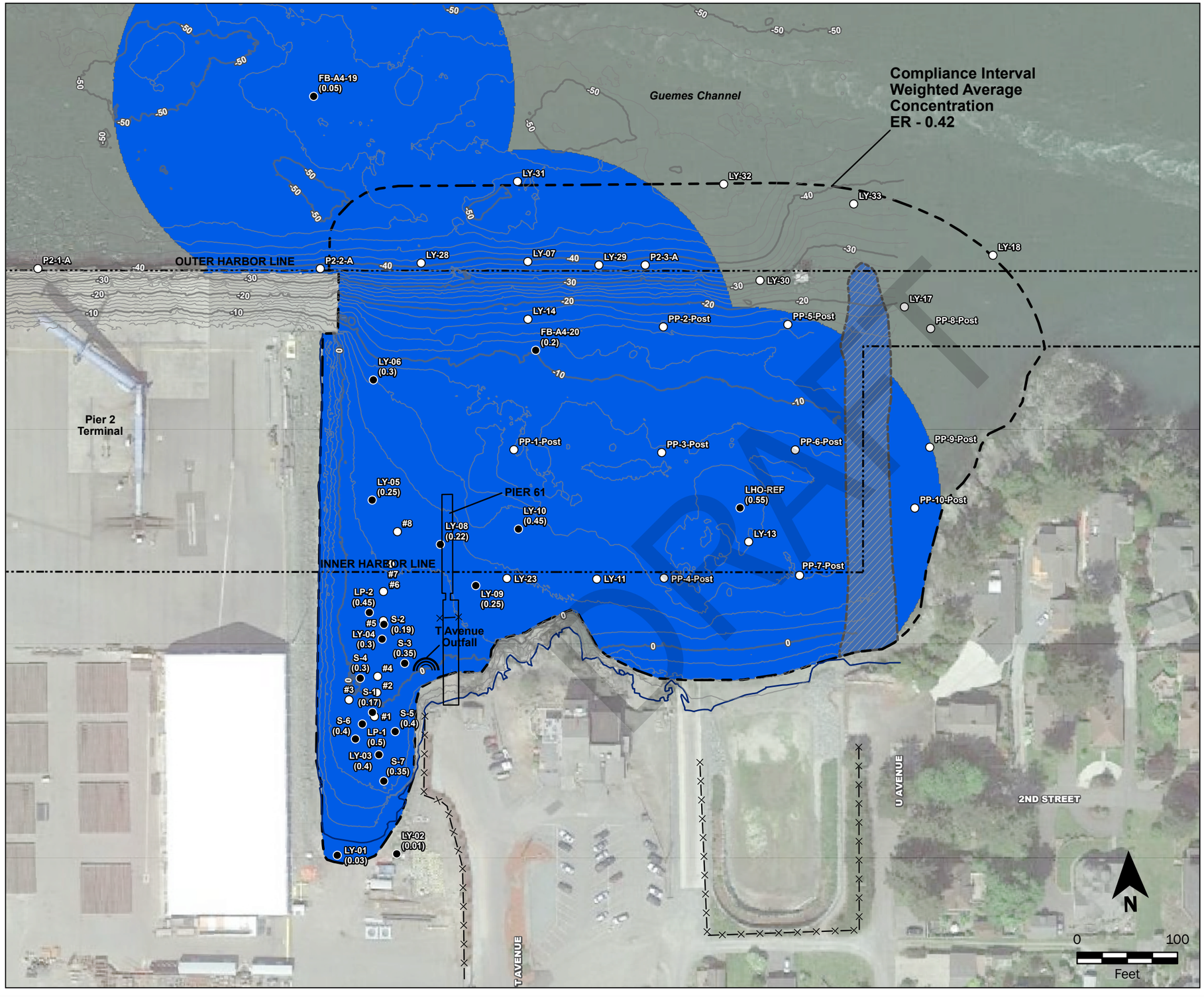
Lead Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 58

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F58_Lead_HH_Subsurf Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

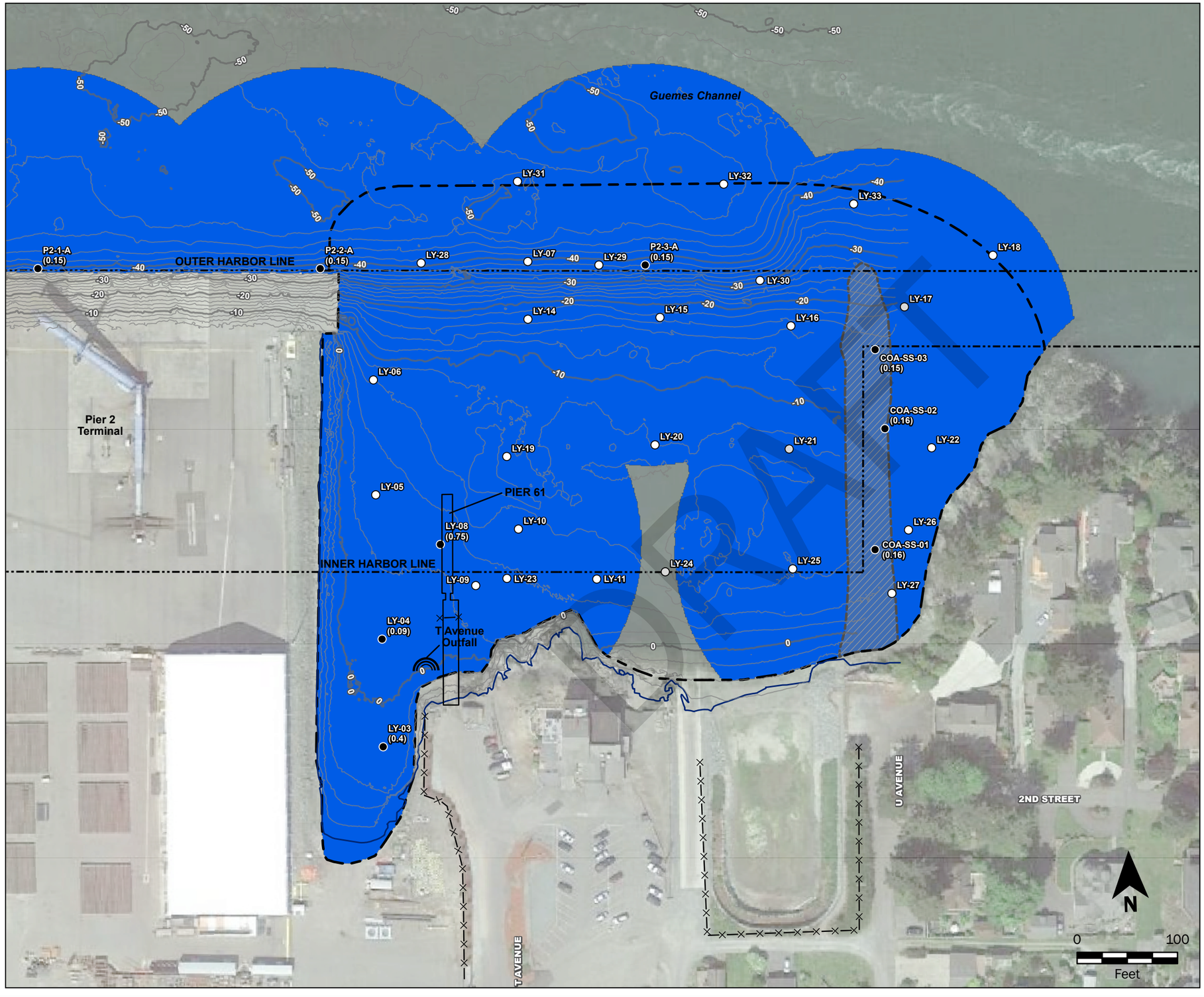
Mercury Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 59

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F59_Mercury_HH_POC Date Exported: 12/30/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

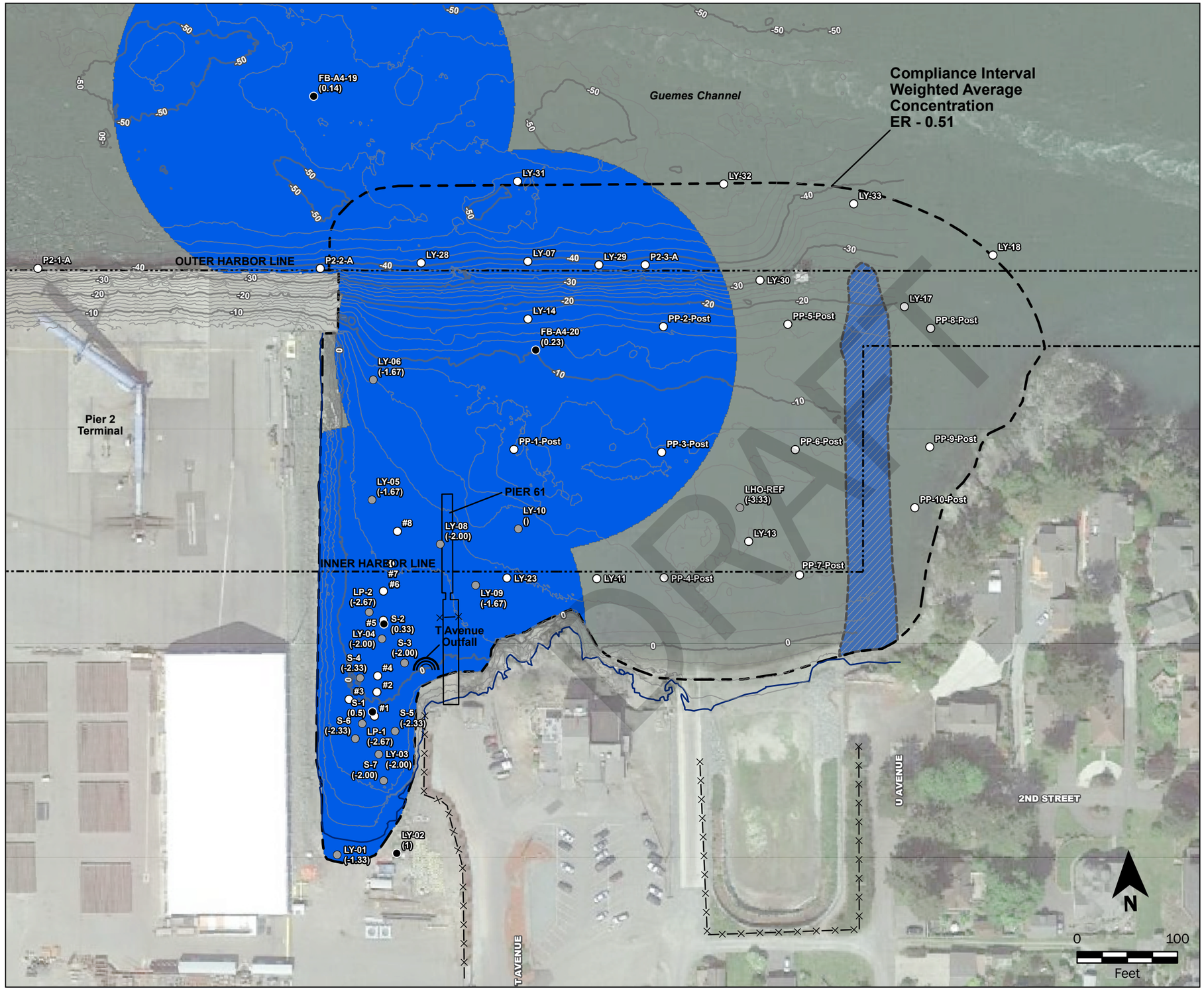
Mercury Results (Human Health)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 60

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Sample Location - Non-Detect Result Greater than Proposed Cleanup Level (PCUL)
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) (denoted as a negative result) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Silver Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 61

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Sample Location - Non-Detect Result Greater than Proposed Cleanup Level (PCUL)
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Silver Results (Human Health)
Subsurface Sediment

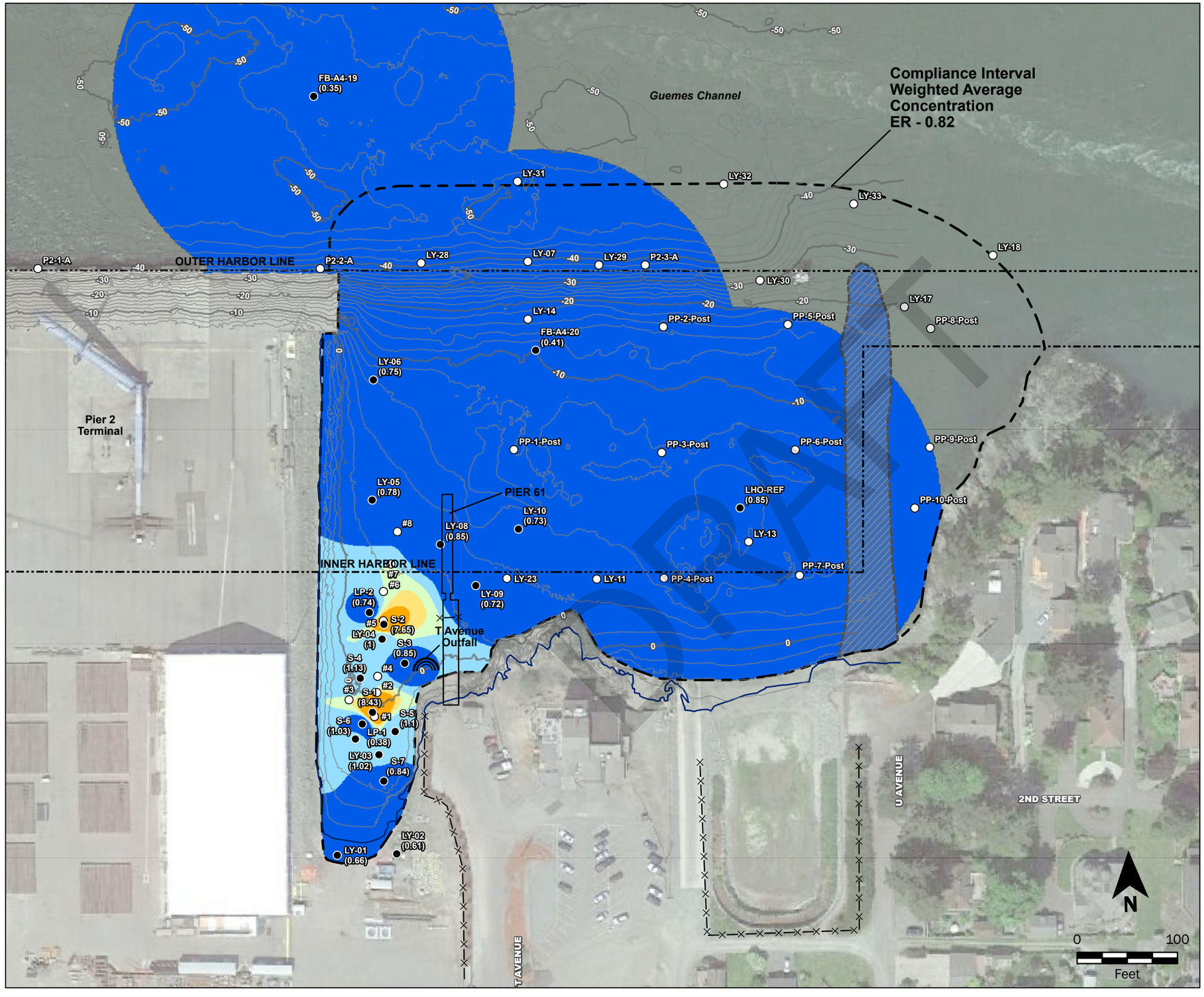
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 62

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Zinc Results (Human Health)
Sediment Compliance Interval

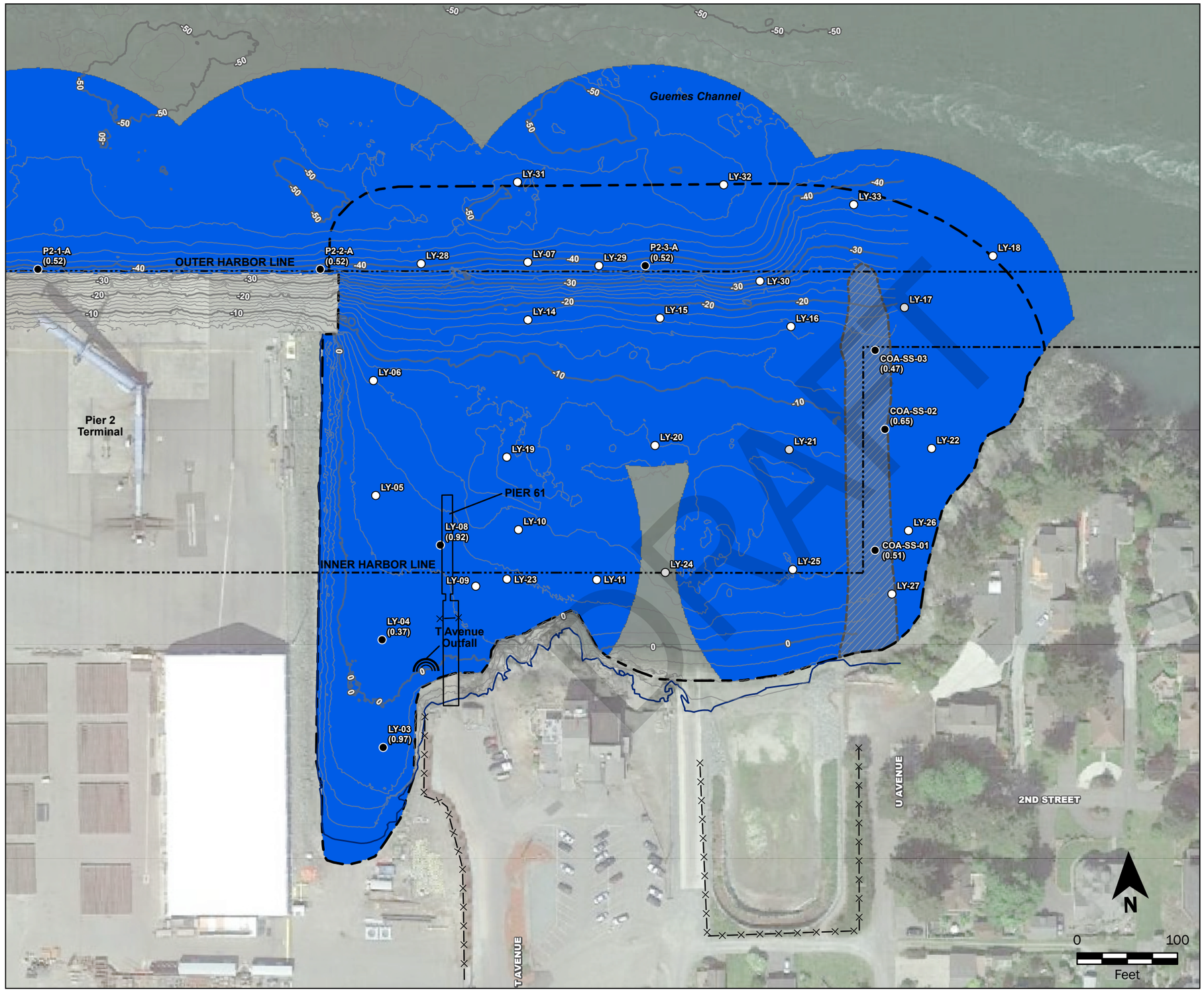
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 63

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Zinc Results (Human Health)
Subsurface Sediment

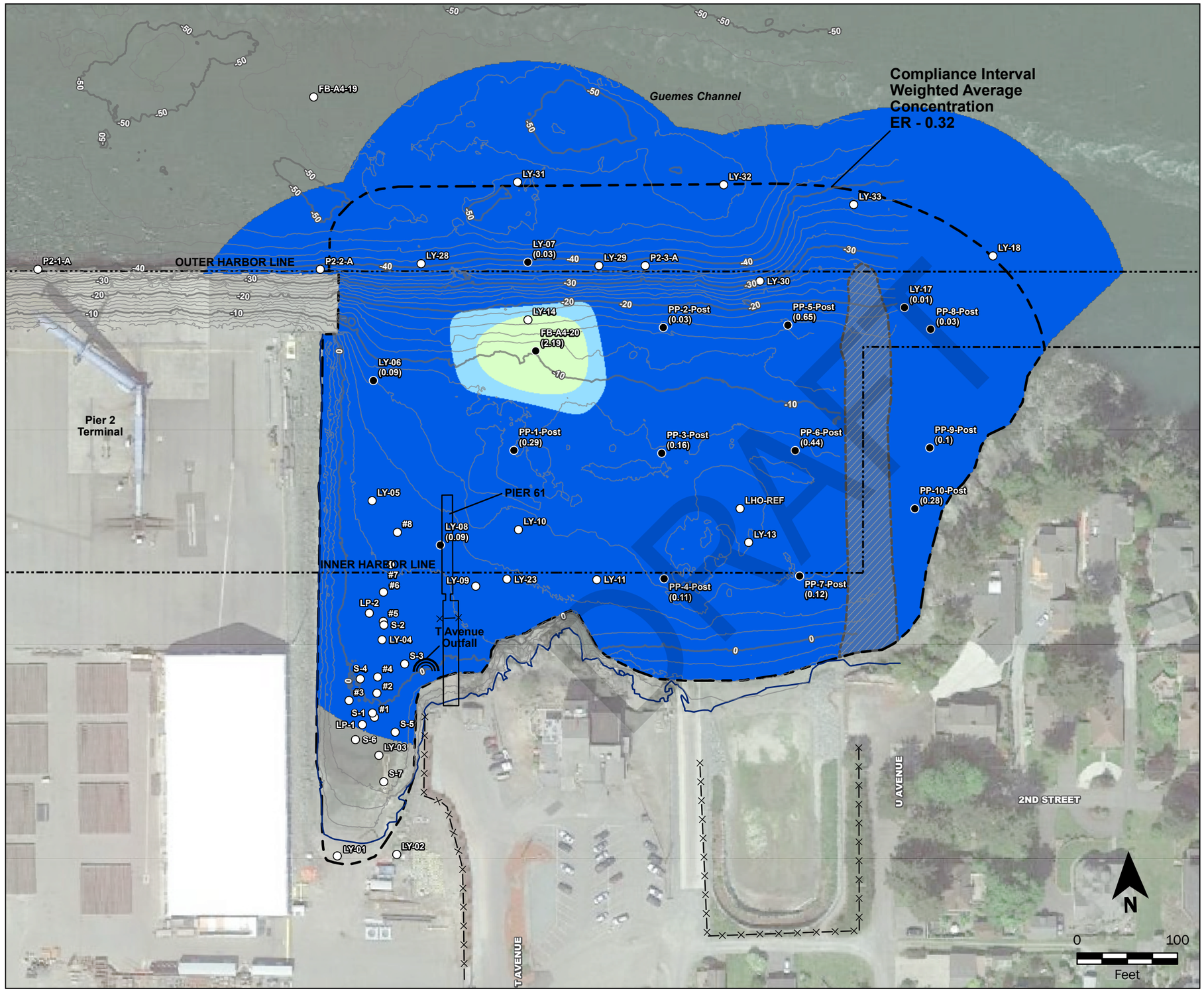
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 64

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

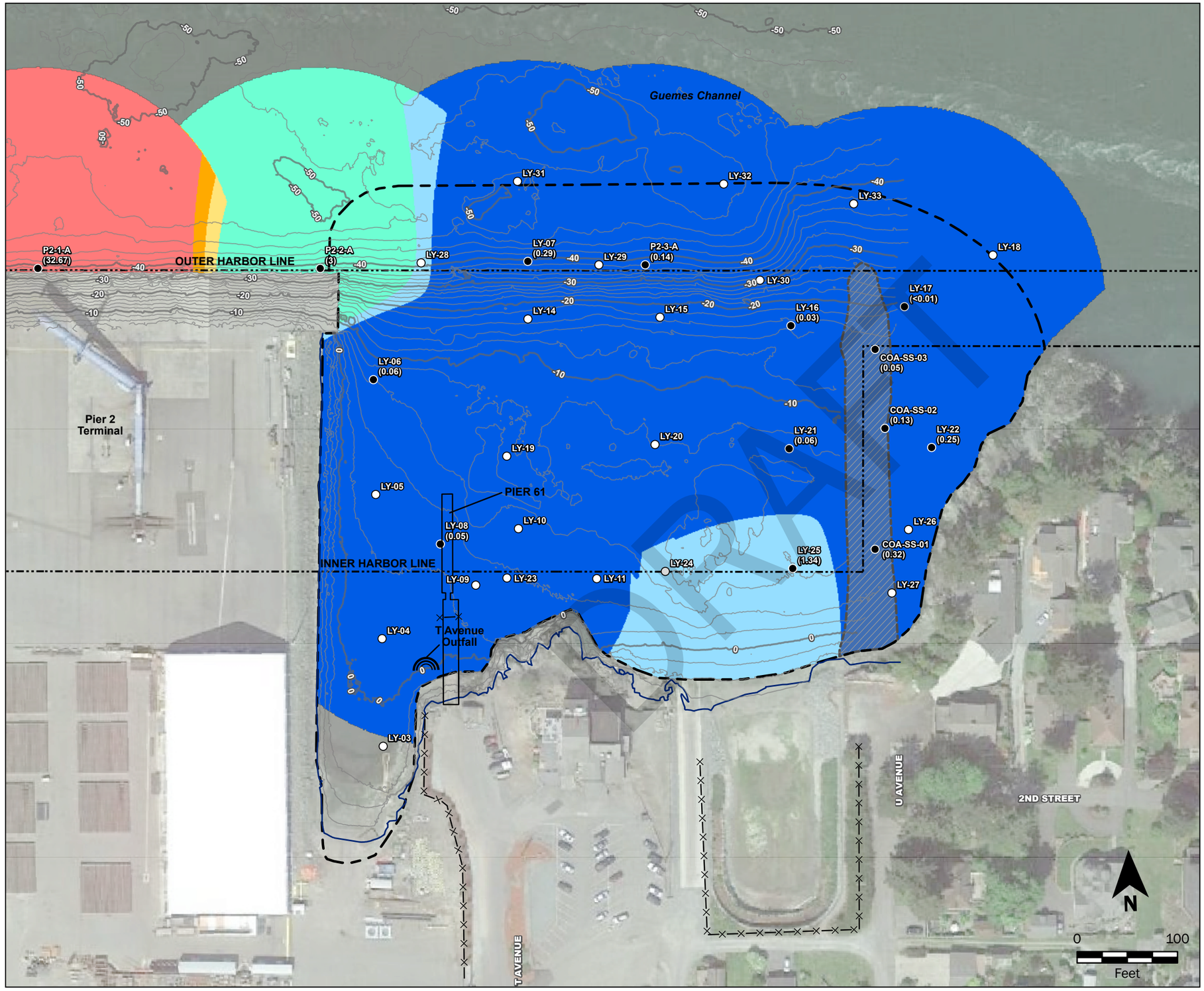
Tributyltin Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 65

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Tributyltin Results (Human Health)
Subsurface Sediment

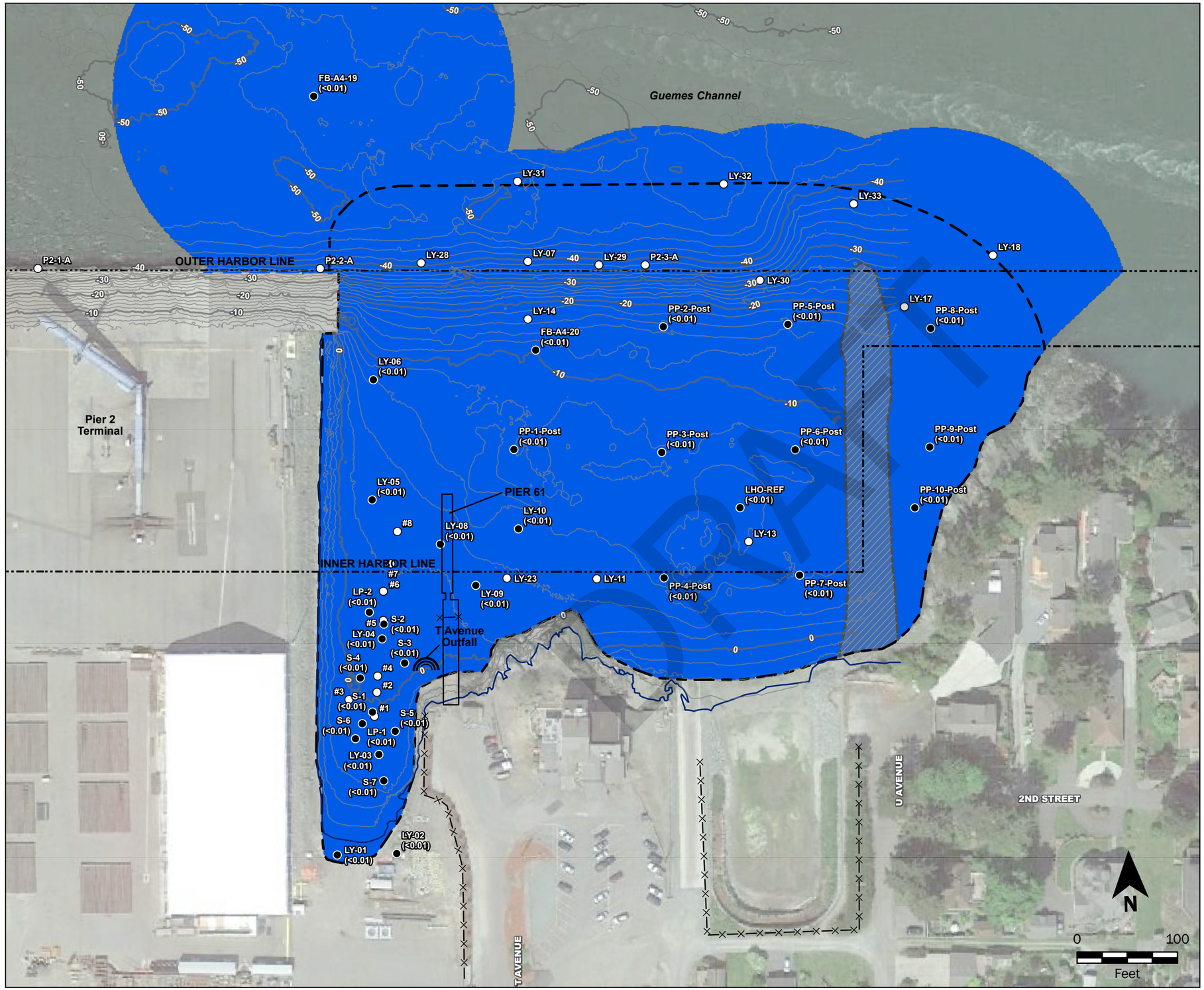
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 66

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

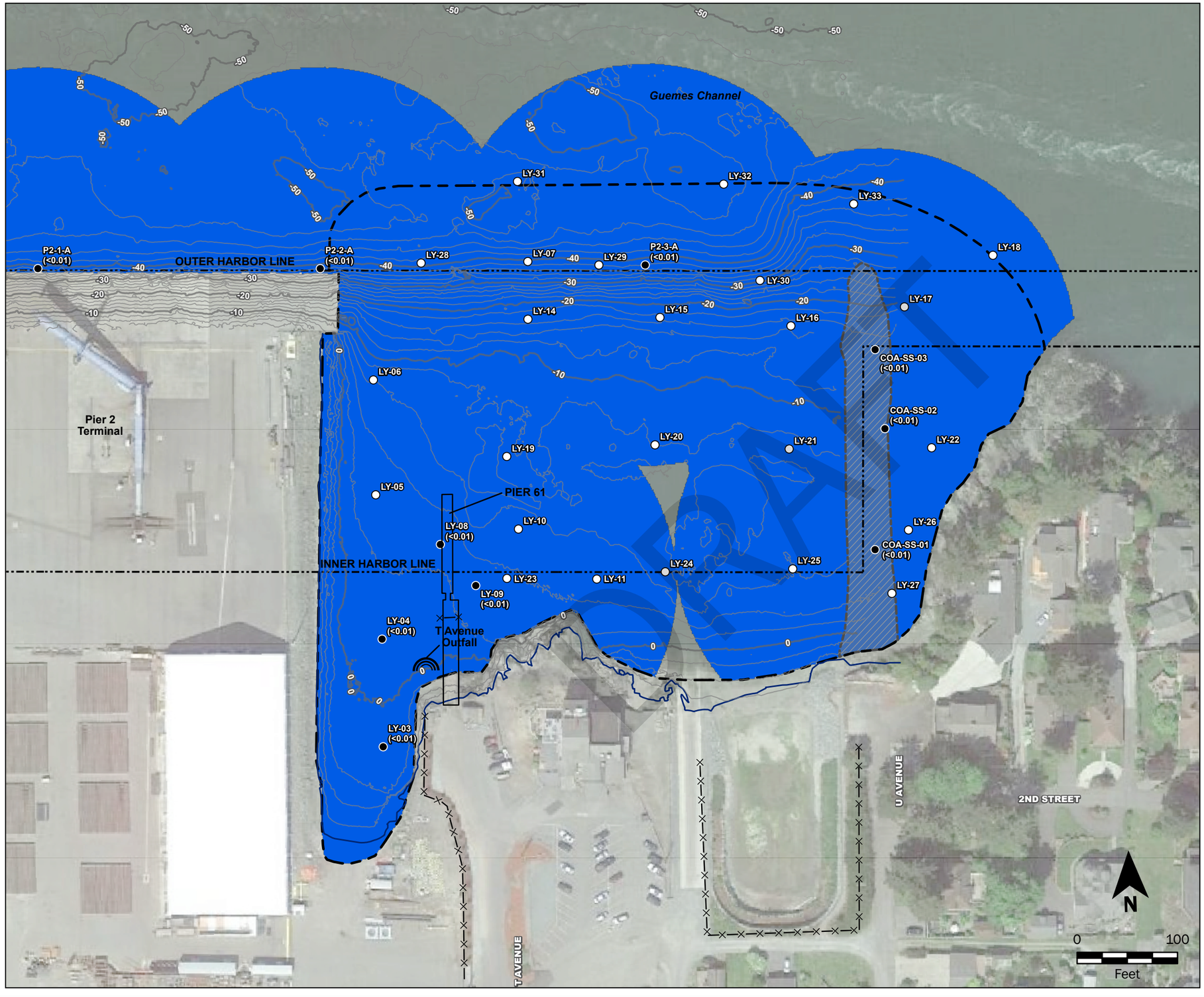
LPAH Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 67

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

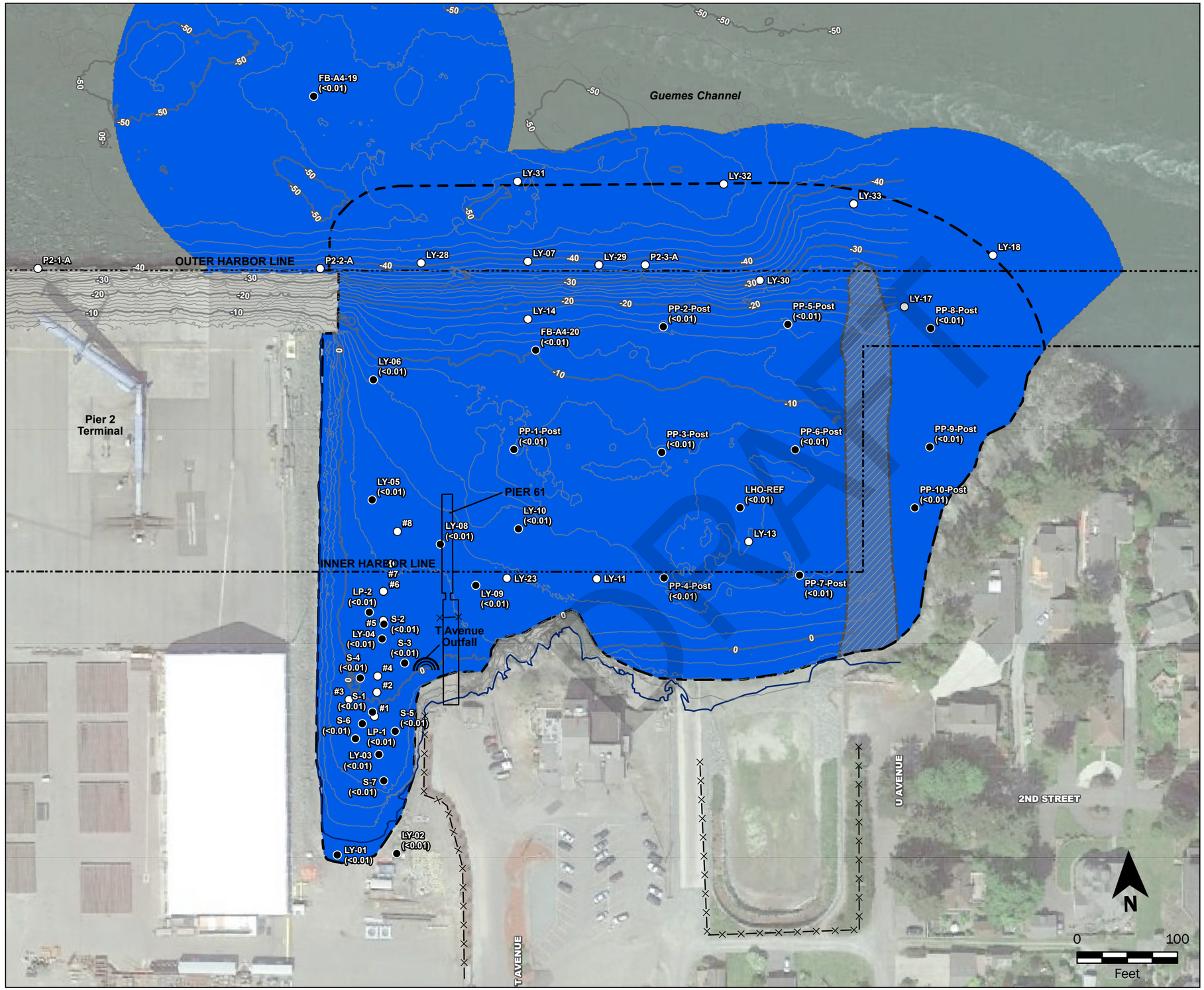
LPAH Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 68

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

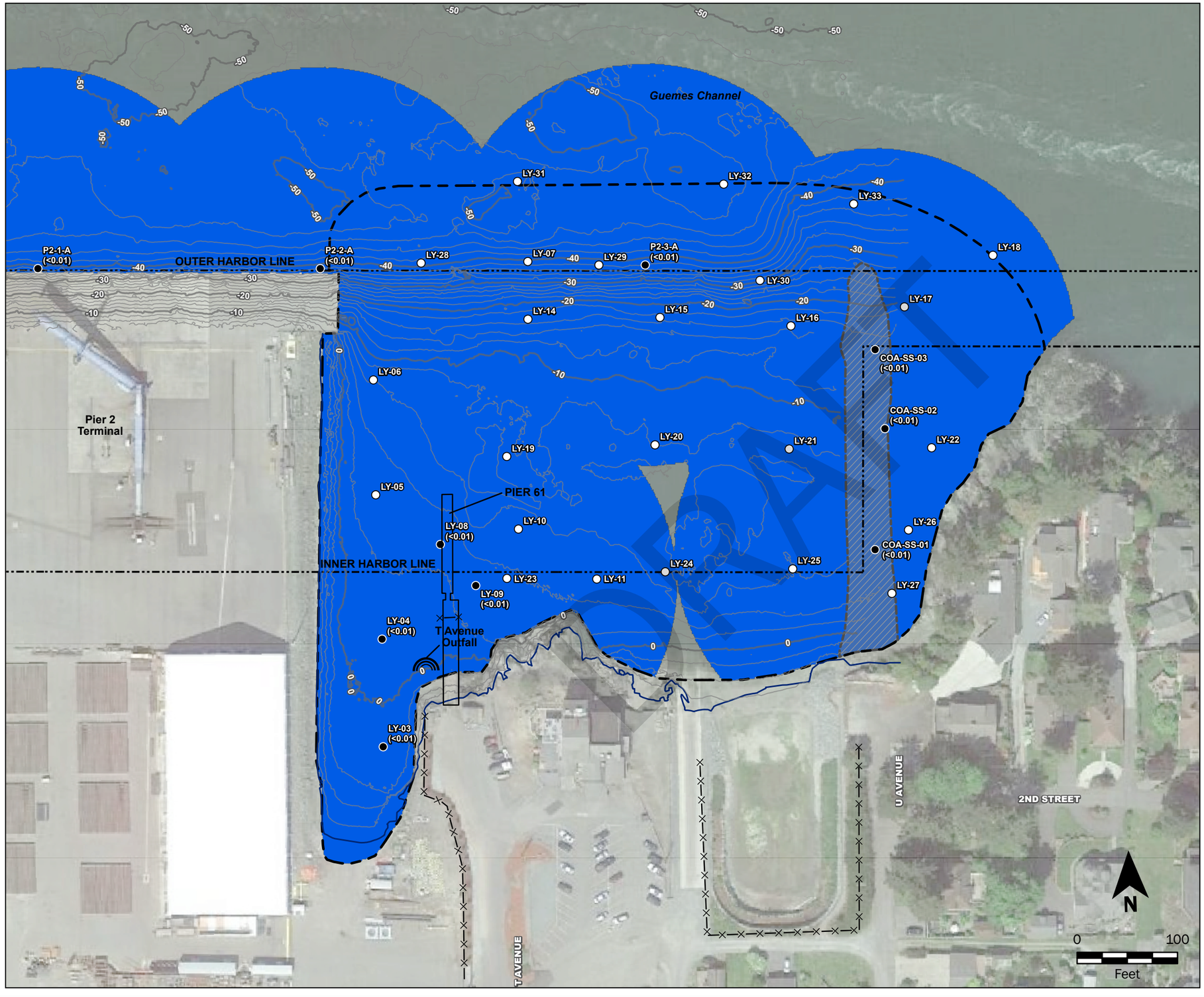
HPAH Results (Human Health) Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 69

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

HPAH Results (Human Health)
Subsurface Sediment

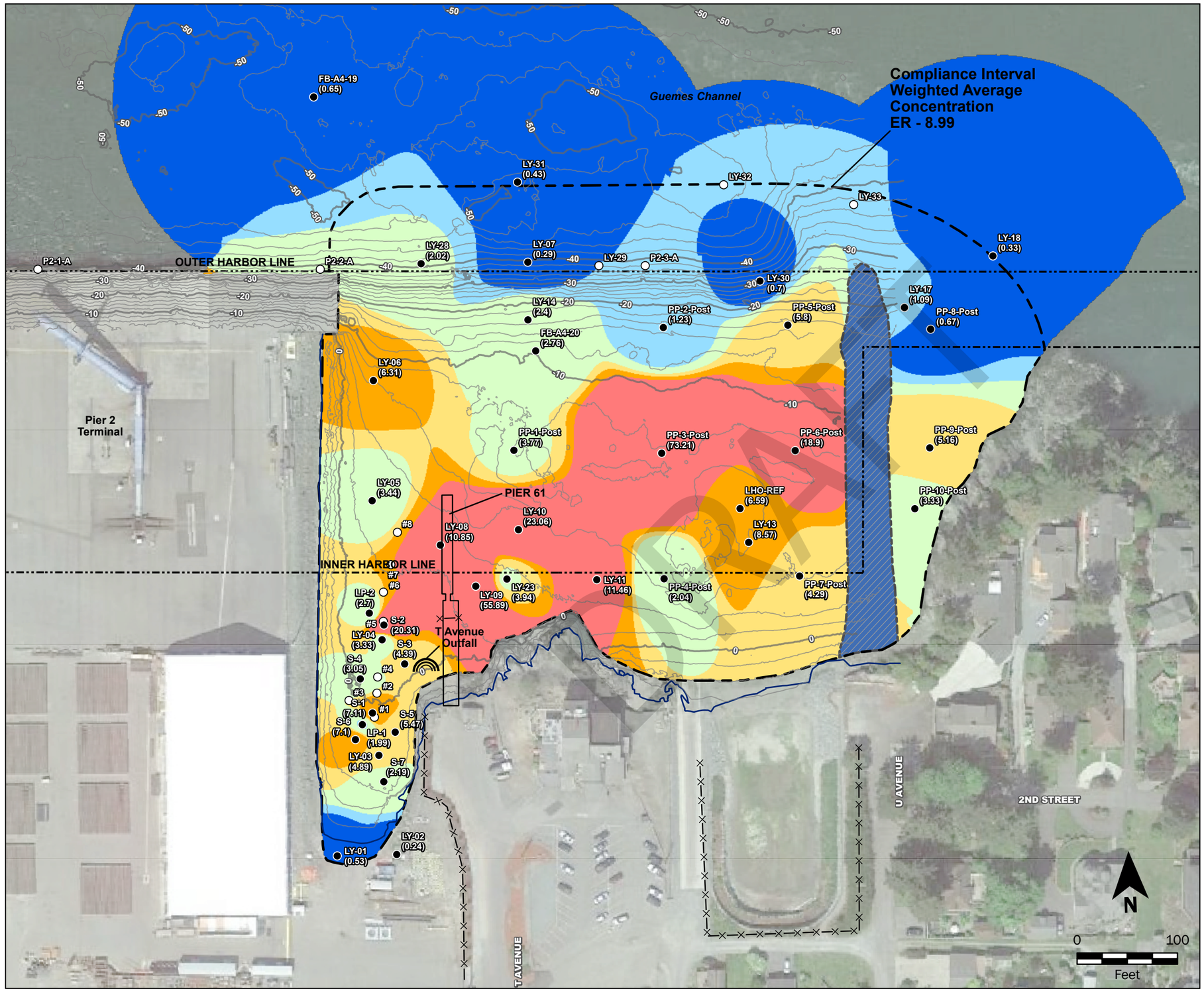
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 70

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

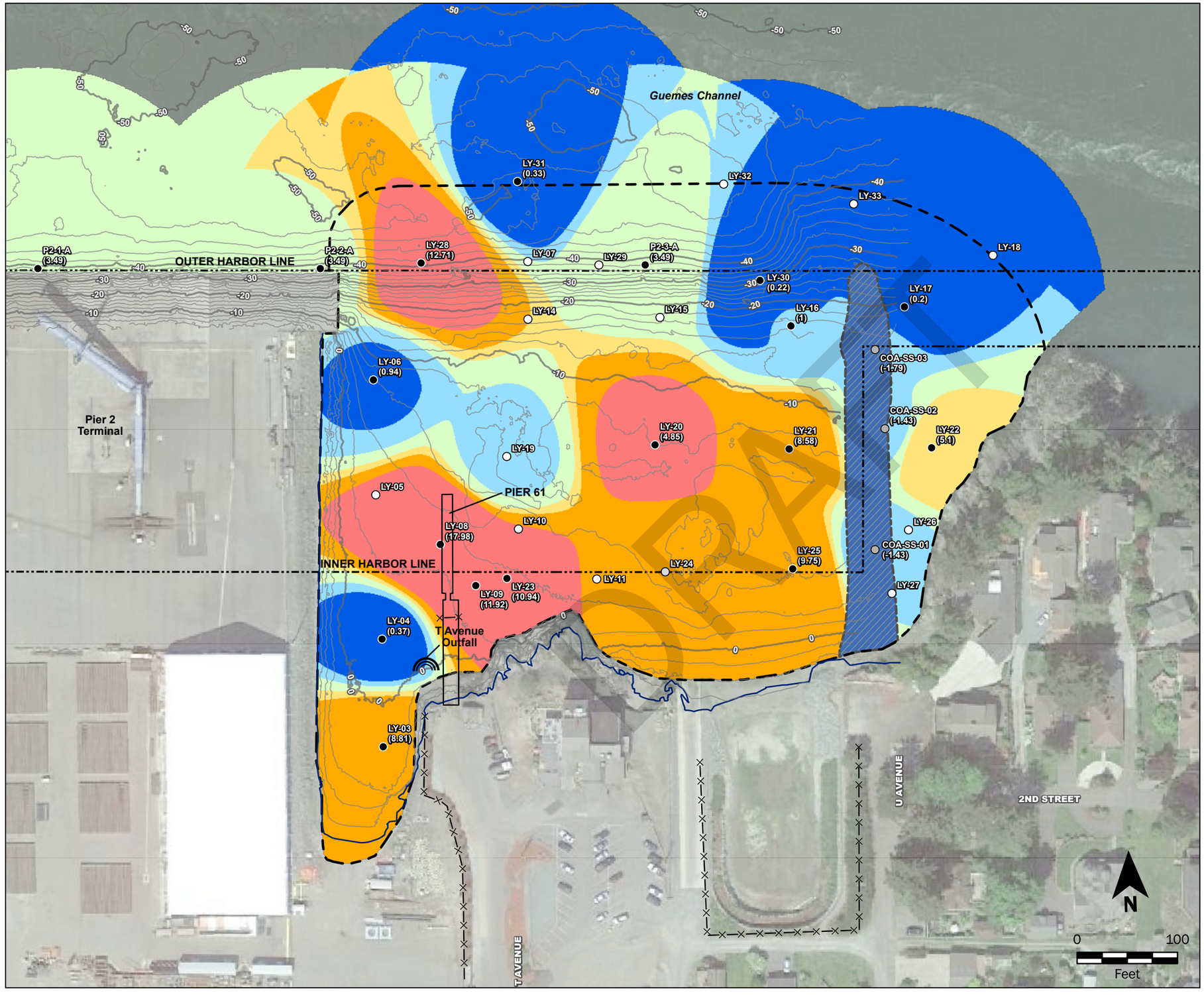
cPAH Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 71

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Sample Location - Non-Detect Result Greater than Proposed Cleanup Level (PCUL)
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) (denoted as a negative result) not included in ER interpolation.

ft = Feet

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

cPAH Results (Human Health) Subsurface Sediment

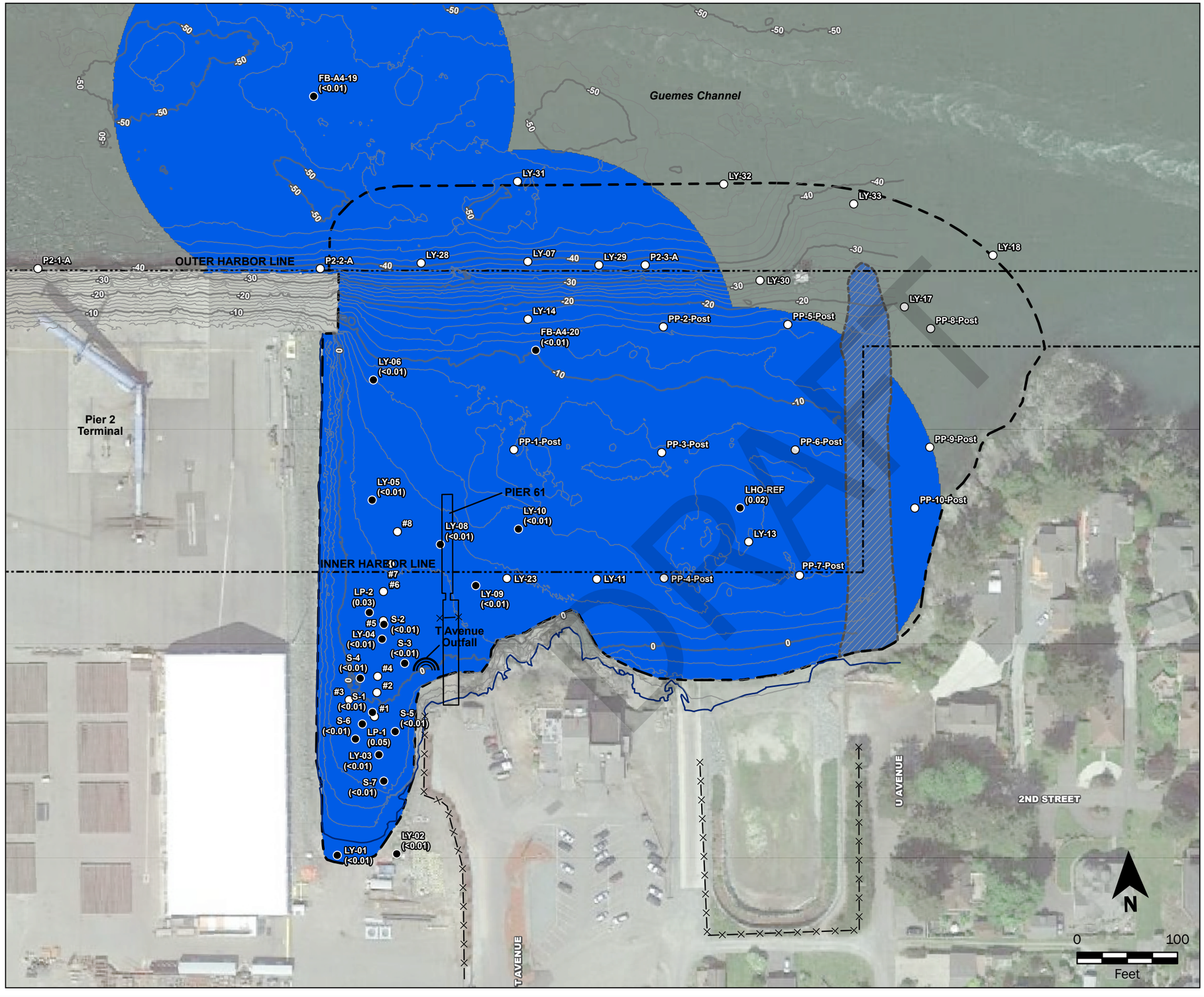
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 72

DRAFT

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

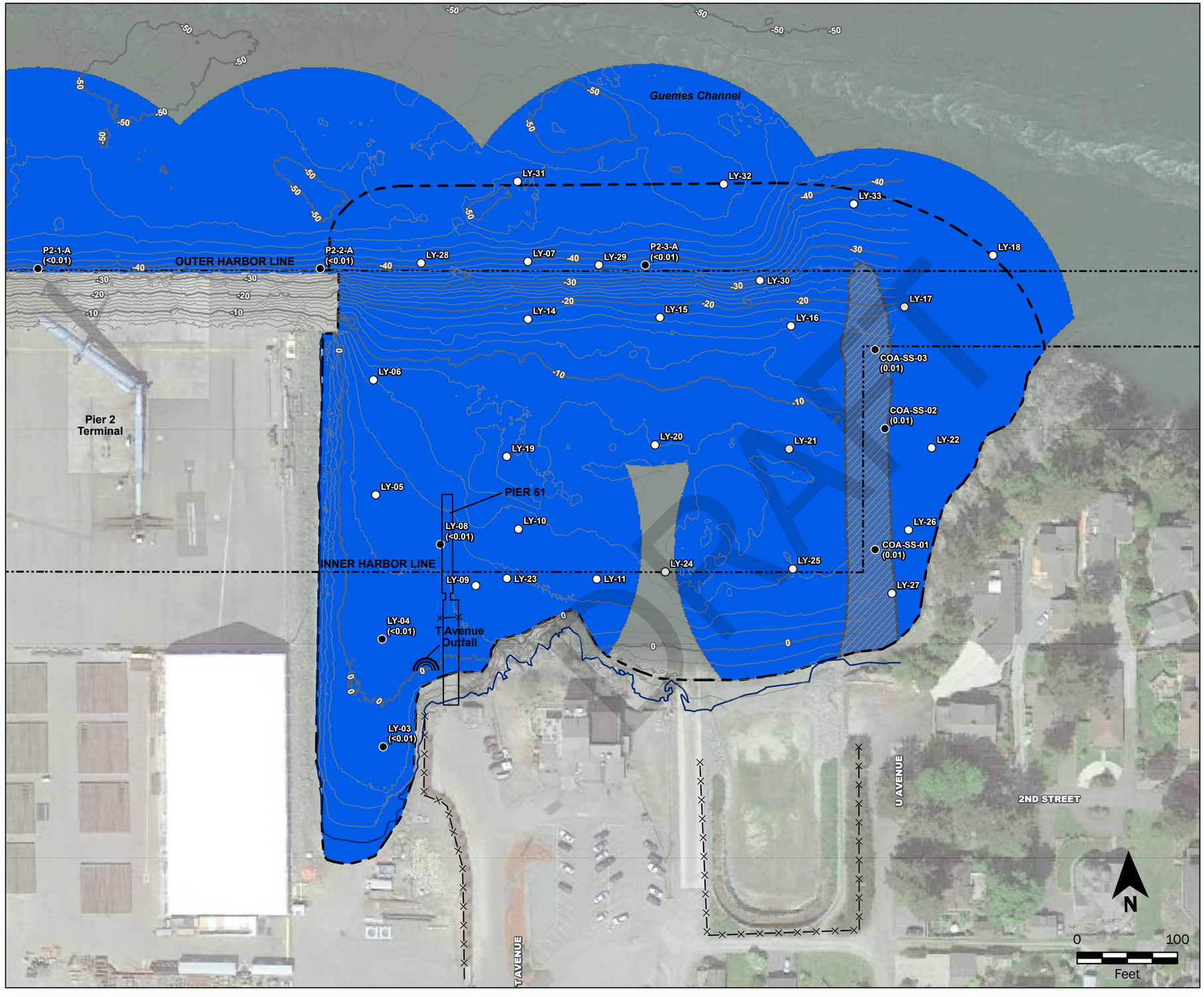
Chlorinated Hydrocarbons Results (Human Health) Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 73

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016O8_F73_ChloronatedHydrocarbons_HH_POC Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

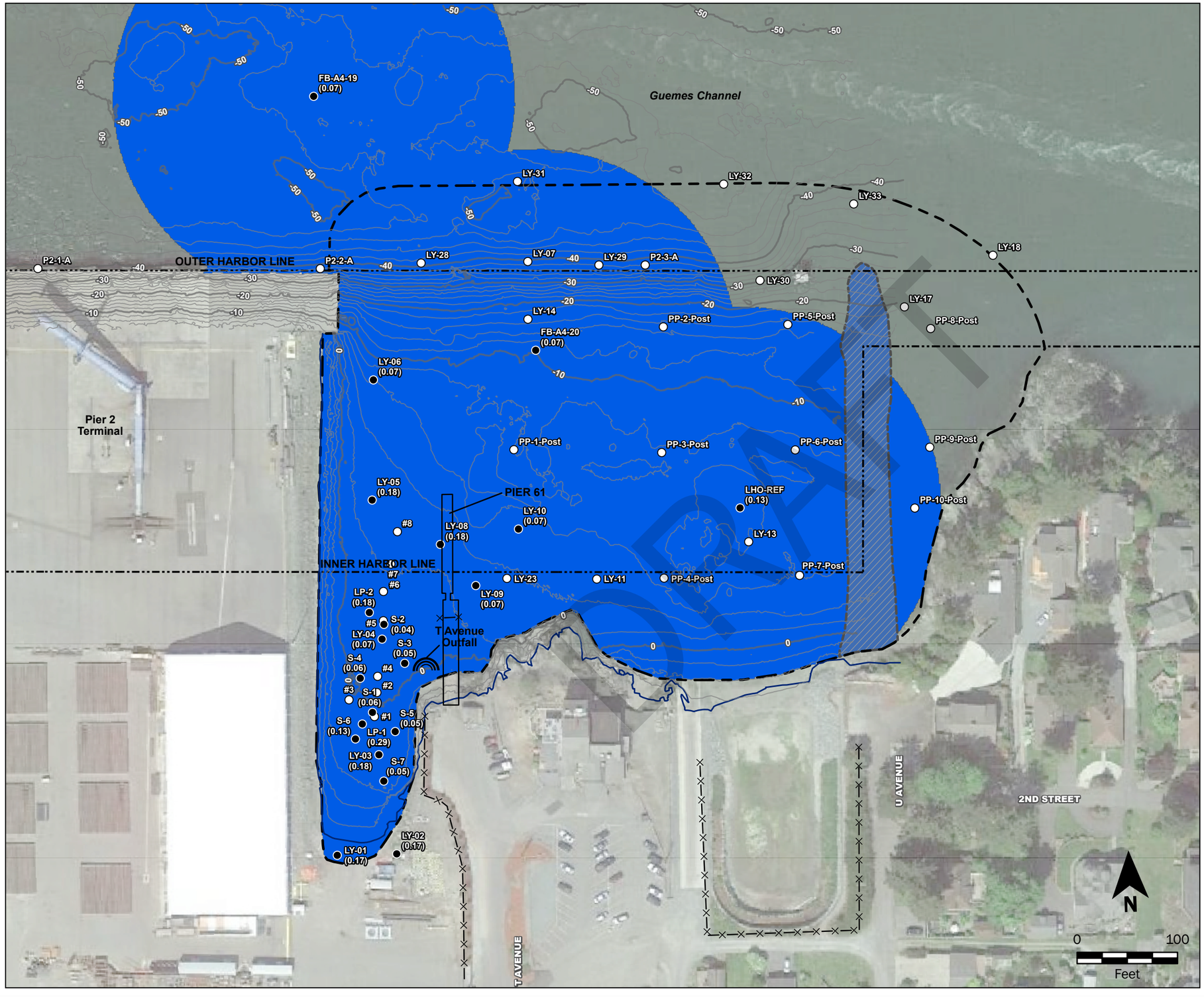
Chlorinated Hydrocarbons Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 74

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016\08_F74_chlorinatedhydrocarbons_HH_Subsurf Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

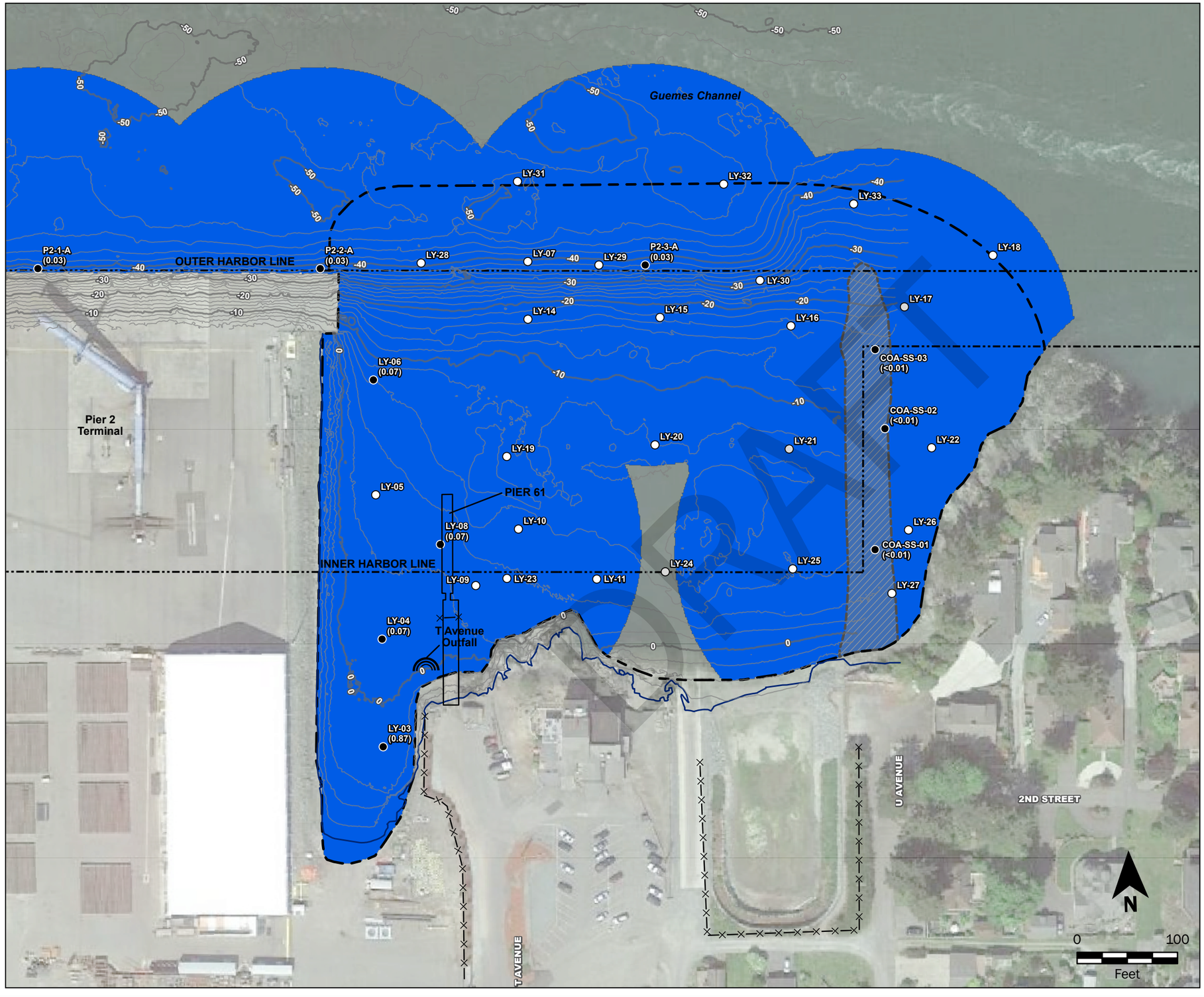
Phthalate Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 75

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F75_Phthalate_HH_POC Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

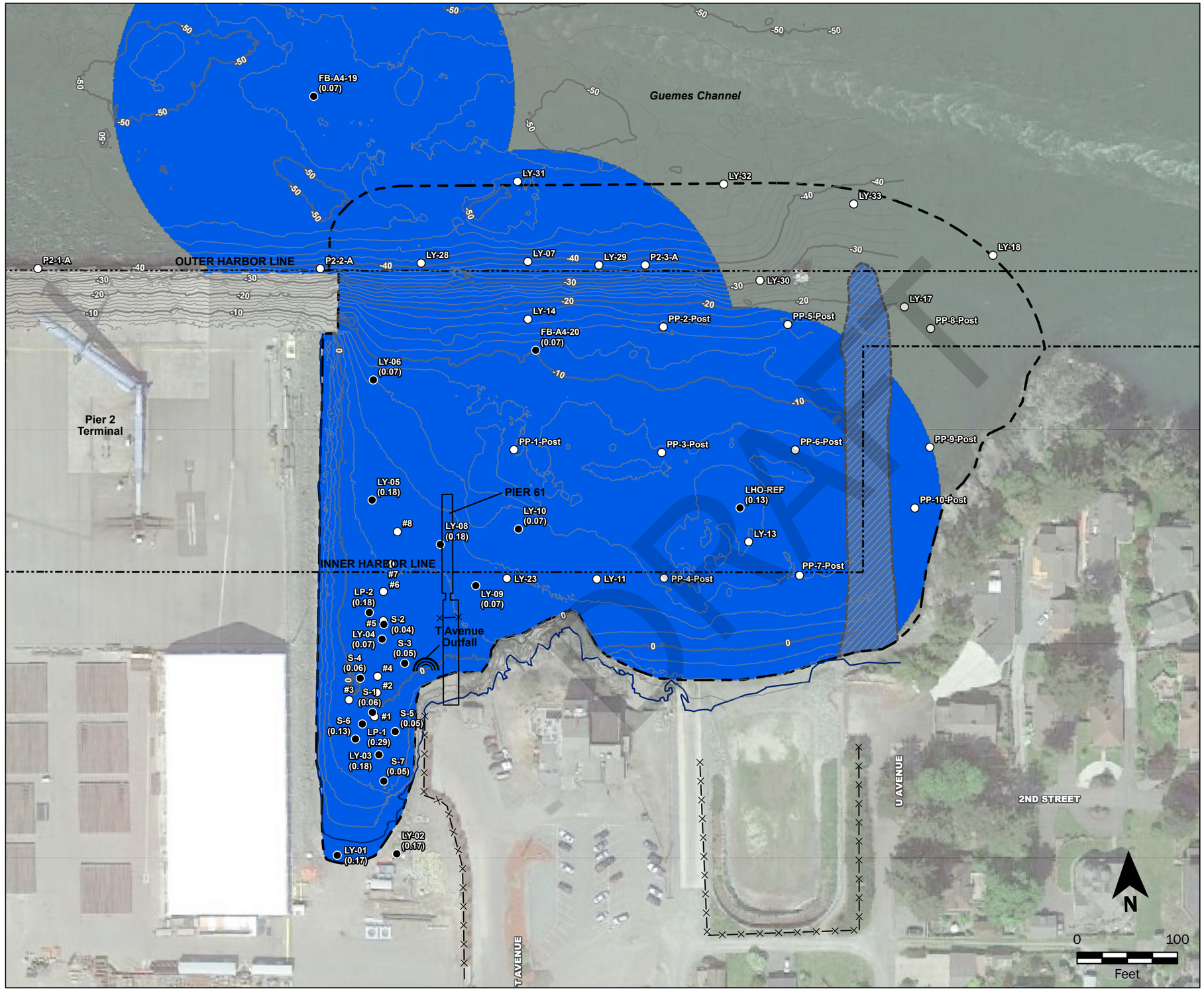
Phthalate Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 76

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

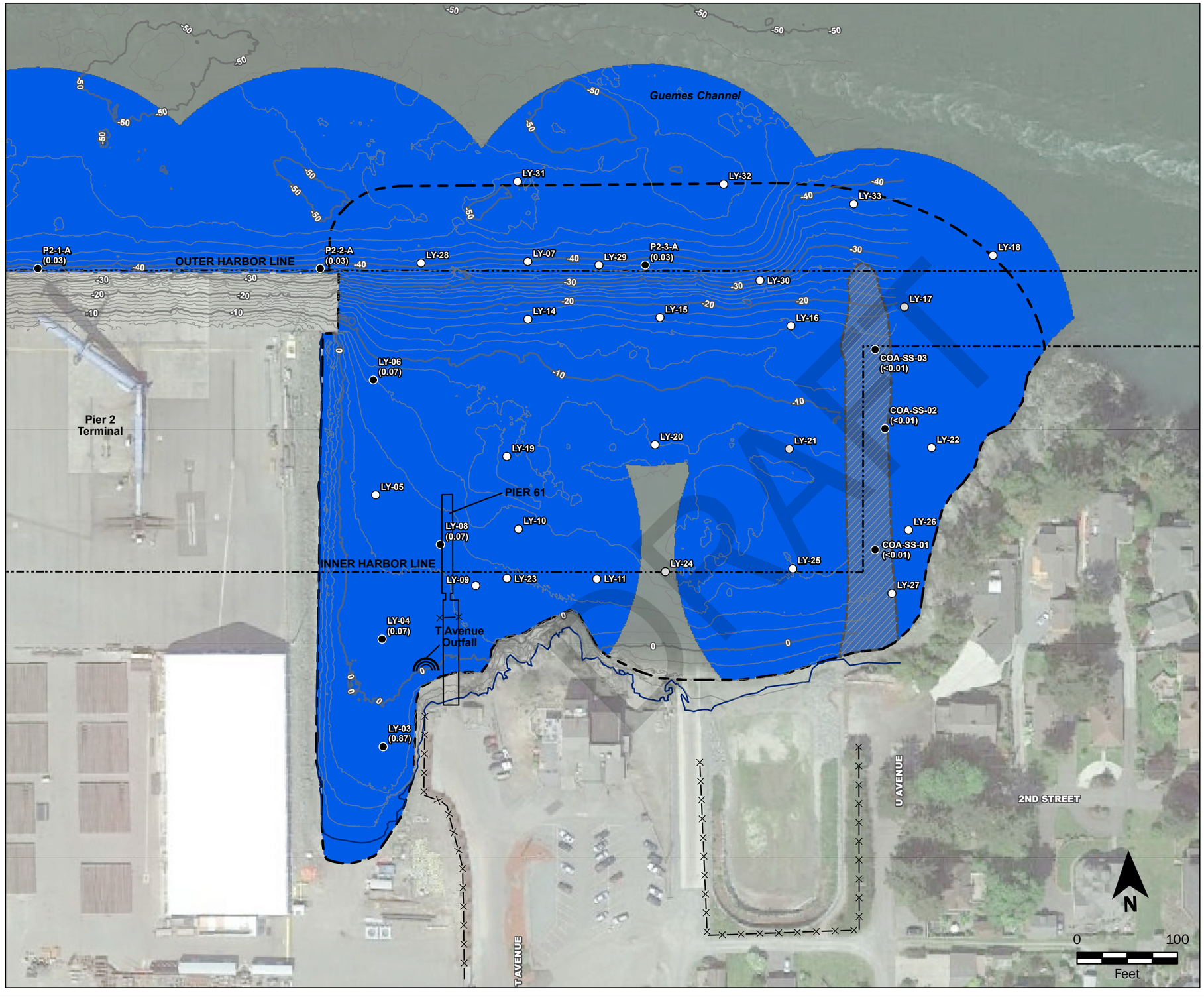
Phenol Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 77

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F77_Phenol_HH_POC Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

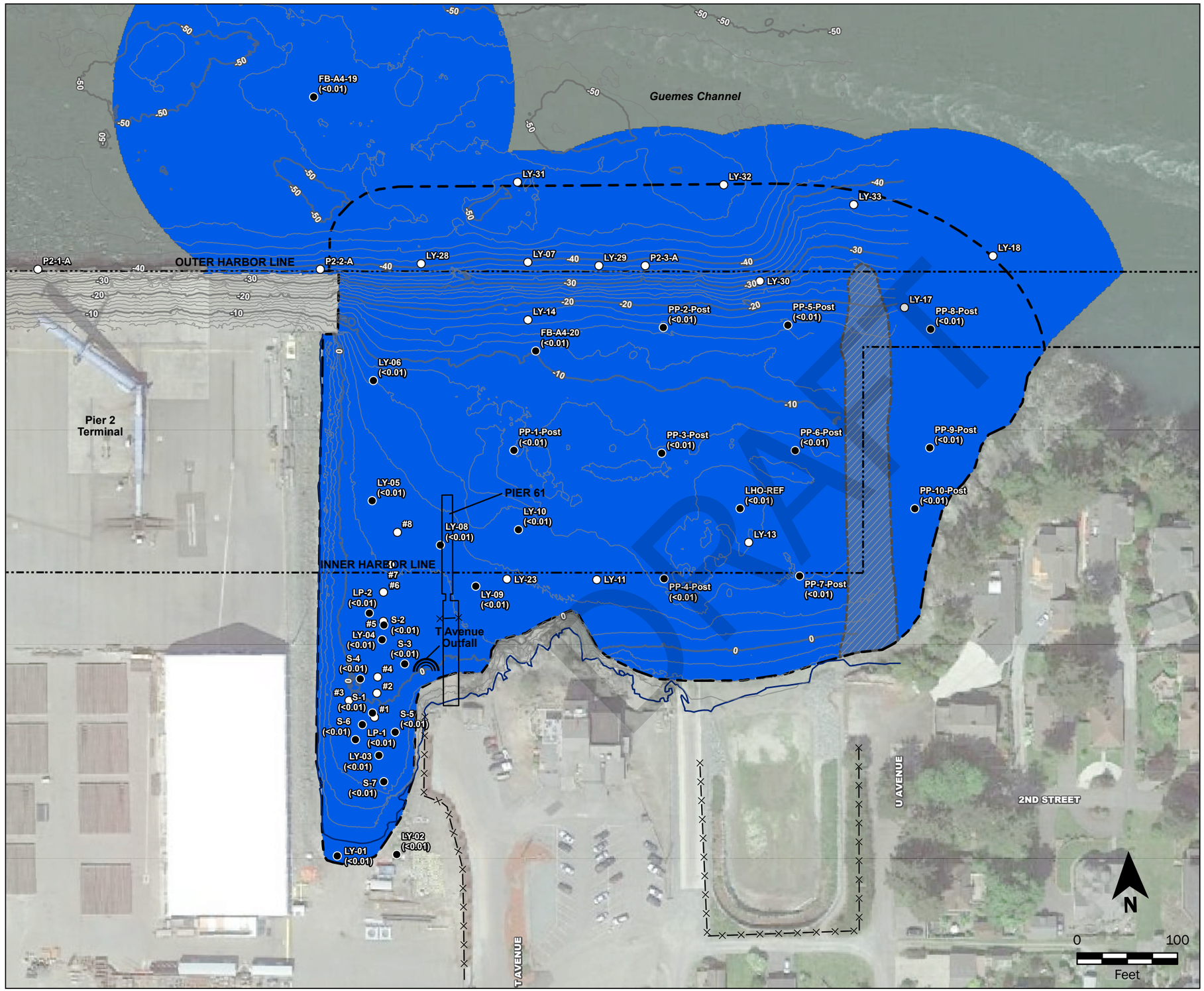
Phenol Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 78

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Miscellaneous Extractables Results (Human Health)
Sediment Compliance Interval

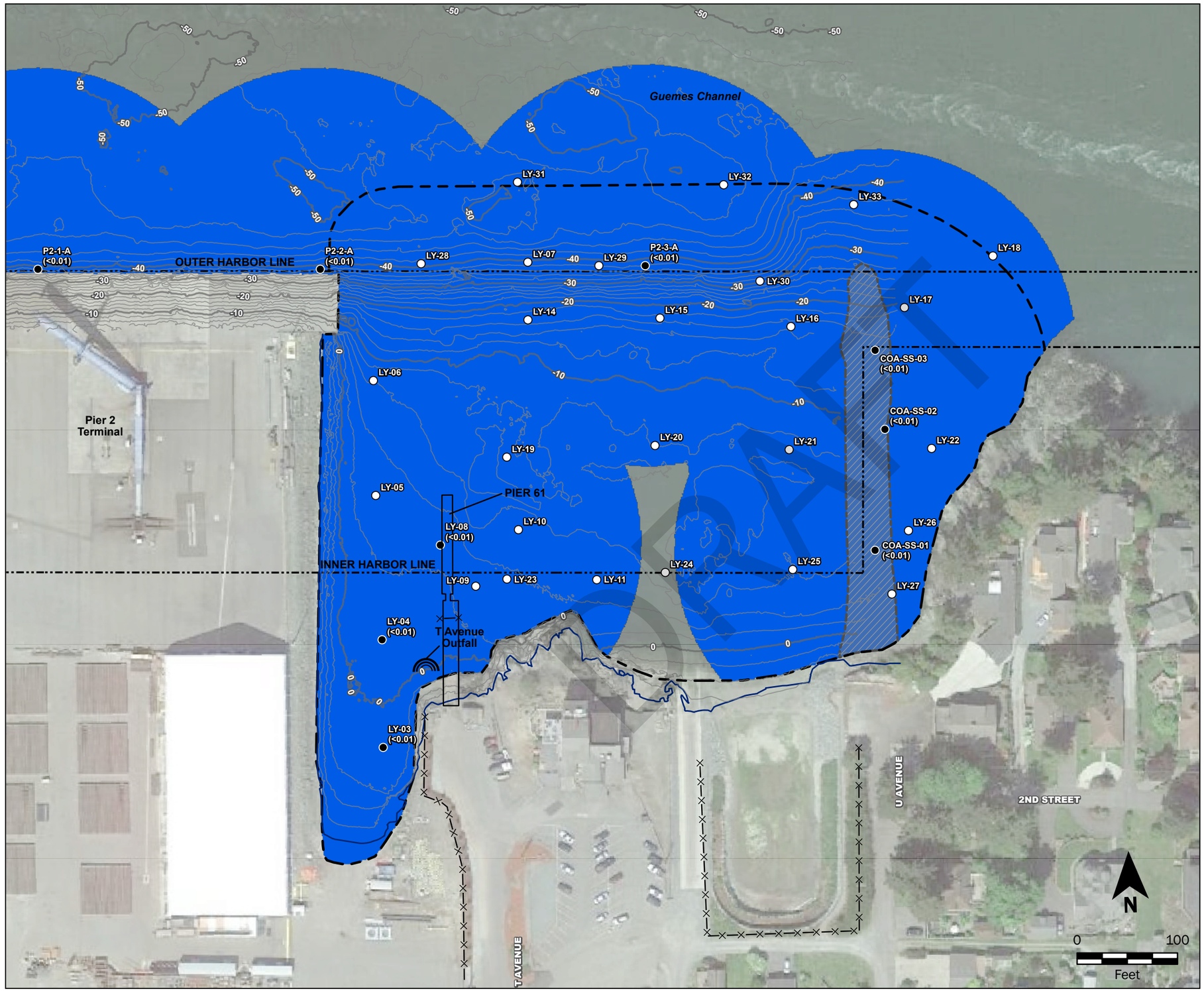
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 79

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

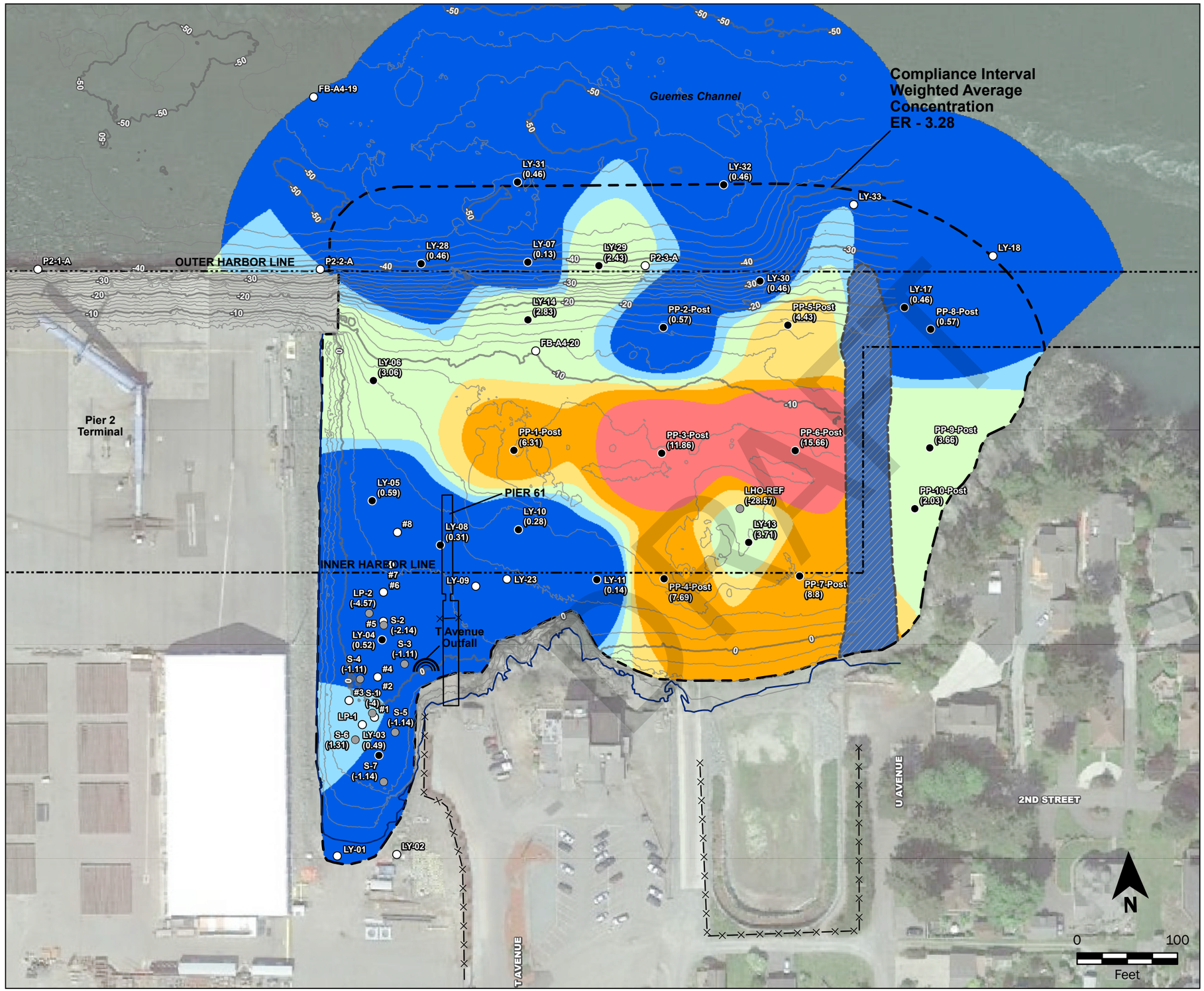
Miscellaneous Extractables Results (Human Health) Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 80

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016O8_F80_MiscExtractables_HH_Subsurf Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Sample Location - Non-Detect Result Greater than Proposed Cleanup Level (PCUL)
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) (denoted as a negative result) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

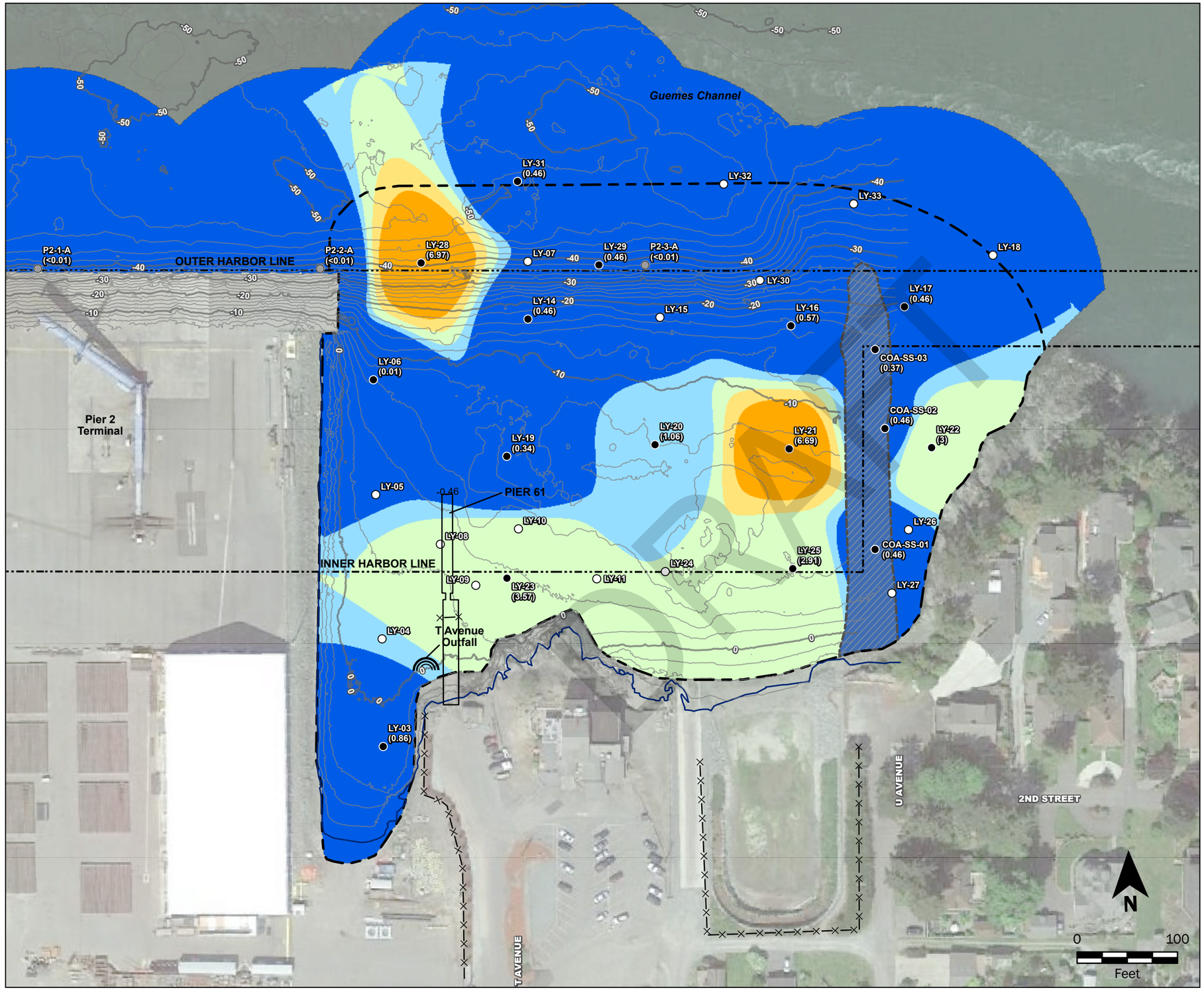
PCB Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 81

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F81_PCB_HH_POC Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Sample Location - Non-Detect Result Greater than Proposed Cleanup Level (PCUL)
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) (denoted as a negative result) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

PCB Results (Human Health)
Subsurface Sediment

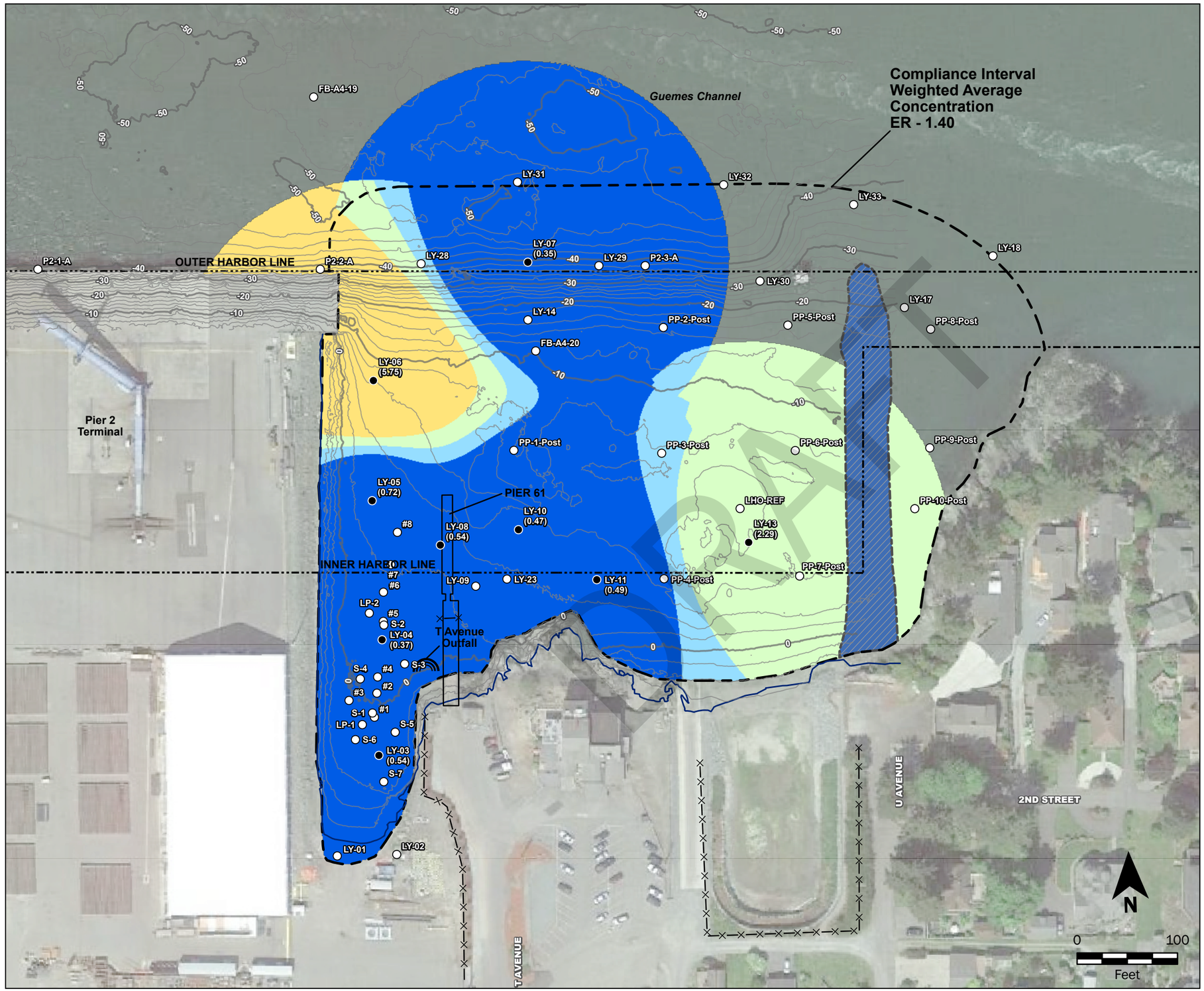
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 82

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Dioxin-Like PCB Results (Human Health)
Sediment Compliance Interval

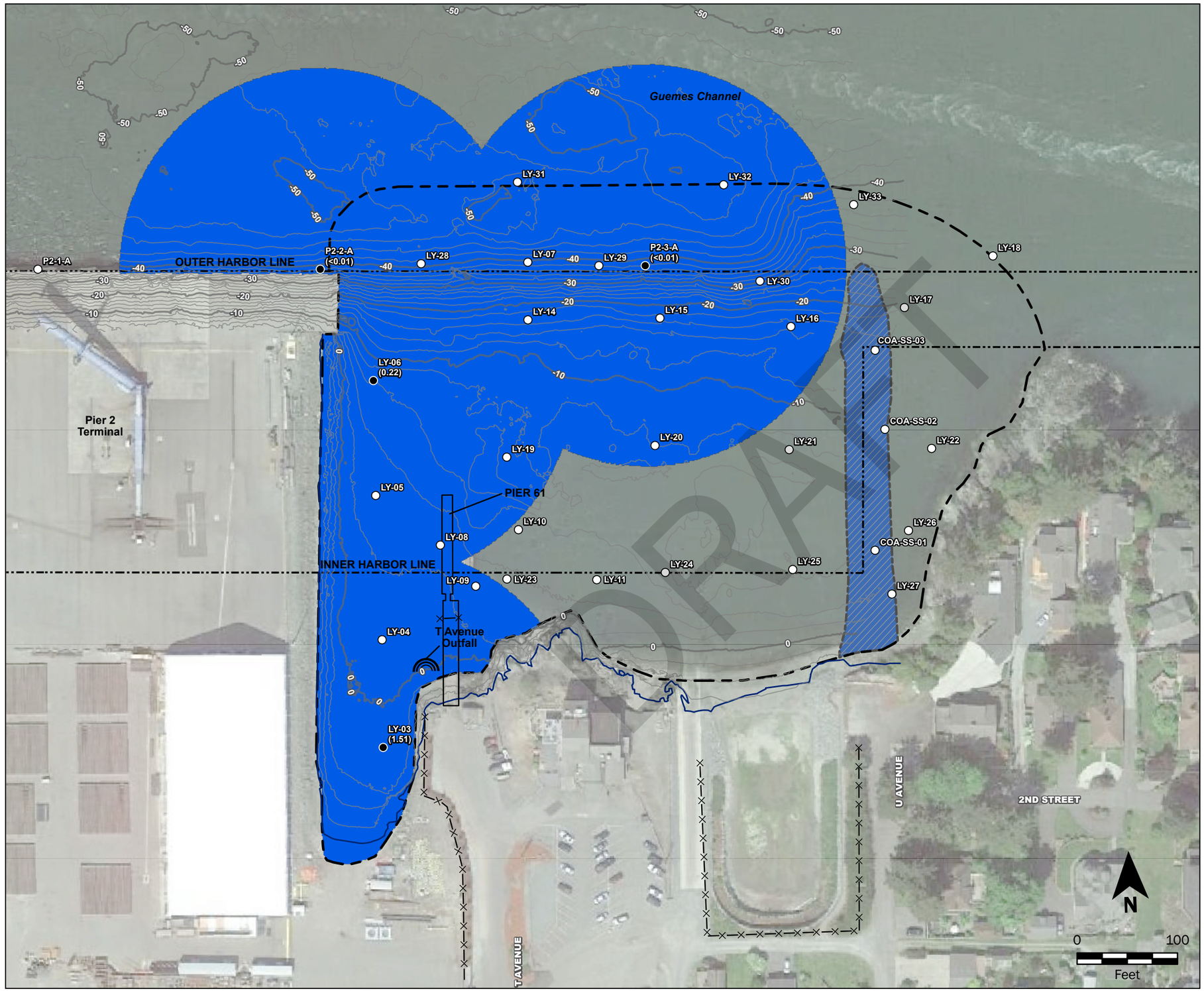
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 83

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F83_DioxLikePCB_HH_POC Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Dioxin-Like PCB Results (Human Health) Subsurface Sediment

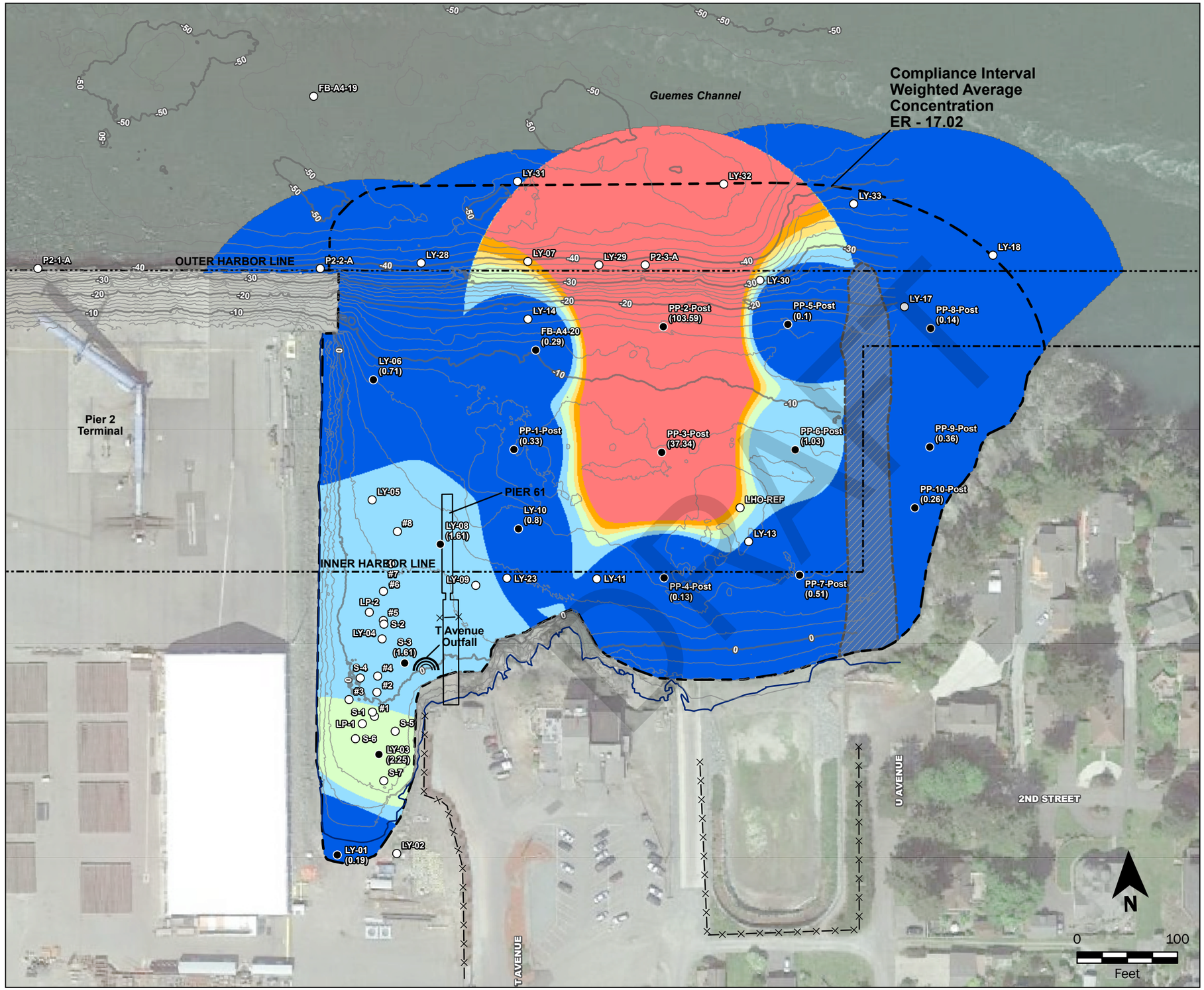
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 84

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F84_DioxLikePCB_HH_Subsurf Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
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Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

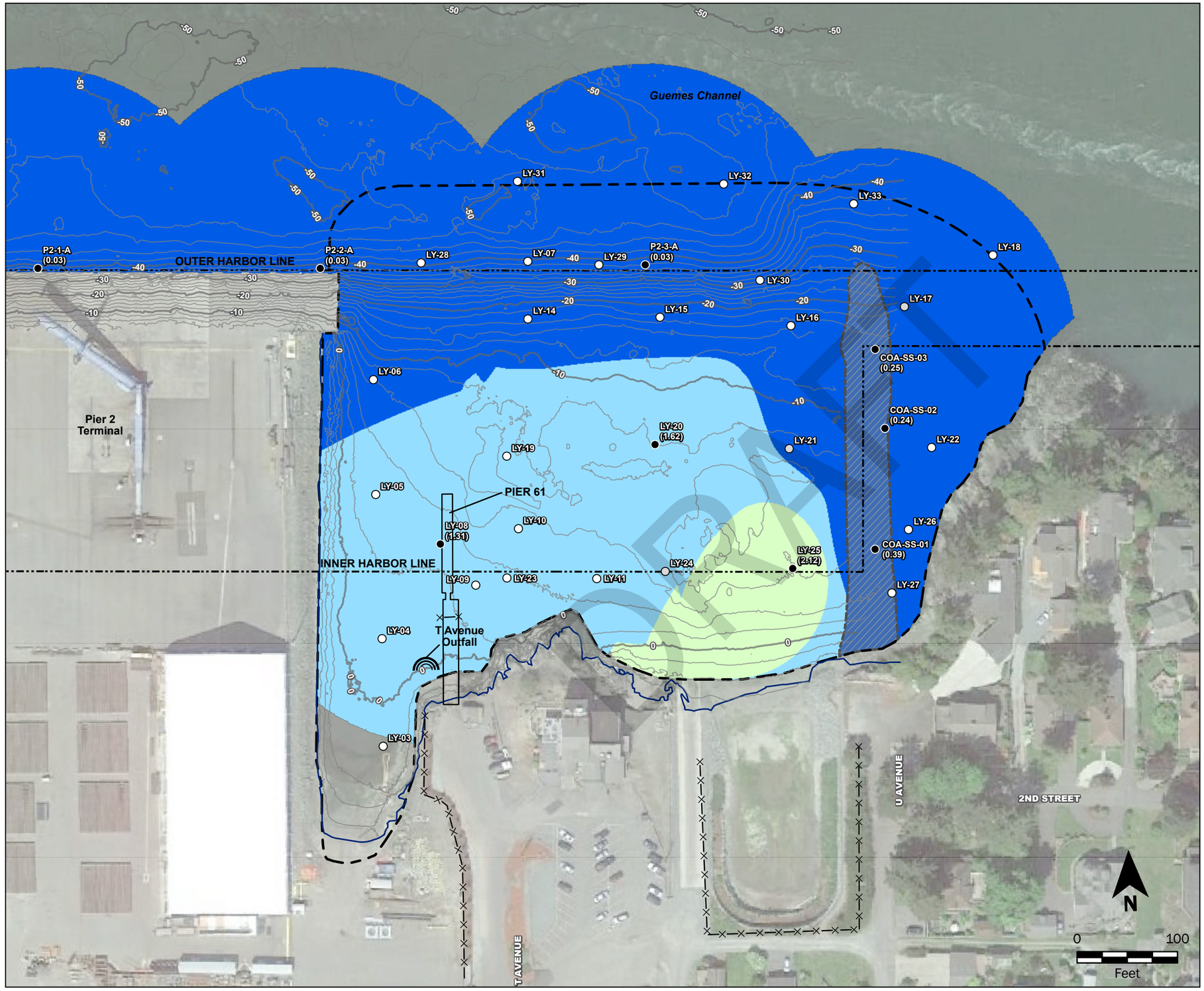
Dioxin/Furan Results (Human Health)
Sediment Compliance Interval

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 85

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F85_Dioxins_HH_POC Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

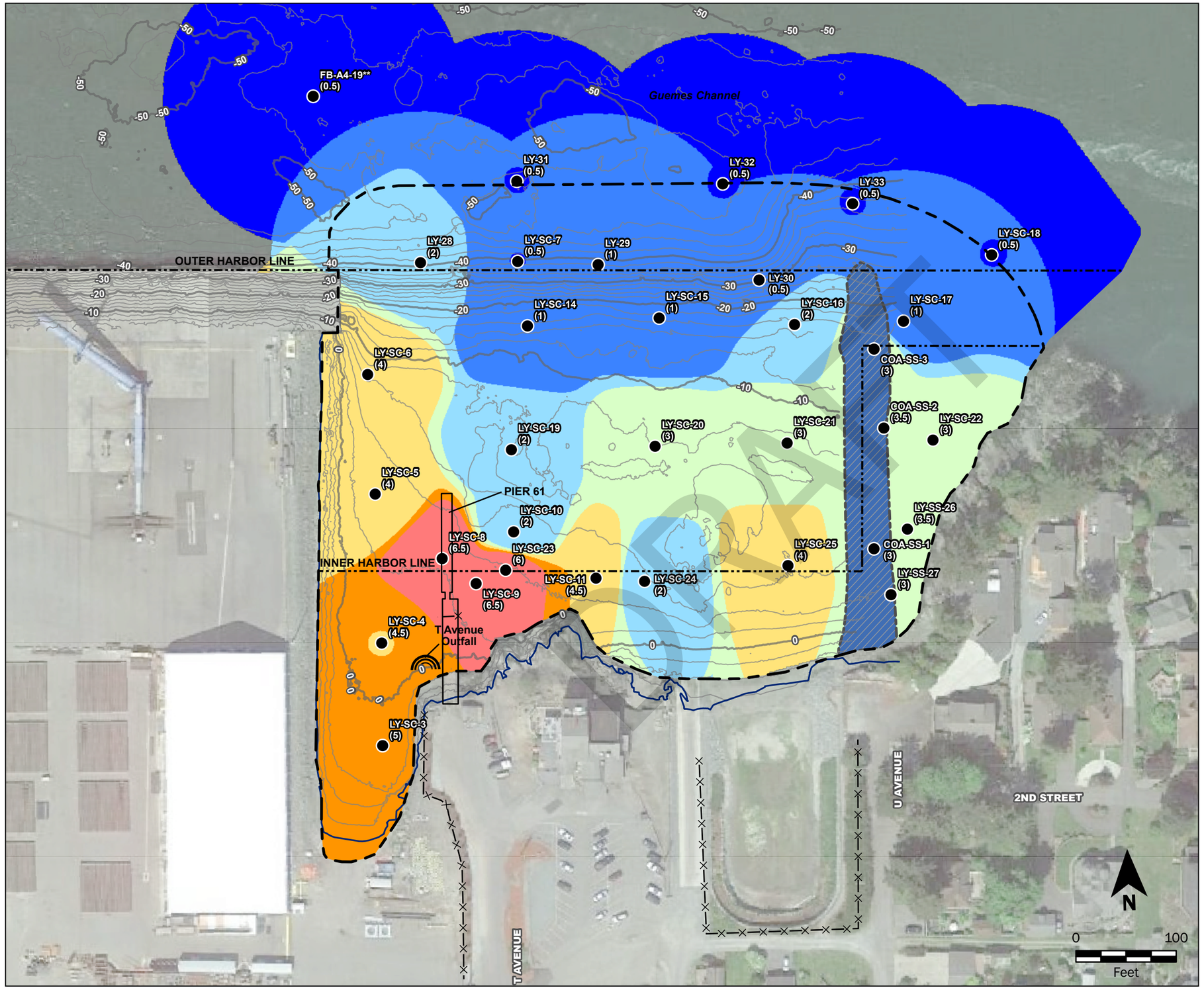
Dioxin/Furan Results (Human Health)
Subsurface Sediment

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 86

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F86_Dioxins_HH_Subsurf Date Exported: 12/31/25 by maugust



Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Index Contour (10 ft)
- Contour (2 ft)
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*
- Sediment Core Sample Location
- **(5.0')** Estimated Contamination Thickness (ft).

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Contaminated Sediment Thickness (ft)

<0.5'	1.5'-2.5'	3.5-4.5'	>5.5'	
0.5-1.5'	2.5-3.5'	4.5-5.5'		

ft = Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Contaminated Sediment Thickness

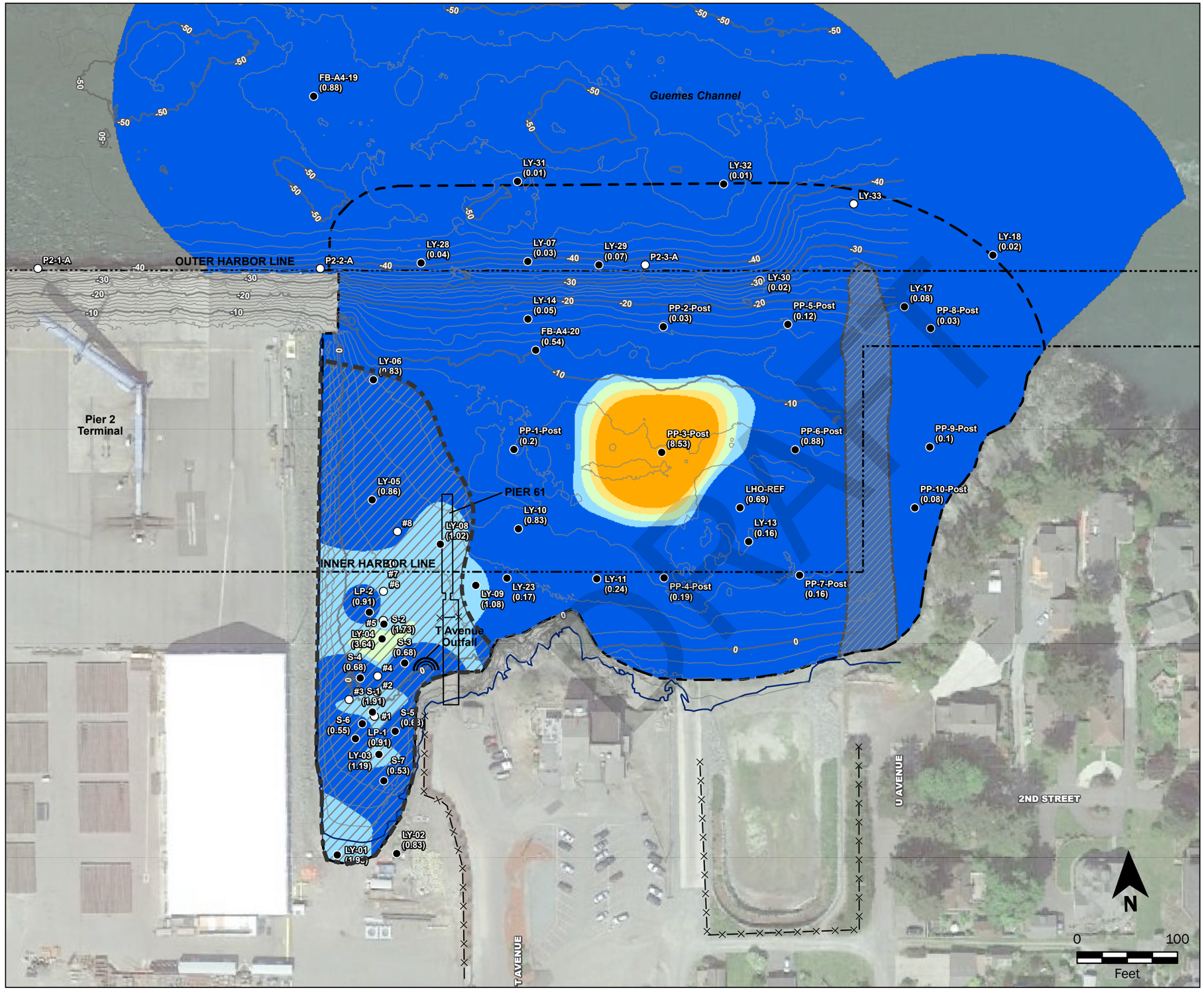
Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 87

DRAFT

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F87_SedimentThickness Date Exported: 01/07/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- Extent of Wood Debris (Greater Than 10 Percent by Volume)
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW)
Concentration Gradient of Maximum Benthic Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet
PCUL = Proposed Cleanup Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

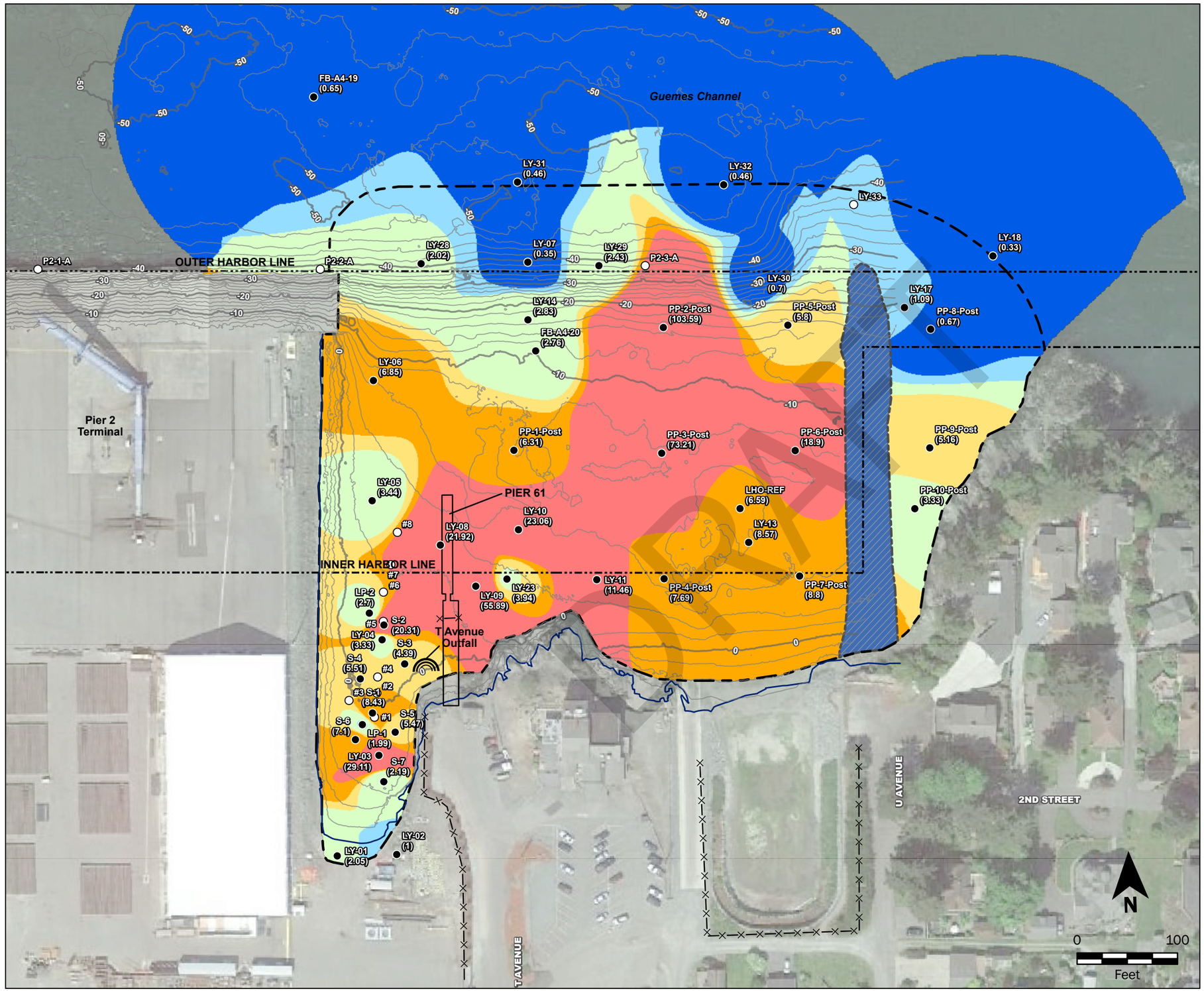
Compliance Interval Benthic PCUL Exceedances

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 88

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_08_F88_Max_Benthic_POC Date Exported: 01/02/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Dredge Project Area*

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Clean imported material placed by the City to backfill the dredge prism in September 2024 as part of the Waste Water Treatment Plant Outfall Project.

Inverse Distance Weighted (IDW) Concentration Gradient of Maximum Human Health Exceedance Ratio**

<1	2 - 4	6-10
1 - 2	4 - 6	>10

**Exceedance Ratio (ER) calculated by dividing the detected analyte concentration by the proposed sediment screening level. At each location, the highest ER for the identified analyte or analyte group is shown. ER for non-detect result exceeding screening level(s) not included in ER interpolation.

ft = Feet
PCUL = Proposed Cleanup Level

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

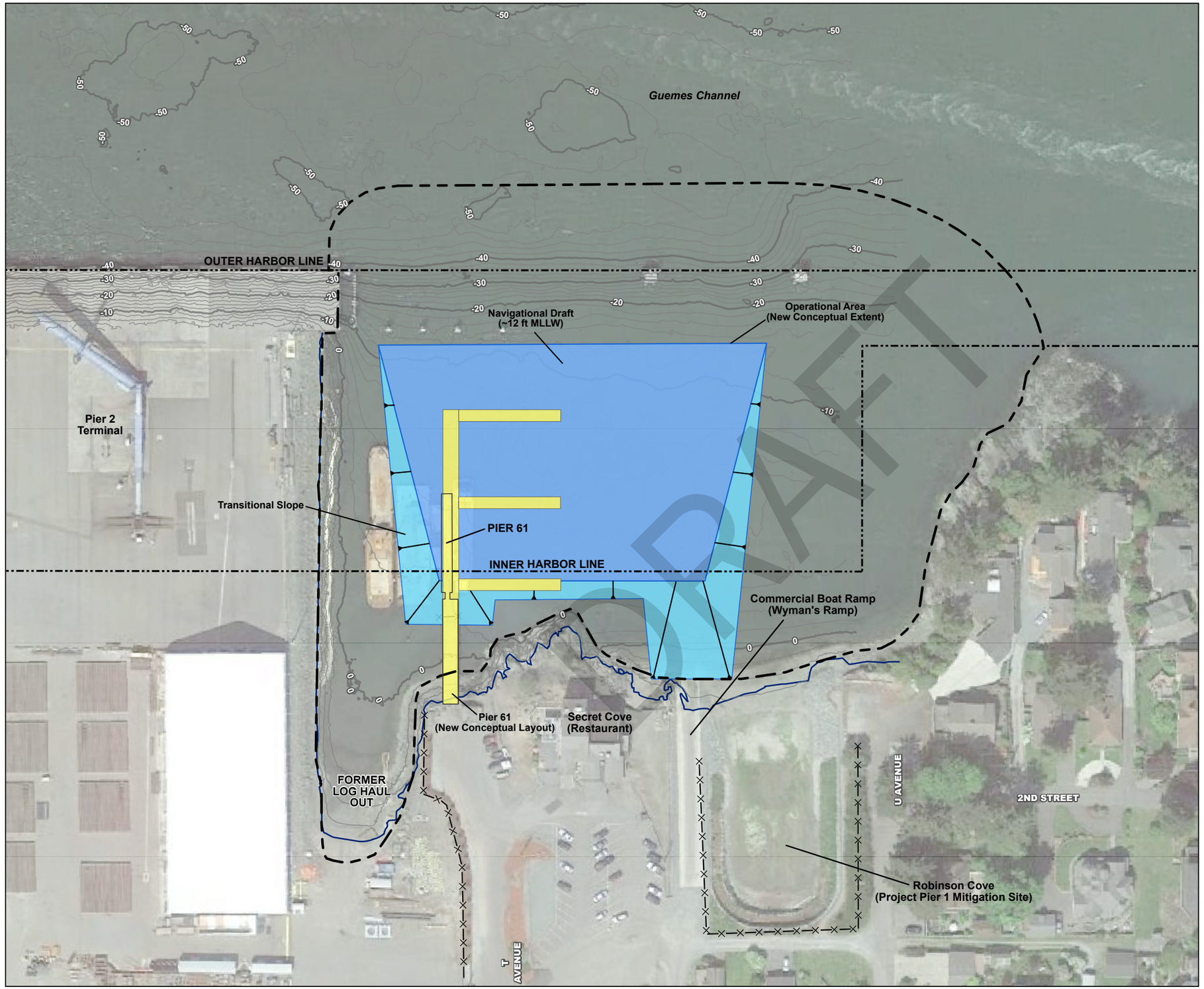
Compliance Interval Human Health PCUL Exceedances

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 89

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F89_Max_HH_POC Date Exported: 01/02/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

N

0 100

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Conceptual Pier 61 Redevelopment and Operational Area Layout

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 90

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016_F90_ConceptualPier61Redevelopment Date Exported: 01/02/26 by maugust



Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

Remedial Area/Technology

- Sediment Management Area (SMA)
- Future Cleanup Action Area
- Full Removal and Backfill Area (Variable Thickness)
- Full Removal Area With No Backfill
- Benthic Contaminant of Concern (COC) and Substance of Concern (SOC) Extent

N

0 100

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Proposed Interim Action

Anacortes Port Log Yard
Anacortes, Washington

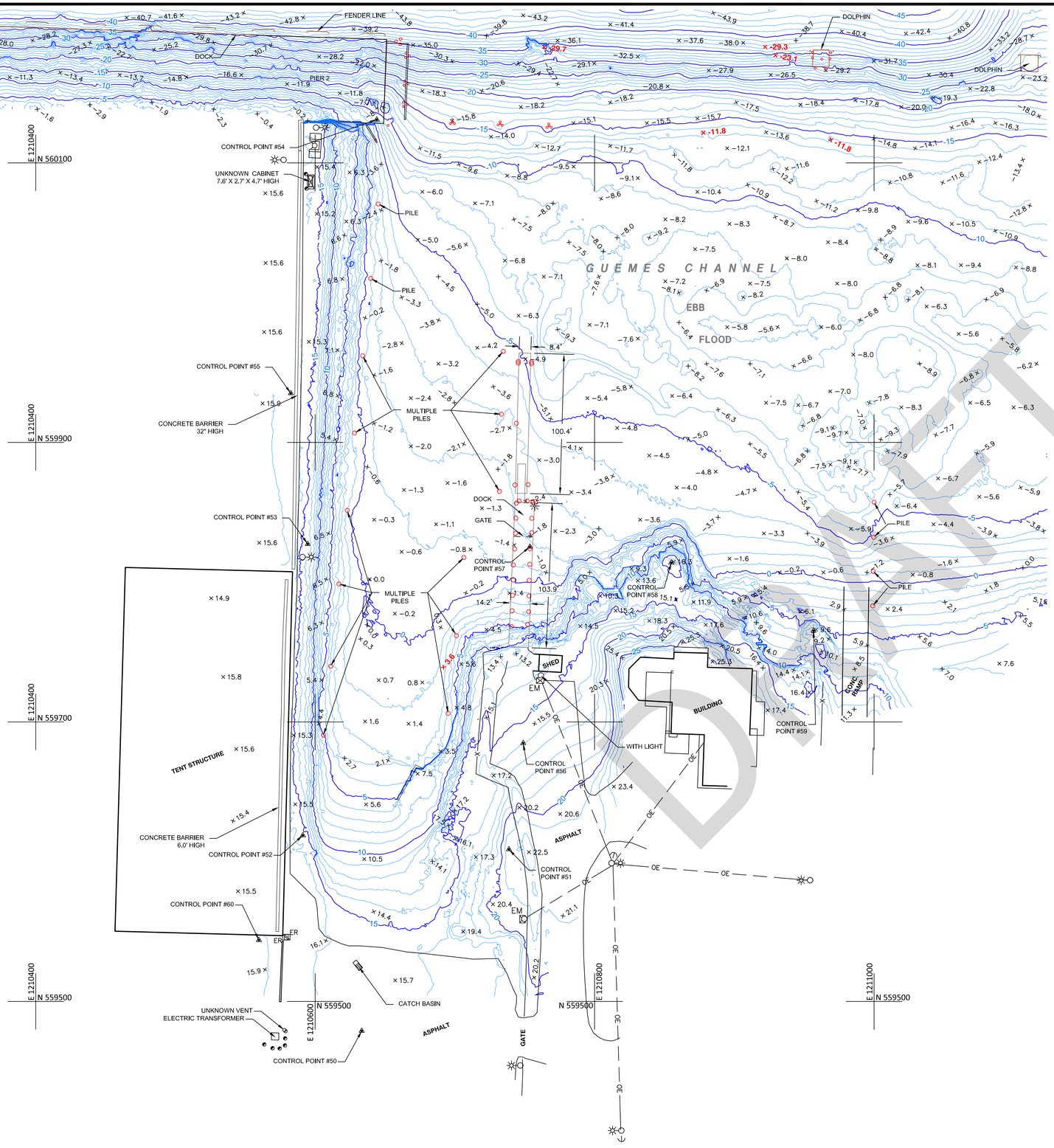
GeoEngineers

Figure 91

P:\5\5147016\GIS\5147016_Project\5147016_Project.aprx\5147016B_F91_ProposedInterimAction Date Exported: 01/07/26 by maugust

Bathymetric Survey

DRAFT



NOTES:

1. THIS DRAWING PRESENTS THE RESULTS OF A 2014 MULTIBEAM BATHYMETRIC AND A MAY 2015 3D TERRESTRIAL SCANNER SURVEY CONDUCTED BY THE MARINE SERVICES AND GEOMATICS DIVISION OF DAVID EVANS AND ASSOCIATES, INC. (DEA).
2. DATE OF SURVEY: UPLAND SURVEY APRIL 23, 2015, BATHYMETRIC SURVEY JUNE 26, 2014.
3. HORIZONTAL DATUM: NORTH AMERICAN DATUM OF 1983 WITH THE 2011 ADJUSTMENT (NAD83/11) STATE PLANE COORDINATE SYSTEM (SPCS), WASHINGTON NORTH ZONE BASED ON SURVEY CONTROL SUPPLIED TO DEA FROM WH PACIFIC.
4. VERTICAL DATUM: MEAN LOWER LOW WATER (MLLW) ON NOAA TIDAL DATUM EPOCH 1941-1959, BASED ON PORT OF ANACORTES SURVEY PROVIDED TO DEA BY WH PACIFIC.
5. UNITS: U.S. FEET.
6. THIS HYDROGRAPHIC SURVEY WAS COLLECTED IN ACCORDANCE TO THE U.S. ARMY CORPS OF ENGINEERS (USACE) HYDROGRAPHIC SURVEYING MANUAL EM1110-2-1003 DATED JANUARY 2002.
7. THIS BATHYMETRIC SURVEY IS REPRESENTATIVE OF THE CONDITION OF THE BOTTOM AT THE TIME OF THE SURVEY; THE CONDITION OF THE SEAFLOOR MAY CHANGE AT ANY TIME AFTER THE DATE OF THIS SURVEY.

CONTROL USED:

SURVEY CONTROL AS PROVIDED BY THE PORT OF ANACORTES:

JETTY-2 (RTK-GPS BASE)
2" BRASS CAP WITH NO STAMP
N: 556042.54
E: 1210661.63
Z: 12.49 (MLLW)

DHA 1723-22
PK NAIL
N: 559404.80
E: 1210236.68
Z: 14.97 (MLLW)

DHA 1723-26
PK NAIL
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

#50
MAG NAIL & WASHER
N: 559478.92
E: 1210633.31
Z: 15.94 (MLLW)

#51
HUB & TACK
N: 559608.81
E: 1210738.69
Z: 21.74 (MLLW)

#52
HUB & TACK
N: 559618.82
E: 1210591.18
Z: 15.68 (MLLW)

#53
HUB & TACK
N: 559827.26
E: 1210594.70
Z: 14.31 (MLLW)

#54
MAG NAIL & WASHER
N: 560130.97
E: 1210644.08
Z: 16.12 (MLLW)

#55
PK NAIL
N: 559935.11
E: 1210582.58
Z: 15.99 (MLLW)

#56
MAG NAIL & WASHER
N: 559684.83
E: 1210748.91
Z: 16.00 (MLLW)

#57
SPIKE
N: 559825.33
E: 1210753.73
Z: 12.84 (MLLW)

#58
"X" ON BOULDER
N: 559813.96
E: 1210854.88
Z: 16.14 (MLLW)

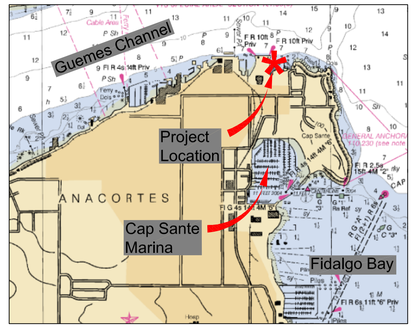
#59
"X" ON BOULDER
N: 559765.24
E: 1210956.71
Z: 10.07 (MLLW)

#60
MAG NAIL & WASHER
N: 559543.87
E: 1210559.74
Z: 15.88 (MLLW)

LEGEND:

- GENERAL OUTLINE OF MARINE STRUCTURES DETERMINED FROM MOBILE LASER SCANNING SYSTEM IN 2009
- GENERAL OUTLINE OF STRUCTURES PROVIDED BY THE PORT OF ANACORTES
- OE — OVERHEAD POWER
- FENCE
- LEAST DEPTH ON UNKNOWN OBJECT ABOVE CONTOURED SURFACE
- 1 FOOT CONTOUR INTERVAL
- SPOT SOUNDING
- 5 FOOT CONTOUR INTERVAL
- FM — ELECTRIC METER
- ELECTRIC CABINET
- ELECTRIC POLE
- ELECTRIC POLE WITH LIGHT
- GUY ANCHOR
- BOLLARD
- FR — ELECTRIC RISER
- CONTROL POINT PK NAIL
- CONTROL POINT AS NOTED
- FIRE HYDRANT

VICINITY MAP



NORTH
0 20 40 80
SCALE FEET

THIS HYDROGRAPHIC SURVEY WAS COMPLETED UNDER THE DIRECTION OF A NATIONAL SOCIETY OF PROFESSIONAL SURVEYORS/THE HYDROGRAPHIC SOCIETY OF AMERICA, CERTIFIED HYDROGRAPHER.

GREGORY P. BAIRD,
NSPS/THSOA CERTIFIED HYDROGRAPHER (261)

SURVEYOR'S CERTIFICATION:
I, GREGORY P. BAIRD, A REGISTERED PROFESSIONAL LAND SURVEYOR IN THE STATE OF WASHINGTON (REG NO. 48744), HEREBY CERTIFY THAT THIS BATHYMETRIC SURVEY WAS PERFORMED UNDER MY DIRECTION AND THAT THE CONTOURS SHOWN HEREON ARE ACCURATELY DEPICTED, UNLESS OTHERWISE NOTED.

GREGORY P. BAIRD, P.L.S.

TOPOGRAPHIC & BATHYMETRIC CONTOURS
PORT OF ANACORTES
PIER 2 LOG HAUL OUT
SHORELINE TOPOGRAPHIC SURVEY
ANACORTES, WASHINGTON

AGREEMENT FOR PROFESSIONAL SERVIDES #21-00-B TASK ORDER #04-15

DAVID EVANS AND ASSOCIATES INC.
MARINE SERVICES
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

DATE: JUNE 11, 2015
DESIGN: GPB
DRAWN: KMD
CHECKED: DDHA
REVISION NUMBER:

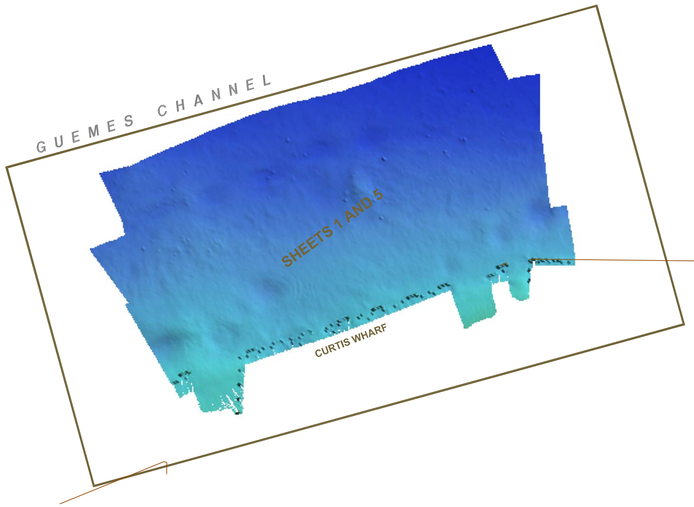
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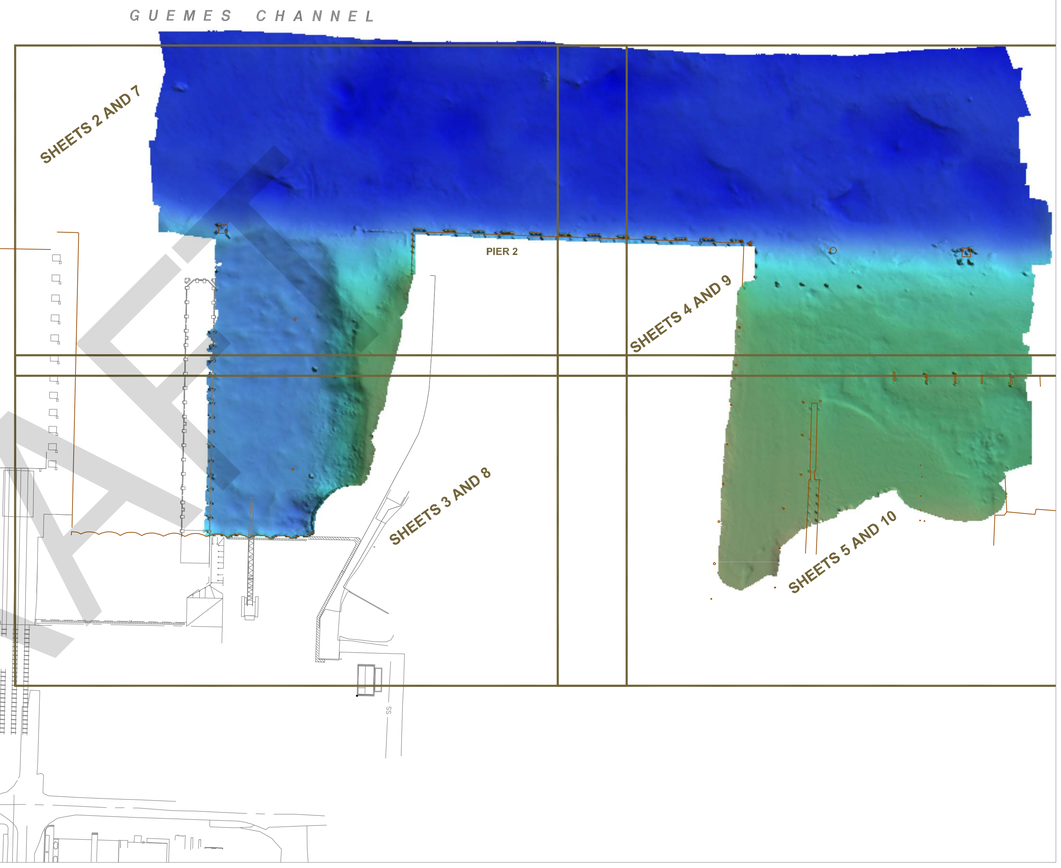
PROJECT NUMBER:
POAN0000-0010

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SHEET NO.
1
OF 1

By: Kyle McNaught-Davis
By: Kmd
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Plot Date: 6/11/2015 4:02 PM
Save Date: 6/11/2015 4:01 PM





DRAFT

BATHYMETRIC SURVEY

PORT OF ANACORTES
PIER 2 AND CURTIS WHARF

ANACORTES, WASHINGTON

GREGORY BAIRD — STATE OF WASHINGTON — 21847 — REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

NOTES

1. This drawing presents the results of a multibeam bathymetric survey conducted by the Marine Services Division of David Evans and Associates, Inc. (DEA).
2. Date of survey: March 28, 2012.
3. Horizontal datum: North American Datum of 1983 with the 1991 adjustment (NAD83/91) State Plane Coordinate System (SPCS), Washington North Zone based on Port of Anacortes survey control monument "JETTY-2".
4. Vertical datum: Mean Lower Low Water (MLLW) on NOAA tidal datum epoch 1941-1959, based on Port of Anacortes survey control monument "JETTY-2".
5. Units: U.S. Feet.
6. The data was thinned to a 1.64 foot grid, using an inverse distance weighted algorithm.
7. The sun-illuminated image was generated from a Digital Terrain Model (DTM) based on a 0.5 meter grid of multibeam data in Caris HIPS software. Illumination angles and color scale are shown in the legend.
8. Water surface elevations were obtained from a Trimble SPS-751 RTK-GPS. A Trimble SPS-851 RTK-GPS base station was deployed to provide real-time GPS correctors.
9. Bathymetric data was collected using a RESON Seabat 7101 multibeam sonar operating at 240 kHz, with an Applanix POS/MV combined kinematic GPS and inertial positioning and motion reference system for vessel attitude and heave.
10. This hydrographic survey was collected in accordance to the U.S. Army Corps Of Engineers (USACE) hydrographic surveying manual EM1110-2-1003 dated January 2002.
11. This bathymetric survey is representative of the condition of the bottom at the time of the survey; the condition of the seafloor may change at any time after the date of this survey.
12. Planimetric data is provided for reference only and should not be used for engineering or design.

This hydrographic survey was completed under the direction of an American Congress on Surveying and Mapping (ACSM) certified hydrographer.

Benjamin L. Hocker
ACSM Certified Hydrographer, No. 263

CONTROL

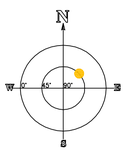
Survey Control as provided by the Port of Anacortes:

JETTY-2 (RTK-GPS Base)
2" Brass cap with no stamp
N: 556042.54
E: 1210661.63
Z: 12.49 (MLLW)

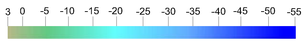
DHA 1723-22
PK Nail
N: 559404.80
E: 1210236.68
Z: 14.97 (MLLW)

DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

HILLSHADE INFORMATION



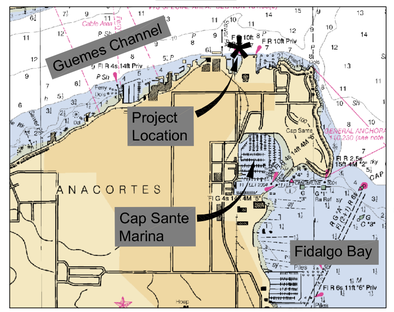
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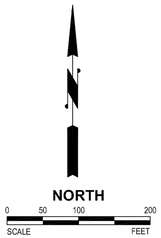


LEGEND

General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

VICINITY MAP





REVISIONS:	APPD.

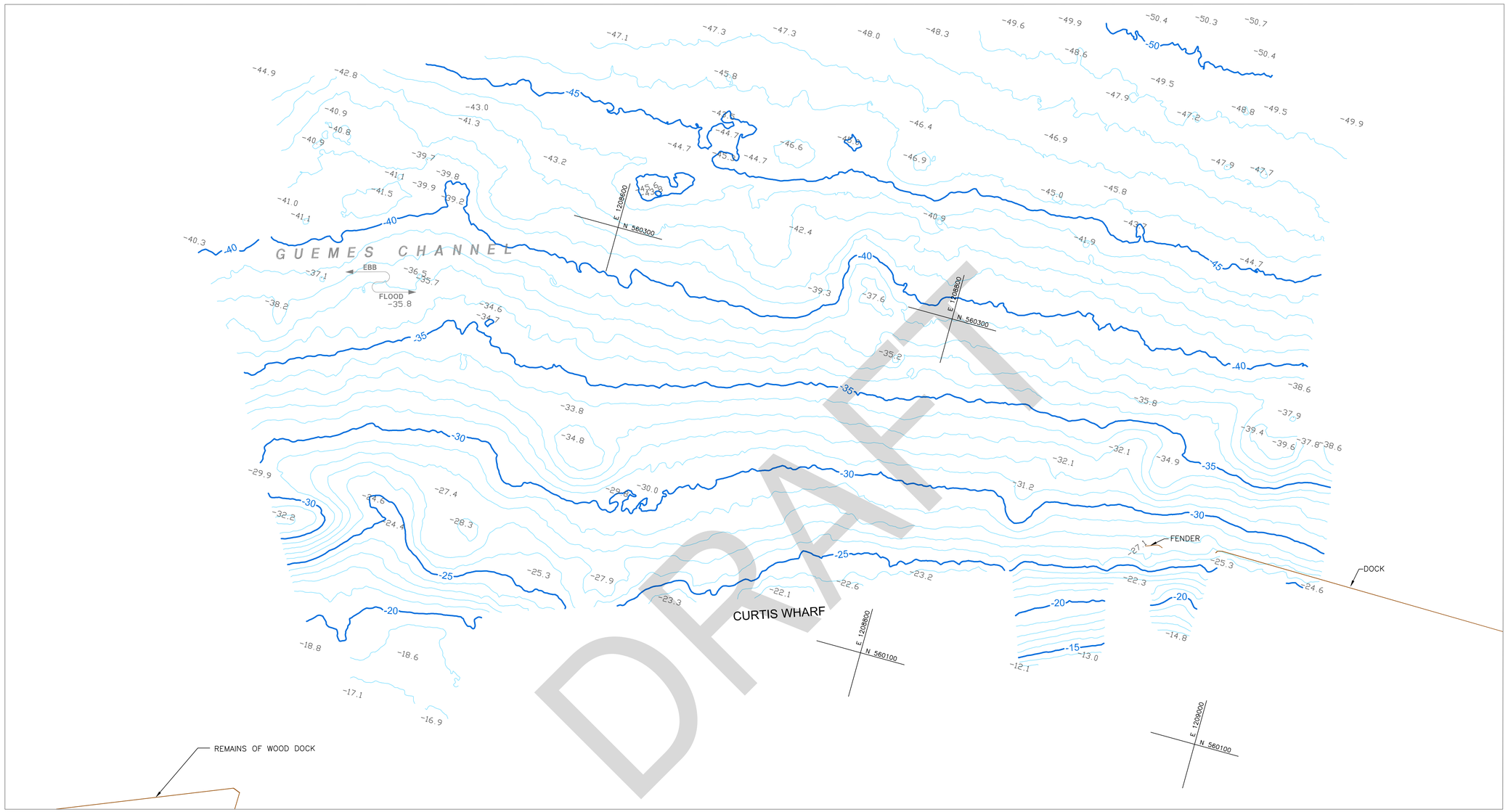
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DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE:

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
INDEX
OF



NOTES

1. This drawing presents the results of a multibeam bathymetric survey conducted by the Marine Services Division of David Evans and Associates, Inc. (DEA).
2. Date of survey: March 28, 2012.
3. Horizontal datum: North American Datum of 1983 with the 1991 adjustment (NAD83/91) State Plane Coordinate System (SPCS), Washington North Zone based on Port of Anacortes survey control monument "JETTY-2".
4. Vertical datum: Mean Lower Low Water (MLLW) on NOAA tidal datum epoch 1941-1959, based on Port of Anacortes survey control monument "JETTY-2".
5. Units: U.S. Feet.
6. The data was thinned to a 1.64 foot grid, using an inverse distance weighted algorithm.
7. Contour interval: 1 foot.
8. Bathymetric data was collected using a RESON Seabat 7101 multibeam sonar operating at 240 kHz, with an Applanix POS/MV combined kinematic GPS and inertial positioning and motion reference system for vessel attitude and heave.
9. Water surface elevations were obtained from a Trimble SPS-751 RTK-GPS. A Trimble SPS-851 RTK-GPS base station was deployed to provide real-time GPS correctors.
10. Spot soundings are positioned at the decimal point.
11. This hydrographic survey was collected in accordance to the U.S. Army Corps Of Engineers (USACE) hydrographic surveying manual EM1110-2-1003 dated January 2002.
12. This bathymetric survey is representative of the condition of the bottom at the time of the survey; the condition of the seafloor may change at any time after the date of this survey.
13. Planimetric data is provided for reference only and should not be used for engineering or design.

CONTROL

Survey Control as provided by the Port of Anacortes:

JETTY-2 (RTK-GPS Base)
2" Brass cap with no stamp
N: 556042.54
E: 1210661.63
Z: 12.49 (MLLW)

DHA 1723-22
PK Nail
N: 559404.80
E: 1210236.68
Z: 14.97 (MLLW)

DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

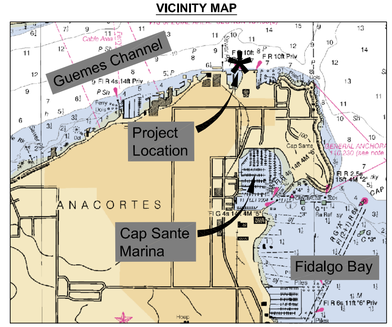
LEGEND

1 Foot Contour Interval
-5 5 Foot Contour Interval
-6.2 Spot Sounding (Location At Decimal)
General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

This hydrographic survey was completed under the direction of an American Congress on Surveying and Mapping (ACSM) certified hydrographer.

Benjamin L. Hocker
ACSM Certified Hydrographer, No. 263

VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

BATHYMETRIC CONTOURS
PORT OF ANACORTES
PIER 2 AND CURTIS WHARF
ANACORTES, WASHINGTON

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

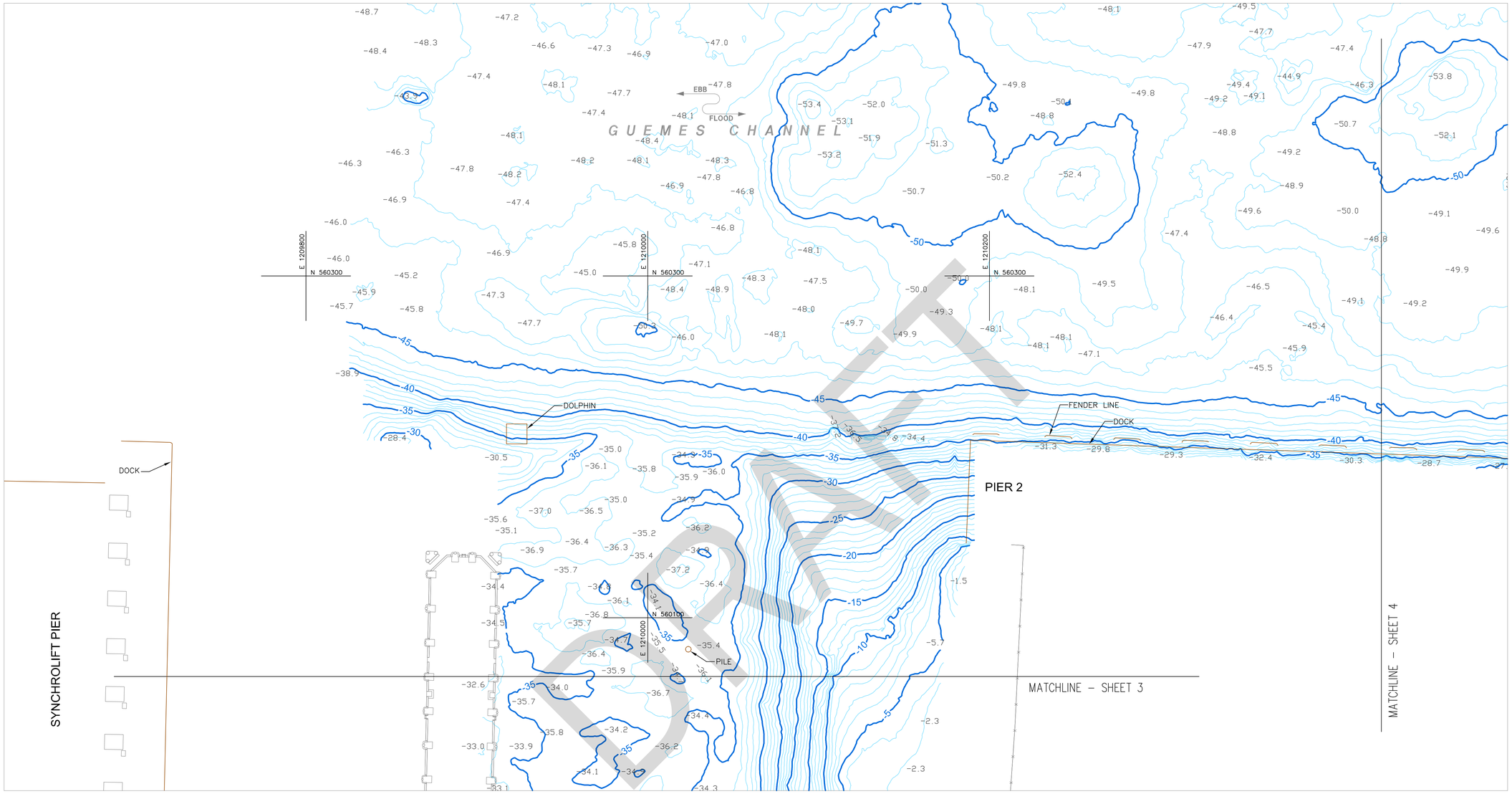
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DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
1
OF 10



DRAFT

NOTES

1. This drawing presents the results of a multibeam bathymetric survey conducted by the Marine Services Division of David Evans and Associates, Inc. (DEA).
2. Date of survey: March 28, 2012.
3. Horizontal datum: North American Datum of 1983 with the 1991 adjustment (NAD83/91) State Plane Coordinate System (SPCS), Washington North Zone based on Port of Anacortes survey control monument "JETTY-2".
4. Vertical datum: Mean Lower Low Water (MLLW) on NOAA tidal datum epoch 1941-1959, based on Port of Anacortes survey control monument "JETTY-2".
5. Units: U.S. Feet.
6. The data was thinned to a 1.64 foot grid, using an inverse distance weighted algorithm.
7. Contour interval: 1 foot.
8. Bathymetric data was collected using a RESON Seabat 7101 multibeam sonar operating at 240 kHz, with an Applanix POS/MV combined kinematic GPS and inertial positioning and motion reference system for vessel attitude and heave.
9. Water surface elevations were obtained from a Trimble SPS-751 RTK-GPS. A Trimble SPS-851 RTK-GPS base station was deployed to provide real-time GPS correctors.
10. Spot soundings are positioned at the decimal point.
11. This hydrographic survey was collected in accordance to the U.S. Army Corps Of Engineers (USACE) hydrographic surveying manual EM1110-2-1003 dated January 2002.
12. This bathymetric survey is representative of the condition of the bottom at the time of the survey; the condition of the seafloor may change at any time after the date of this survey.
13. Planimetric data is provided for reference only and should not be used for engineering or design.

CONTROL

Survey Control as provided by the Port of Anacortes:

JETTY-2 (RTK-GPS Base)
2" Brass cap with no stamp
N: 556042.54
E: 1210661.63
Z: 12.49 (MLLW)

DHA 1723-22
PK Nail
N: 559404.80
E: 1210236.68
Z: 14.97 (MLLW)

DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

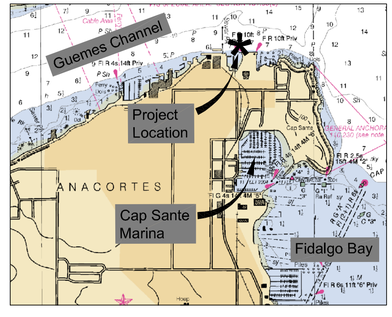
LEGEND

1 Foot Contour Interval
-5 5 Foot Contour Interval
-6.2 Spot Sounding (Location At Decimal)
General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

This hydrographic survey was completed under the direction of an American Congress on Surveying and Mapping (ACSM) certified hydrographer.

Benjamin L. Hocker
ACSM Certified Hydrographer, No. 263

VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

BATHYMETRIC CONTOURS
PORT OF ANACORTES
PIER 2 AND CURTIS WHARF
ANACORTES, WASHINGTON

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

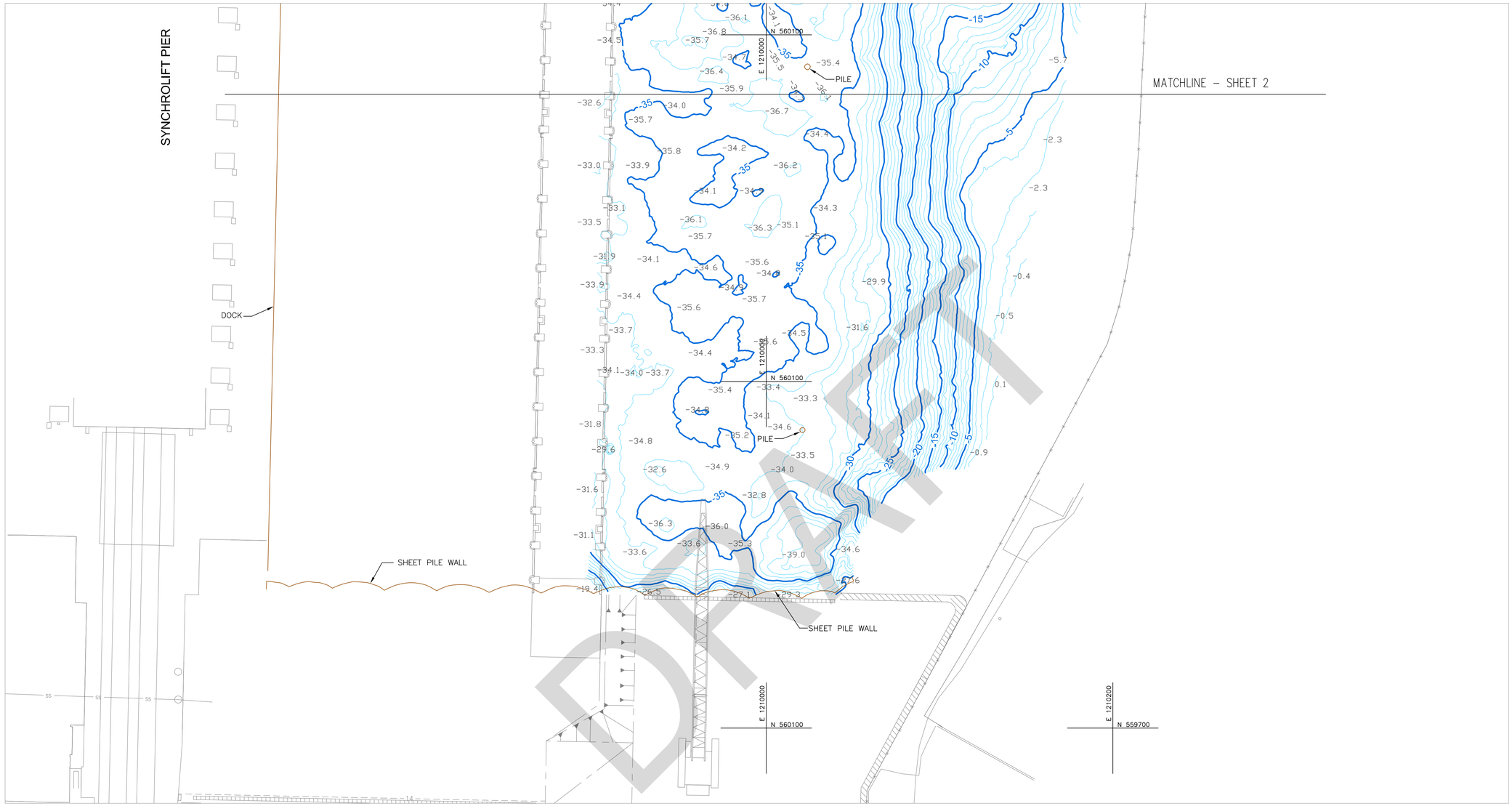
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DESIGN:
DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
2
OF 10



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DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

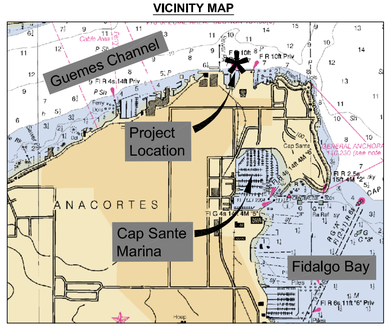
LEGEND

- 1 Foot Contour Interval
- -5 — 5 Foot Contour Interval
- -6.2 — Spot Sounding (Location At Decimal)
- General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

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Benjamin L. Hocker
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VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

BATHYMETRIC CONTOURS
PORT OF ANACORTES
PIER 2 AND CURTIS WHARF
ANACORTES, WASHINGTON

CHRISTOPHER BAIRD — STATE OF WASHINGTON — 22474 — REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

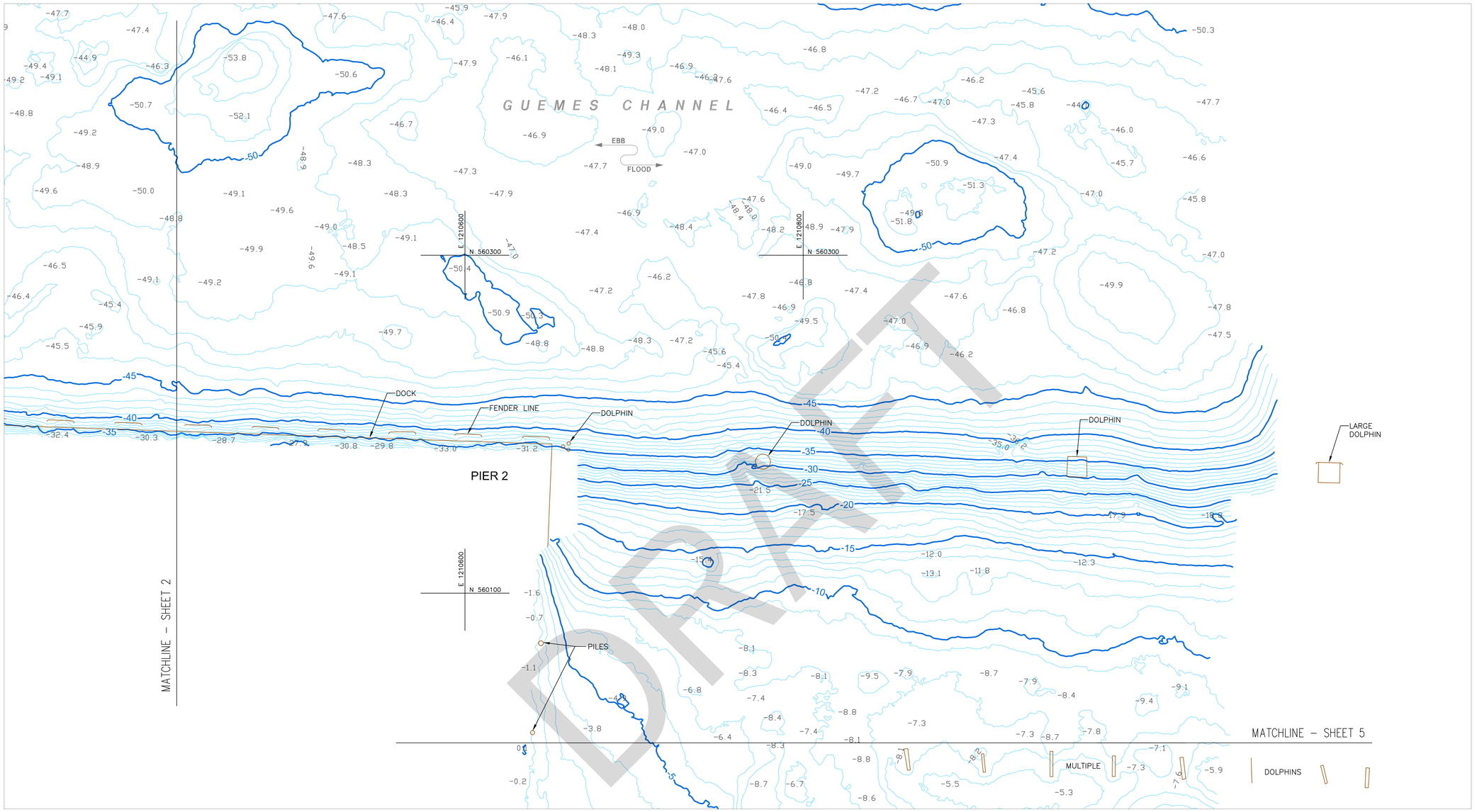
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DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
3
OF 10



DRAFT

NOTES

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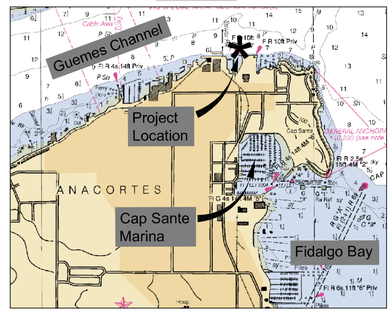
LEGEND

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Benjamin L. Hocker
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VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

BATHYMETRIC CONTOURS
PORT OF ANACORTES
PIER 2 AND CURTIS WHARF
ANACORTES, WASHINGTON

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

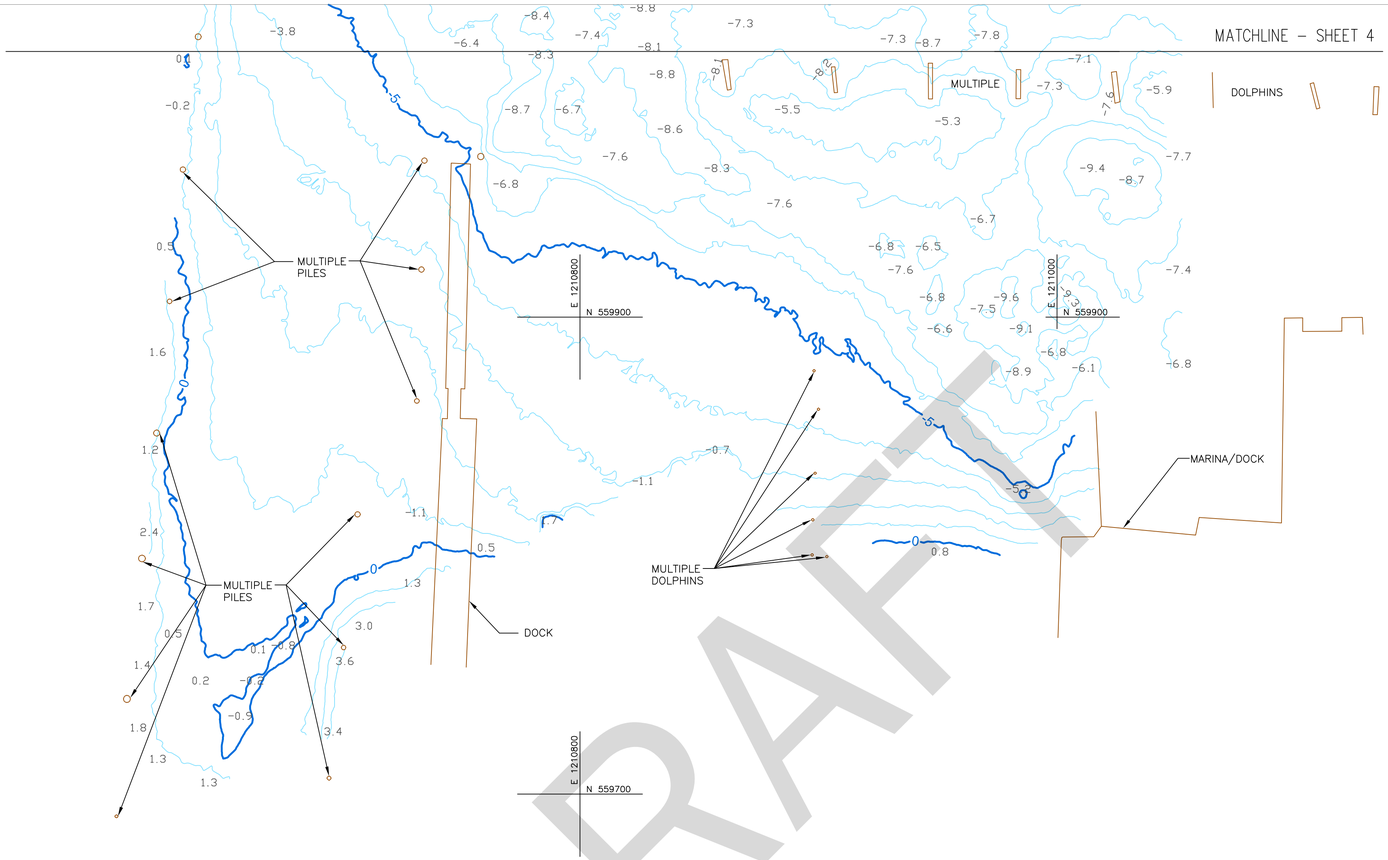
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DESIGN:
DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
4
OF 10



DRAFT

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Z: 14.97 (MLLW)

DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

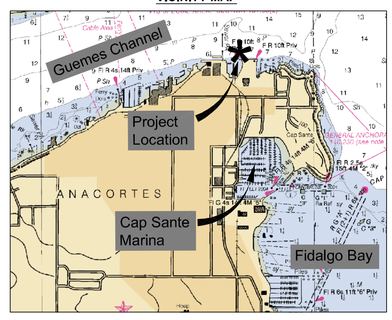
LEGEND

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General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

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VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

BATHYMETRIC CONTOURS
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Phone: 360.314.3200

REVISIONS: APPD.

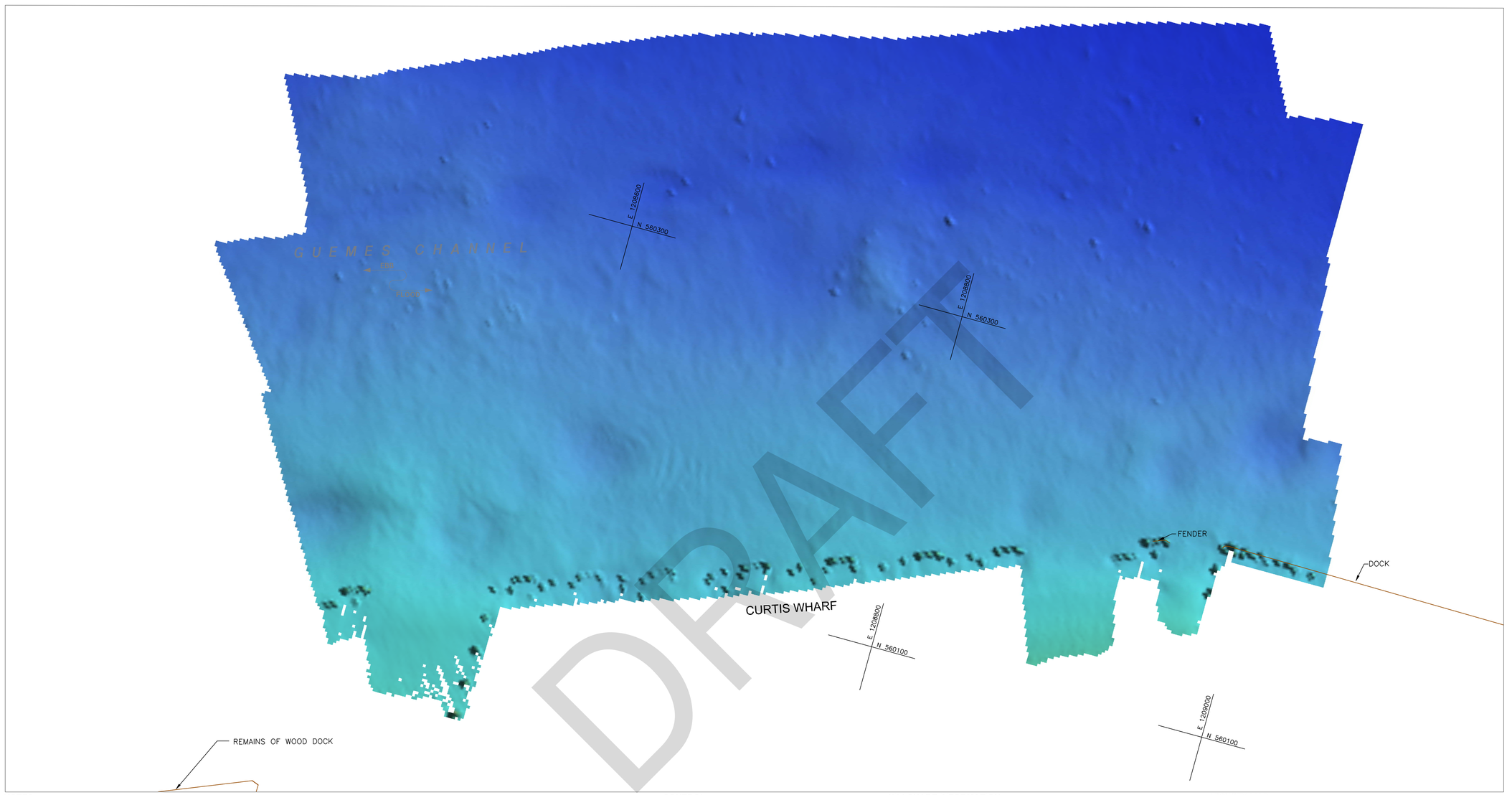
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DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
5
OF 10



DRAFT

SUN-ILLUMINATED IMAGE

PORT OF ANACORTES
PIER 2 AND CURTIS WHARF

ANACORTES, WASHINGTON

GREGORY BAIRD — STATE OF WASHINGTON — 22447 — REGISTERED PROFESSIONAL LAND SURVEYOR

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5. Units: U.S. Feet.
6. The data was thinned to a 1.64 foot grid, using an inverse distance weighted algorithm.
7. The sun-illuminated image was generated from a Digital Terrain Model (DTM) based on a 0.5 meter grid of multibeam data in Caris HIPS software. Illumination angles and color scale are shown in the legend.
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Benjamin L. Hocker
ACSM Certified Hydrographer, No. 263

CONTROL

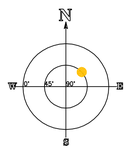
Survey Control as provided by the Port of Anacortes:

JETTY-2 (RTK-GPS Base)
2" Brass cap with no stamp
N: 556042.54
E: 1210661.63
Z: 12.49 (MLLW)

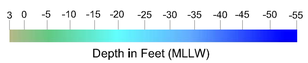
DHA 1723-22
PK Nail
N: 559404.80
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Z: 14.97 (MLLW)

DHA 1723-26
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N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

HILLSHADE INFORMATION



Hillshade image illumination based on Sun azimuth from 45° at an elevation of 45°.

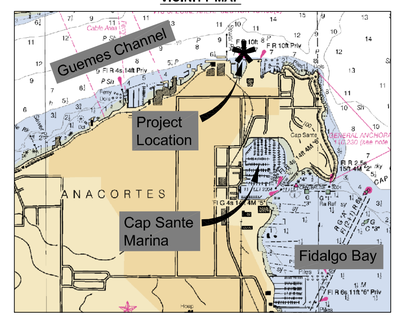


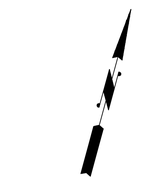
Depth in Feet (MLLW)

LEGEND

General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

VICINITY MAP





REVISIONS: APPD.

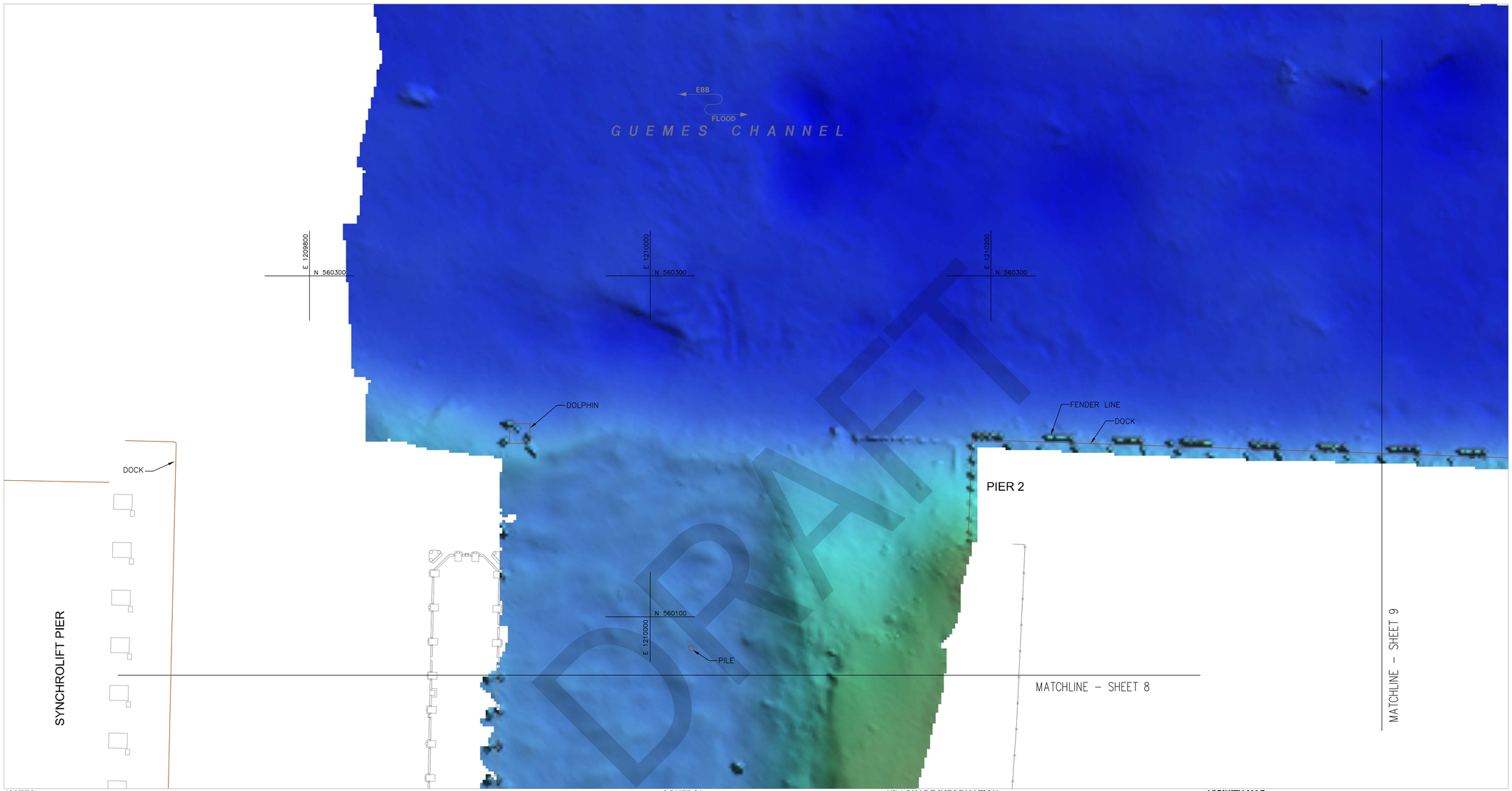
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DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
6
OF 10



SUN-ILLUMINATED IMAGE

PORT OF ANACORTES
PIER 2 AND CURTIS WHARF

ANACORTES, WASHINGTON

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CONTROL

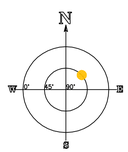
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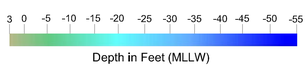
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DHA 1723-26
PK Nail
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HILLSHADE INFORMATION



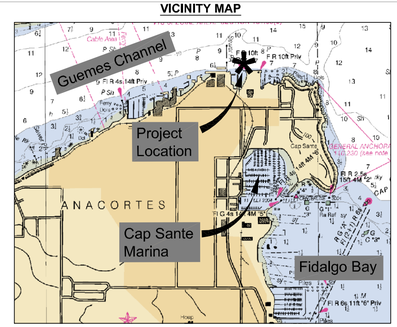
Hillshade image illumination based on Sun azimuth from 45° at an elevation of 45°.



LEGEND

General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

REVISIONS:	APPD.

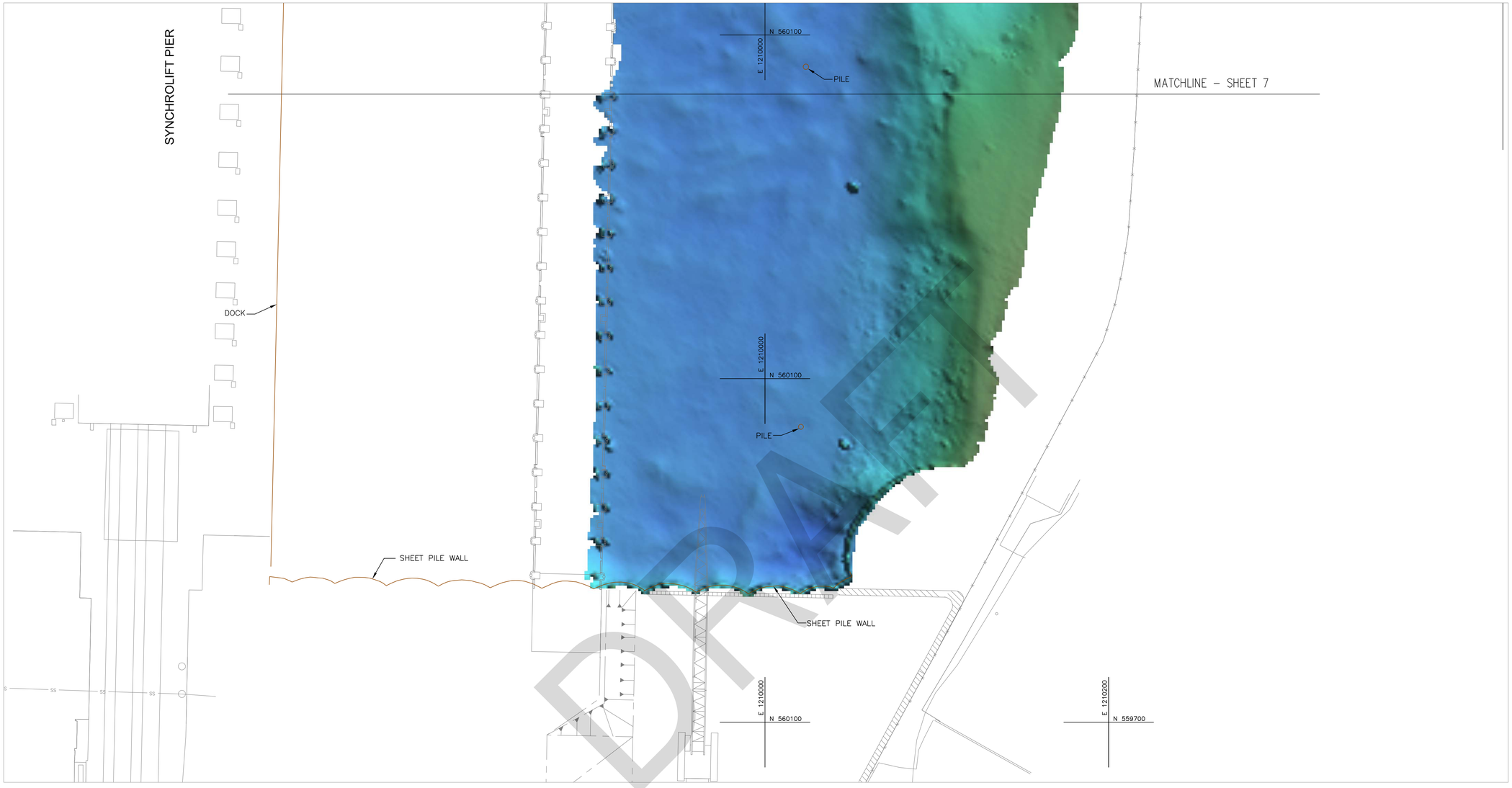
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DESIGN:
DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
7
OF 10



DRAFT

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7. The sun-illuminated image was generated from a Digital Terrain Model (DTM) based on a 0.5 meter grid of multibeam data in Caris HIPS software. Illumination angles and color scale are shown in the legend.
8. Water surface elevations were obtained from a Trimble SPS-751 RTK-GPS. A Trimble SPS-851 RTK-GPS base station was deployed to provide real-time GPS correctors.
9. Bathymetric data was collected using a RESON Seabat 7101 multibeam sonar operating at 240 kHz, with an Applanix POS/MV combined kinematic GPS and inertial positioning and motion reference system for vessel attitude and heave.
10. This hydrographic survey was collected in accordance to the U.S. Army Corps Of Engineers (USACE) hydrographic surveying manual EM1110-2-1003 dated January 2002.
11. This bathymetric survey is representative of the condition of the bottom at the time of the survey; the condition of the seafloor may change at any time after the date of this survey.
12. Planimetric data is provided for reference only and should not be used for engineering or design.

This hydrographic survey was completed under the direction of an American Congress on Surveying and Mapping (ACSM) certified hydrographer.

Benjamin L. Hocker
ACSM Certified Hydrographer, No. 263

CONTROL

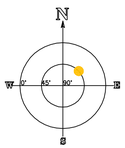
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Z: 12.49 (MLLW)

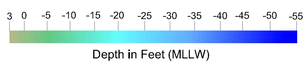
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PK Nail
N: 559404.80
E: 1210236.68
Z: 14.97 (MLLW)

DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

HILLSHADE INFORMATION



Hillshade image illumination based on Sun azimuth from 45° at an elevation of 45°.

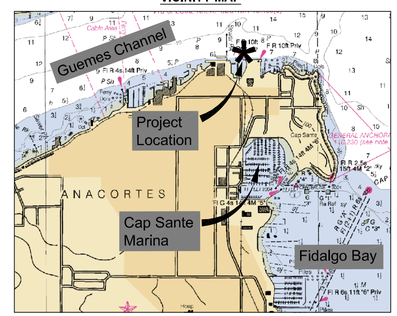


Depth in Feet (MLLW)

LEGEND

General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

VICINITY MAP



NORTH
0 15 30 60
SCALE FEET

SUN-ILLUMINATED IMAGE

PORT OF ANACORTES
PIER 2 AND CURTIS WHARF

ANACORTES, WASHINGTON

GREGORY BAIRD
STATE OF WASHINGTON
25744
REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

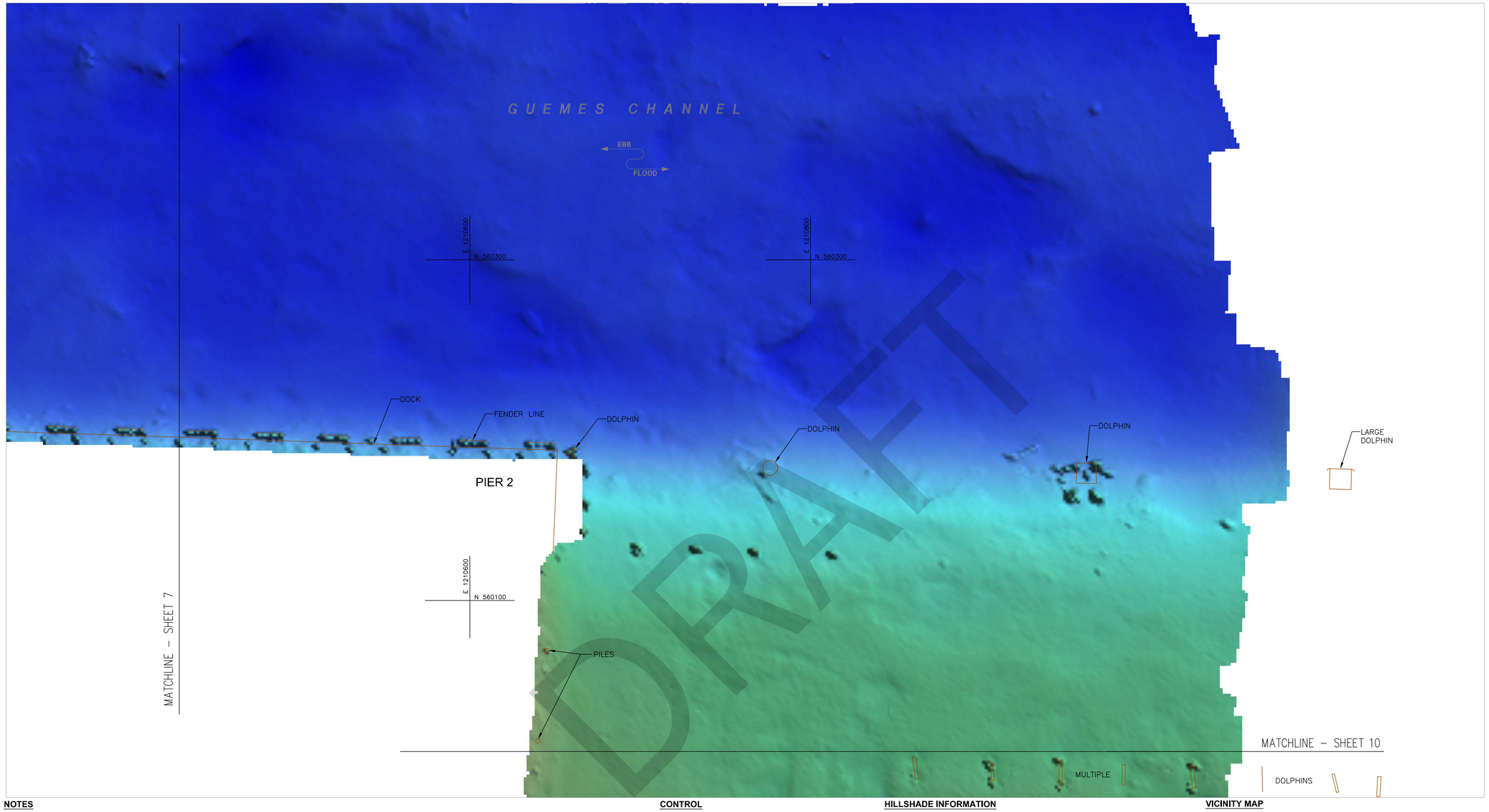
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DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
8
OF 10



SUN-ILLUMINATED IMAGE

PORT OF ANACORTES
PIER 2 AND CURTIS WHARF

ANACORTES, WASHINGTON

GREGORY BAIRD — STATE OF WASHINGTON — 21672 — REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

DATE: 04/18/12
DESIGN:
DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER: POAN0000-0007

DRAWING FILE: POAN00000007

SHEET NO. 9 OF 10

NOTES

1. This drawing presents the results of a multibeam bathymetric survey conducted by the Marine Services Division of David Evans and Associates, Inc. (DEA).
2. Date of survey: March 28, 2012.
3. Horizontal datum: North American Datum of 1983 with the 1991 adjustment (NAD83/91) State Plane Coordinate System (SPCS), Washington North Zone based on Port of Anacortes survey control monument "JETTY-2".
4. Vertical datum: Mean Lower Low Water (MLLW) on NOAA tidal datum epoch 1941-1959, based on Port of Anacortes survey control monument "JETTY-2".
5. Units: U.S. Feet.
6. The data was thinned to a 1.64 foot grid, using an inverse distance weighted algorithm.
7. The sun-illuminated image was generated from a Digital Terrain Model (DTM) based on a 0.5 meter grid of multibeam data in Caris HIPS software. Illumination angles and color scale are shown in the legend.
8. Water surface elevations were obtained from a Trimble SPS-751 RTK-GPS. A Trimble SPS-851 RTK-GPS base station was deployed to provide real-time GPS correctors.
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10. This hydrographic survey was collected in accordance to the U.S. Army Corps Of Engineers (USACE) hydrographic surveying manual EM1110-2-1003 dated January 2002.
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This hydrographic survey was completed under the direction of an American Congress on Surveying and Mapping (ACSM) certified hydrographer.

Benjamin L. Hocker
ACSM Certified Hydrographer, No. 263

CONTROL

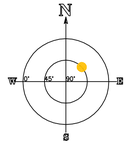
Survey Control as provided by the Port of Anacortes:

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Z: 12.49 (MLLW)

DHA 1723-22
PK Nail
N: 559404.80
E: 1210236.68
Z: 14.97 (MLLW)

DHA 1723-26
PK Nail
N: 559841.84
E: 1210232.19
Z: 15.44 (MLLW)

HILLSHADE INFORMATION



Hillshade image illumination based on Sun azimuth from 45° at an elevation of 45°.

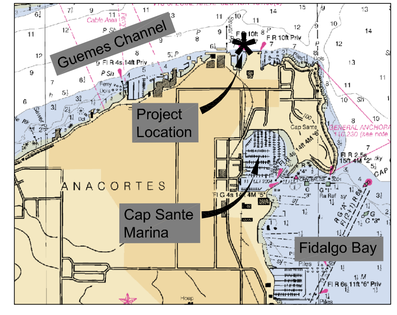
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Depth in Feet (MLLW)

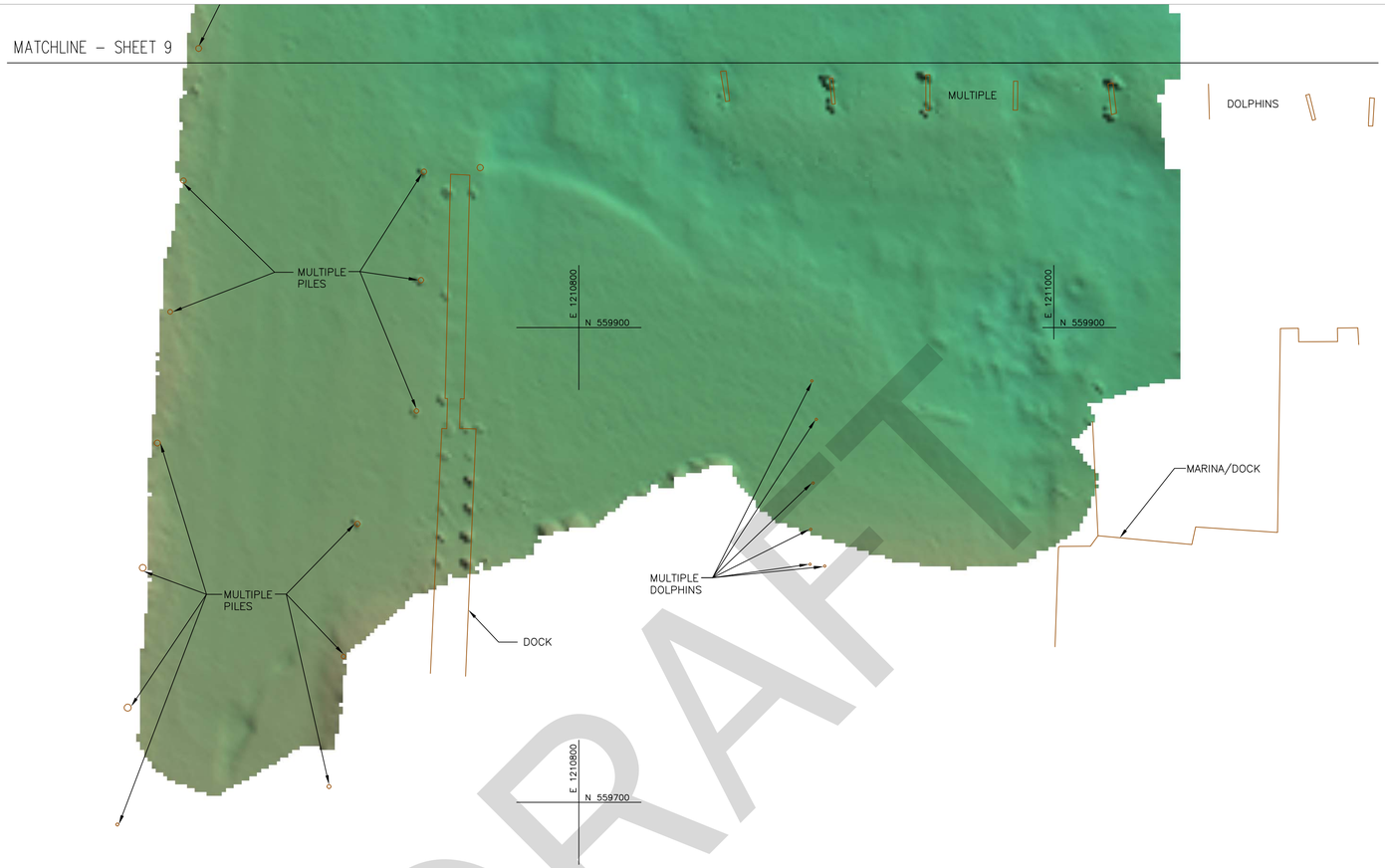
LEGEND

General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

VICINITY MAP



NORTH
0 15 30 60
SCALE FEET



DRAFT

NOTES

1. This drawing presents the results of a multibeam bathymetric survey conducted by the Marine Services Division of David Evans and Associates, Inc. (DEA).
2. Date of survey: March 28, 2012.
3. Horizontal datum: North American Datum of 1983 with the 1991 adjustment (NAD83/91) State Plane Coordinate System (SPCS), Washington North Zone based on Port of Anacortes survey control monument "JETTY-2".
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Benjamin L. Hocker
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CONTROL

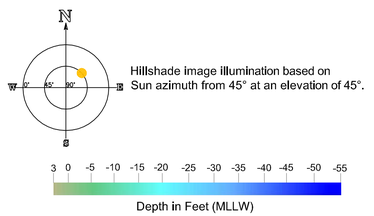
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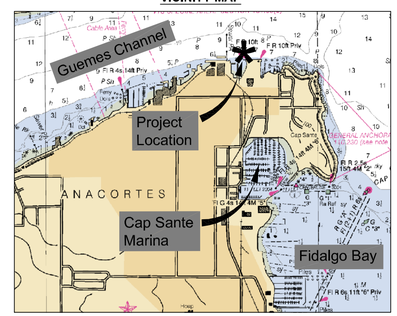
HILLSHADE INFORMATION



LEGEND

General Outline of Marine Structures Determined From Mobile Laser Scanning System in 2009

VICINITY MAP





SUN-ILLUMINATED IMAGE

PORT OF ANACORTES
PIER 2 AND CURTIS WHARF

ANACORTES, WASHINGTON

GREGORY BAIRD — STATE OF WASHINGTON — 21746 — REGISTERED PROFESSIONAL LAND SURVEYOR

DAVID EVANS AND ASSOCIATES INC.
2801 Southeast Columbia Way Suite 130
Vancouver Washington 98661
Phone: 360.314.3200

REVISIONS: APPD.

DATE: 04/18/12
DESIGN:
DRAWN: SNA/MJCH
CHECKED: GPB/BXHO
REVISION NUMBER:

SCALE: 1" = 30'

PROJECT NUMBER:
POAN0000-0007

DRAWING FILE:
POAN00000007

SHEET NO.
10
OF 10

Appendix B
Historical Photographs

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Circa 1917 aerial photograph of the Anacortes Lumber and Box Company along the Guemes Channel shoreline (courtesy of Port of Anacortes).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

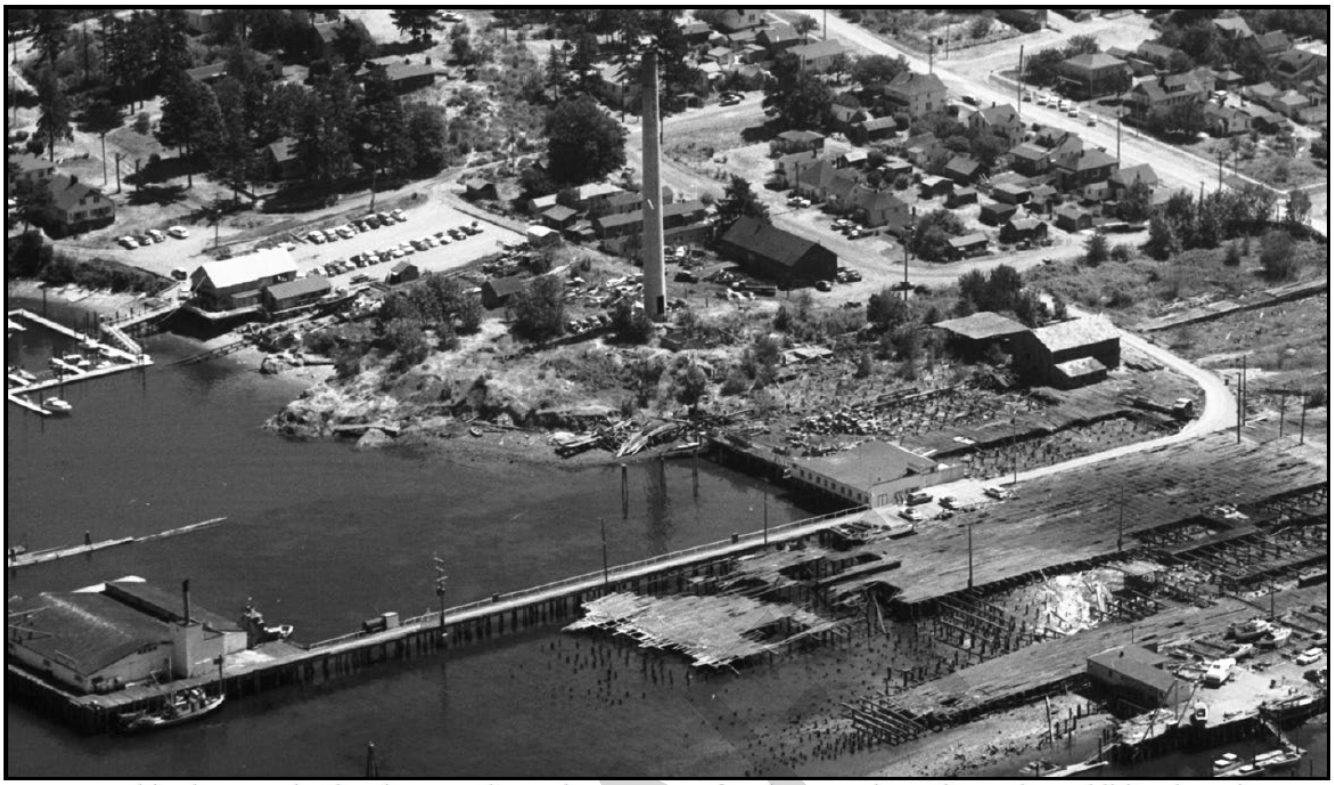
Historical Photograph – Circa 1917

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-1

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 1959 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (courtesy of Port of Anacortes).

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Notes:

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Data Source: Library of Congress

Historical Photograph – Circa 1959

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-2

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 1972 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (courtesy of Port of Anacortes).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1972

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-3

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 1975 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (courtesy of Port of Anacortes).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1975

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-4

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 1977 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (Washington State Department of Ecology – Costal Atlas).

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Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 1977

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-5

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 1994 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (Washington State Department of Ecology – Costal Atlas).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

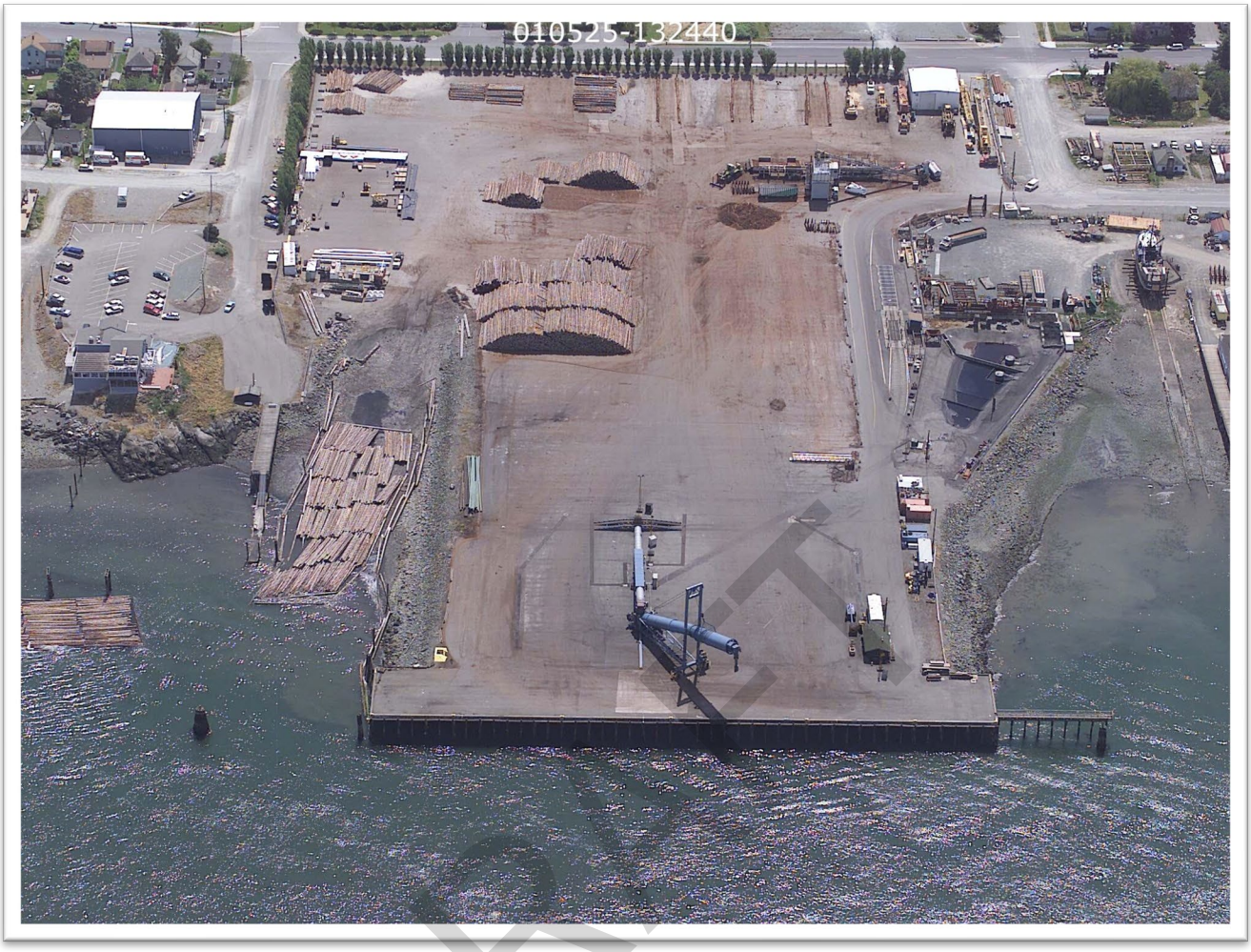
Historical Photograph – Circa 1994

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-6

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 2001 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (Washington State Department of Ecology – Costal Atlas).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 2001

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-6

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 2006 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (Washington State Department of Ecology – Costal Atlas).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 2006

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-8

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26



Circa 2016 aerial photograph of the Anacortes waterfront along the Guemes Channel shoreline (Washington State Department of Ecology – Shoreline Photo Viewer).

DRAFT

Notes:

1. This photo is for information purposes. It is intended to assist in showing Site and surrounding features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Library of Congress

Historical Photograph – Circa 2016

Anacortes Port Log Yard Site
Anacortes, Washington

GeoEngineers

Figure B-9

https://projects.geoengineers.com/sites/0514701615/IAWP/Historical Photos Date Exported: 04/03/26

Appendix C
Memorandum – Pier 61 Assessment

DRAFT

PND ENGINEERS, INC.

MEMORANDUM

To:	Jenkins Dossen, Port of Anacortes	Date:	November 29, 2017
From:	John Olson, PND Engineers, Inc.	Project No:	164027.00-2
Subject:	Secret Cove Pier 61 Assessment		

BACKGROUND

The Port is under an Agreed Order with Washington State Department of Ecology to conduct a cleanup project in the log pocket area, called Anacortes Port Log Yard, immediately adjacent and East of Pier 2. See ***Appendix A*** for aerial view of project area. PND was asked to make an assessment of the existing float, gangway and approach pier (cumulatively known as Pier 61) and evaluate how the cleanup might affect the structures.

Currently, the geotechnical information in the immediate area of Pier 61 is sparse. Soil sampling was limited to surface samples for contaminant testing. It is unclear what the overburden thickness is and the character and composition of the overburden soils and underlying bedrock. There is exposed bedrock along the shoreline indicating that shallow bedrock may be present. The existing pier is founded on driven creosote treated timber piles. The existing float is anchored with driven creosote treated timber piles. Based on our overburden thickness and shallow bedrock assumptions, these piles may only be embedded 10 to 15-ft in many cases. The condition of the timber piles is generally poor with significant section loss visible, from deterioration and marine borer damage. See photo log, attached as part of ***Appendix B***.

CONCLUSION

It is expected that the cleanup action will involve the removal of a significant amount of submerged sediment, replacement or capping with clean material. Removal of any material from the base of the piles would significantly reduce the capacity of the piles to support the weight of the structures and would likely result in structural failure.

As a result of this assessment and evaluation, the Port's question was if Pier 61 did not survive, what would the replacement cost be.

A major hurdle to the replacement structures is the ever expanding list of permitting restraints. Increasingly, agencies have been requiring 'grating' be included over a larger portion of overwater coverage area. Below are excerpts from the Washington Administrative Code.

> WAC 220-660-380 (F) & (G) and WAC 220-660-140 (E) & (F):
> A float six feet wide or less must have at least thirty percent of the entire deck surface covered in functional grating. A float between six and eight feet wide must have at least fifty percent of the entire deck surface covered in functional grating. Orient grating so the lengthwise opening

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> maximizes the amount of light penetration. Any objects that are not part of the structure on, above, or below the grating should not block light penetration. Flotation must be located under the solid decked area only. The grating material's open area must be at least 60%.

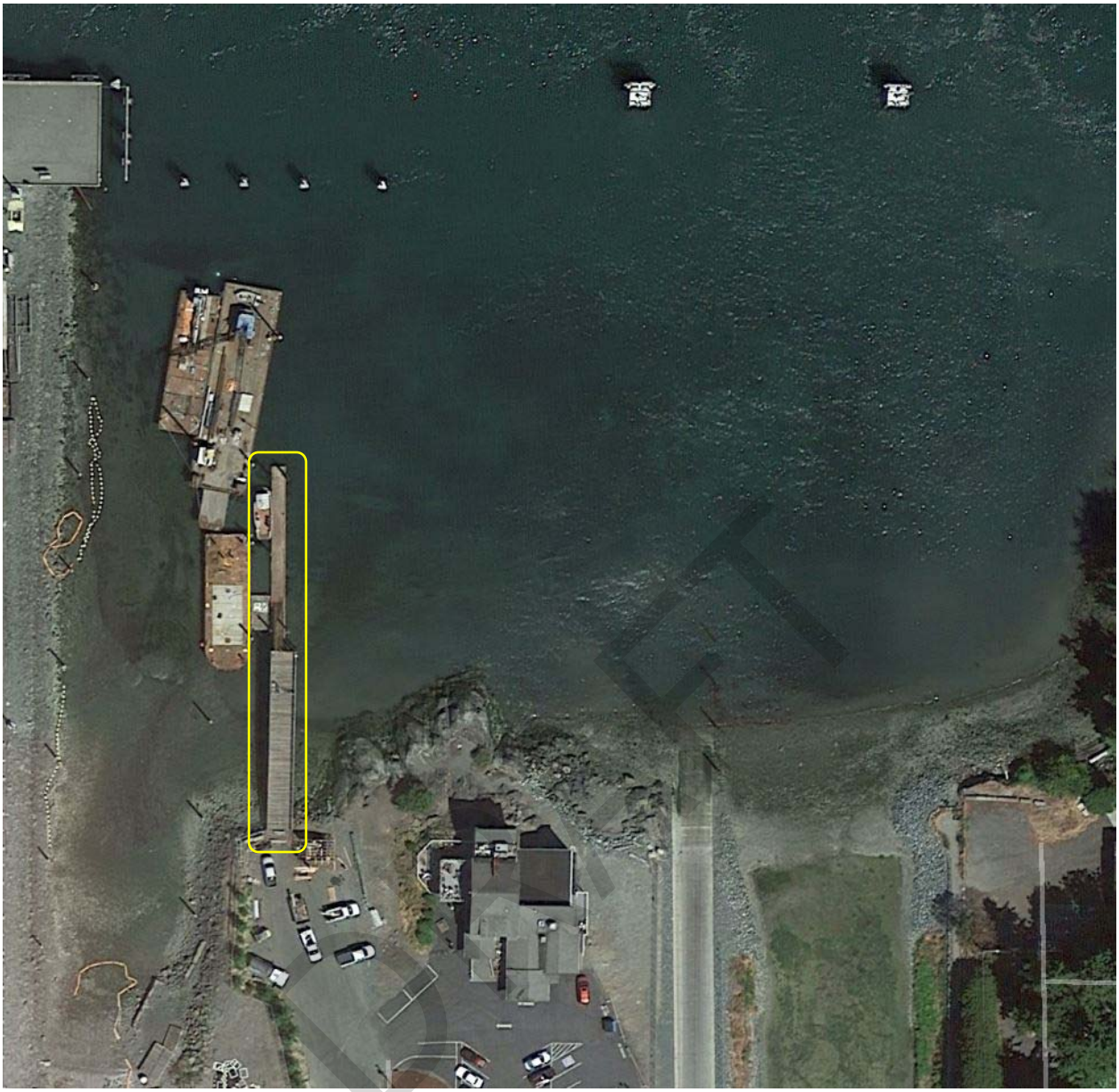
It may be very difficult to permit a new float this large without accommodating some form of a grating requirement.

PRELIMINARY COST ESTIMATE

A preliminary planning level construction cost estimate was prepared for replacement of the approach pier, gangway and float with structures of similar size and configuration, with required grating. The rough order of magnitude construction cost was estimated at approximately $1.44 million. This estimate assumes a construction contingency of 20%, which is appropriate for preliminary budgeting purposes.

It is noted that soft costs, including engineering design, permitting, geotechnical and soils testing, contract administration, management costs, etc. are not included in this estimate. These components would typically add 10% to 20% to the project cost depending on complexity, permitting and agency requirements, etc.

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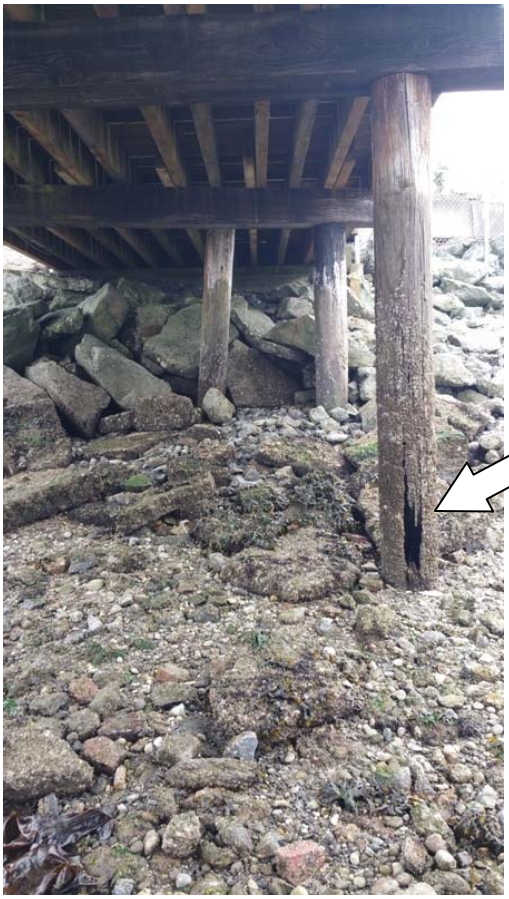
Appendix A: Aerial view of project area



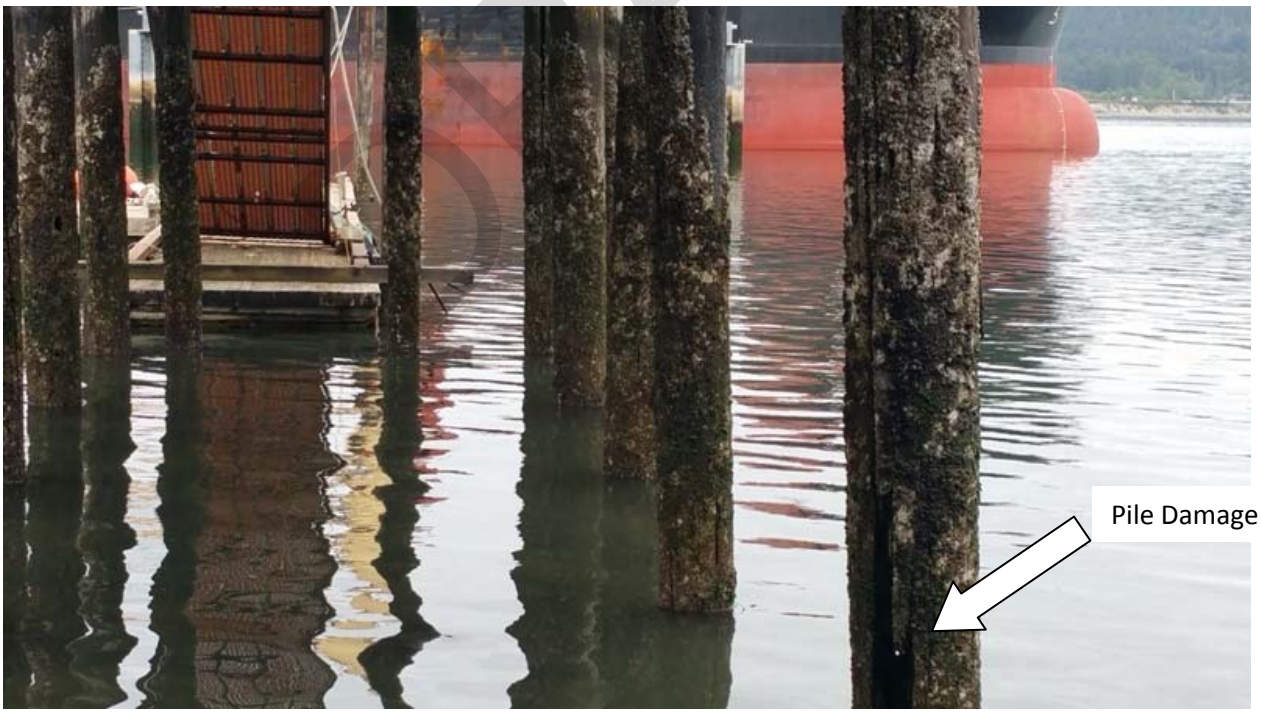


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Appendix B: Site Photos (page 1)



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Appendix B: Site Photos (page 2)

Appendix D

Archeological Resources Preliminary Determination

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DEPARTMENT OF ECOLOGY
State of Washington

DATE: September 15, 2020

TO: Arianne Fernandez, Department of Ecology, Toxics Cleanup Program

FROM: Donna Podger, Department of Ecology, Toxics Cleanup Program

SUBJECT: Washington State Governor's Executive Order 05-05
Anacortes Port Log Yard Cleanup Site
Department of Archaeology and Historic Preservation State Archaeologist Project
2020-05-03272 ECY Final Determination on July 11, 2020

The Washington State Department of Ecology (Ecology) proposes to fund the following project to conduct a remedial action at 718 4th Street, Anacortes, in Skagit County. The project area is at the terminus of T Street.

The purpose of this project is to cleanup a former log yard site on the shoreline of Guemes Channel. The exact scope of the remedial action has not been fully defined but the maximum extent could include excavation of the intertidal and subtidal contaminated sediment. Additional upland area may be used for staging construction of the remedial action. Ecology has completed the Ecology Form 05-05/106, describing the project location and possible ground disturbing activities (attached).

A consultation under Section 106 may be conducted by the US Army Corps of Engineers when permits for construction are under review.

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Area of Potential Impacts and Project Activities
The project location is approximately 4 acres on the shoreline of Guemes Channel at the terminus of T Street in Anacortes, Section 18, of Township 35 Range 02. Project activities may include excavation to remove contaminated sediment in the intertidal and subtidal areas, with the exact scope yet to be defined. Ancillary activities may include construction staging in the adjacent paved upland area and possible demolition of a pier and floating dock to accomplish the cleanup.

Final Determination
Ecology made a Preliminary Determination of low risk for encountering archaeological resources during construction, and a high risk of affecting a dock that is over 50 years old. The dock has been determined by DAHP to be not eligible for the historic register. The preliminary determination and request for consultation were sent via email to the following parties on June 11, 2020 and provided an opportunity for comments:

- Rob Whitlam, Department of Archaeology and Historic Preservation
- Dennis Lewarch, Suquamish Tribe
- Richard Young & Gene Enick, Tulalip Tribes,
- Jackie Ferry, Samish Tribe
- Scott Schuyler, Upper Skagit Tribe

- Josephine Peters, Swinomish Tribe

We received comments from Rob Whitlam that concurred with our preliminary determination. The comment period ended July 11, 2020. No other comments were received.

Based on our review and comments received, Ecology is retaining the earlier determination of a low risk of encountering archaeological resources.

Ecology is requiring an inadvertent discovery plan (IDP). The recipient can use the Ecology IDP Template at https://fortress.wa.gov/ecy/publications/SummaryPages/ECY070560.html or equivalent. The recipient must follow the IDP protocol in the event that archaeological deposits are inadvertently discovered during construction, ground-disturbing activities should be halted immediately in an area large enough to maintain integrity of the deposits. The DAHP, affected tribes, and Ecology must be notified. Appropriate treatment of the archaeological resources and/or human remains would be determined among these parties.

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Attachments

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Attachment 1

Pre-Remedial Design Investigation and Dredged Material Characterization Sampling and Analysis Plan

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Pre-Remedial Design Investigation and Dredged Material Characterization Sampling and Analysis Plan

Anacortes Port Log Yard
Anacortes, Washington
Facility Site No. 21898438
Cleanup Site No. 3604
Ecology Agreed Order No. DE 10630

for
Dredged Material Management Office and
Washington State Department of Ecology
on Behalf of Port of Anacortes

October 5, 2026

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Pre-Remedial Design Investigation and Dredged Material Characterization Sampling and Analysis Plan

Anacortes Port Log Yard
Anacortes, Washington

File No. 5147-016-15
October 5, 2026

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Appendix A. Pre-Remedial Design Investigation Health and Safety Plan

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Subcontractor Acknowledgment Form

ANACORTES PORT LOG YARD PRE-REMEDIAL DESIGN INVESTIGATION AND DREDGED MATERIAL CHARACTERIZATION

GEOENGINEERS FILE NO. 05147-016-15

I verify that a copy of the Pre-Remedial Design Investigation Sampling and Analysis Plan has been provided by GeoEngineers, Inc. to inform me of the procedures and protocols that will be used.

Print Name	**Signature**	**Firm**	**Date**

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Acronyms and Abbreviations

°C	degrees Celsius
AFDW	ash-free dry-weight
Agreed Order	Agreed Order No. DE 10630
ARL	Analytical Resources, LLC
ASTM	ASTM International
BA	Biological Assessment
BCOCs	bioaccumulative chemical of concern
BCY	bank (in-situ) cubic yard
BT	Bioaccumulation Trigger
City	City of Anacortes
CMP	Compliance Monitoring Plan
COC	Contaminant of Concern
CORS	Continuously Operating Reference Stations
cPAH	carcinogenic polycyclic aromatic hydrocarbons
CRL	Contracted Reporting Limit
CRM	certified reference material
CY	cubic yards
DAHP	Department of Archaeology and Historic Preservation
DD	decimal degrees
DGPS	differential global positioning system
DOF	Dalton, Olmsted & Fuglevand, Inc.
DM	degrees-minutes
DMS	degrees-minutes-seconds
DMMO	Dredged Material Management Office
DMMP	Dredged Material Management Program
DMMU	Dredged Material Management Unit
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EDL	Estimated Detection Limits
EIM	Environmental Information Management

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EMPC	estimated maximum possible concentration
EPA	United States Environmental Protection Agency
FAA	Federal Aviation Administration
FS	Feasibility Study
GPS	global positioning system
GNSS	Global Navigation Satellite System
HASP	Health and Safety Plan
HPAH	high molecular weight polycyclic aromatic hydrocarbon
HRGC/HRMS	High Resolution Gas Chromatography/Mass Spectrometer
H:V	horizontal to vertical
IDP	Inadvertent Discovery Plan
LCS/LCSD	Laboratory Control Sample/Laboratory Control Sample Duplicate
LOQ	limits of quantification
LPAH	low molecular weight polycyclic aromatic hydrocarbon
MBE	multibeam echosounder
MDL	method detection limit
MHHW	mean higher high water
MLLW	mean lower low water
MRL	method reporting limit
MS	Manufacturing/Shipping
MS/MSD	Matrix Spike/Matrix Spike Duplicate
MTCA	Model Toxics Control Act
NAD83	North American Datum of 1983
NFA	No Further Action
NGS	National Geodetic Survey
OHWM	ordinary high-water mark
OPR	Ongoing Precision and Recovery
PCB	polychlorinated biphenyl
PDF	Portable Document Format
PND	PND Engineers, Inc.
Port	Port of Anacortes
ppt	parts per thousand

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pptr	parts per trillion
PQL	practical quantitation limit
PRDI	Pre-Remedial Design Investigation
PSEP	Puget Sound Estuary Program
PS-SRM	Puget Sound Sediment Reference Material
QA/QC	quality assurance/quality control
RI	Remedial Investigation
ROW	right-of-way
RPD	relative percent difference
RTK	real-time kinematic
SAP	Sampling and Analysis Plan
SBE	single-beam echosounder
SL	Screening Level
SMS	Sediment Management Standard
SOC	Substance of Concern
SVOC	semi-volatile organic compound
TBT	tributyltin
TEF	toxicity equivalency factor
TEQ	toxic equivalent quotient
TLS	Terrestrial Laser Scanner
TOC	total organic carbon
TRL	target reporting limit
TS	total solids
TTL	target tissue levels
TVS	total volatile solids
USACE	United States Army Corps of Engineers
USCS	Unified Soil Classification System
USGS	United States Geological Survey
UST	underground storage tank
VCP	Voluntary Cleanup Program
WAC	Washington Administrative Code
WDFW	Washington Department of Fish and Wildlife

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WSDA	Washington State Department of Agriculture
WWTP	Wastewater Treatment Plant
WWTO	Wastewater Treatment Outfall

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1.0 Introduction

This document describes the approach and procedures to be used to complete a Pre-Remedial Design Investigation (PRDI) pursuant to Agreed Order No. DE 10630 (Agreed Order) issued by the Washington State Department of Ecology (Ecology) in accordance with Model Toxics Control Act (MTCA) cleanup regulations (Chapters 173-204 and 173-340 Washington Administrative Code [WAC]), and dredged material characterization pursuant to the Dredged Material Management Program (DMMP) to support Interim Action cleanup and redevelopment activities at the Anacortes Port Log Yard site (Site) located in Anacortes, Washington. An Interim Action is proposed by the Port of Anacortes (Port) to expedite part of the environmental cleanup at the Site within the current and planned future operational area encompassing Pier 61 and commercial boat ramp facility (Wyman's Ramp) as well as the area containing elevated levels of wood waste resulting from historical log haul out operations (i.e., Interim Action Dredging). Dredging activities also include increasing the navigational draft depth within the Pier 61/Wyman's Ramp operational area below the contaminated sediment layer to facilitate the replacement and redevelopment of Pier 61 to meet commercial demands (i.e., Navigational Dredging).

This document has been prepared in general accordance with the requirements specified in the DMMP User Manual (USACE 2025) and will be subject to review and approval by the DMMP agencies. This document has also been prepared for Ecology for review and approval, who is overseeing the Interim Action cleanup of the Site. Overall, this document serves as the guide for the standard operating procedures that will be used during the field investigation to meet the following objectives:

- Establish pre-construction conditions for design and volumetric calculations and provide comparative data for the evaluation of pre-/post-dredge conditions through bathymetric and topographic surveys.
- Document the extent and location of existing habitat features along the nearshore, intertidal and subtidal zones of the Site to assess the impact of the proposed Interim Action on existing habitats including forage fish spawning and eelgrass habitats.
- Determine the thickness of accumulated sediment above the toe of the armored revetment slope east and west of the Former Log Haul Out area and along Pier 2.
- Confirm the elevation of the contact between the recently deposited contaminated sediments and underlying clean native layer within the Interim Action area to support dredge design, refine dredge volume estimates for contract bidding purposes and compliance with the cleanup requirements.
- Characterize the clean native dredge material underlying the contaminated sediment layer within the Port's future operational area for the purpose of determining open-water disposal suitability and/or beneficial reuse.

The anticipated schedule for completing the dredging project is the 2028/2029 in-water work window. To meet this timeframe, the field investigation will be initiated as soon as allowable following approval of this document by Ecology and the DMMP. The results of this study will inform on permitting requirements, verify the contact between the sediment contamination and underlying clean native material, disposal options for the proposed dredged materials, and environmental protections that will be required to complete the Interim Action in a manner consistent with the suitability determination and cleanup requirements for the Site.

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The Site is shown relative to the surrounding area in Figure 1. The current Site layout, features, facilities and sediment investigations completed to date are shown in Figures 2 and 3. Figure 4 shows the Interim Action and Navigational Dredging areas and proposed investigation locations. These locations are intended to confirm the elevation of the contaminated sediment base within the Interim Action area and to evaluate the suitability of the underlying clean native material for open-water disposal to meet the Port's navigational berth depth needs. Interim Action and Navigational Dredging is shown in cross-section in Figures 5 through 7. The following sections provide background information concerning the project area, a description of the proposed Interim Action, a summary of previous sampling activities completed, and a description of the sampling and analysis approach and methods that will be used for further evaluating Site conditions. A detailed description of the Site location, area development and previous sediment characterization results are presented in the Interim Action Work Plan (GeoEngineers 2026).

1.1 LOCATION AND DESCRIPTION

The Site comprises the intertidal and subtidal marine areas within an embayment along Guemes Channel at the northern terminus of T Avenue in the nearshore area northwest of 718 4th Street (Figure 2). The Site is bounded to the west by the Port's Pier 2 Marine Terminal (Pier 2), which is an earth fill structure and pile-supported wharf along the northernmost portion of the facility. The slope of the earth fill is armored with large rock (riprap). Several mooring piles are located along the eastern toe of the armored slope and along the eastern flank of the Former Log Haul Out. The shoreline south and east of the Site includes a mixture of riprap, remnant structures, natural rock outcroppings, and sand and gravel beaches containing cobbles, large rock and concrete/asphalt debris. A wooden dock (Pier 61) used for commercial transient vessels extending into the Site marine area from the southern shoreline. Additionally, a commercial launch (Wyman's Ramp), pocket beach (Robinson Cove constructed as a compulsory mitigation site as part of the Port's Pier 1 Redevelopment Project) and former full-service restaurant (Secret Cove) are situated along the shoreline south of the Site.

A City of Anacortes (City) 30-inch diameter concrete pipe outfall (T Avenue Outfall) discharges to the surface water adjacent to Pier 61 (Figure 2). The T Avenue Outfall discharges stormwater collected in catch basins located within portions of 3rd and 4th Streets and portions of T Avenue. In 2024, the City constructed a new wastewater treatment plant outfall (WWTO) into the Guemes Channel from the U Avenue right-of-way (ROW). The new wastewater outfall extends through the eastern portion of the Site from the shoreline into Guemes Channel where it discharges approximately 700 feet north of the outer harbor line.

Guemes Channel is a marine passage separating Guemes Island from Fidalgo Island, where Anacortes is located. The channel connects Rosario Strait to the west and Padilla Bay to the east. In the vicinity of the Marina, Guemes Channel is approximately 0.5 miles wide and has an average elevation of approximately -60 feet mean lower low water (MLLW). Within Guemes Channel, the average difference in height between mean higher high water (MHHW) and MLLW is 8.2 feet. Currents in Guemes Channel are relatively strong (averaging 0.9 and 2.1 knots on flood and ebb tides, respectively; Antrim et al. 2000).

1.2 AREA DEVELOPMENT AND DREDGING HISTORY

Historically, the Site and surrounding area was used for lumber and wood milling and ship building operations from the early 1900s to 1965. In 1965, the Port purchased the Site and adjacent uplands (the "Property"). Between 1965 and 2004, the Port leased the Property to multiple tenants for log handling and loading operations. Log handling operations ceased after 2004, and the Site has remained largely

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unchanged since that time. The adjacent upland area is currently used for storing oil spill response booms, Pier 61 is used for moorage of commercial vessels. Wyman's Ramp is used for loading and unloading commercial goods.

The development history for the Port's Pier 2 Terminal facility, Pier 61, Wyman's Ramp and surrounding area are further discussed below.

1.2.1 Pier 2 Terminal Development

Following purchase by the Port in 1965, the earthen fill structure and pile supported deep water berth of the Pier 2 Terminal facility was constructed. Between 1966 and 2004, portions of the Pier 2 Terminal facility were leased or operated by a number of different businesses and by the Port itself for log handling operations. Logs were delivered to the Pier 2 Terminal facility either by truck or by log rafts. Rafted logs were delivered to the Site, pulled ashore, sorted and stacked for temporary storage pending shipment either by loading onto vessels or re-rafting for transport. In some instances, logs that had been delivered by trucks were rafted at the Site for shipment. After 2004, log handling operations ceased. Since this time, the former log handling area has remained largely unchanged.

The beach area south of the former log handling area is currently used for storage of oil spill response booms. The northern part of the Pier 2 Terminal facility is a deep-water moorage terminal used for berthing and product loading and offloading, including petroleum coke and prilled sulfur. Other portions of the Pier 2 Terminal facility are leased to various tenants for equipment laydown and storage.

1.2.2 Pier 61 Development

Pier 61 extends into the marine area east of the former log handling area. Limited information is available regarding the development history of Pier 61, however, based on the timeline for the Port's acquisition of the surrounding Property, it is presumed that the pier was constructed in 1965 or shortly thereafter. The southern half of Pier 61 is supported on creosote treated timber piles extending over the water surface. The northern half of Pier 61 is comprised of a marine float that is anchored in place with creosote treated timber piles. A gangway connects both the northern and southern portions of Pier 61.

A 2017 assessment of the pier structure by PND Engineers, Inc. (PND) concluded that the current condition of the timber piles supporting the pier structure is generally poor with significant section loss visible from deterioration and marine borer damage. Recently, the Port completed emergency repairs to reinforce portions of the pier structure to prevent its collapse in advance of the planned redevelopment discussed above. Currently, Pier 61 is used for moorage of commercial drop-framed barges that facilitates daily transit of goods and services to and from the San Juan Islands.

1.2.3 Wyman's Ramp, Marina and Wholesale Supply and Project Pier 1 Habitat Mitigation Site Development

Prior to the late 1940s the Property and surrounding area were used for lumber milling and ship building operations. With the decline in the demand for lumber and the high cost to rebuild many of the mill facilities following fires, the Wyman's Marina and Wholesale Supply property was sold to Raymond and Kathleen Robinson who operated an 80-berth marina with fueling, dry dock, and maintenance and storage facilities (Robinson's Marina). The area in front of the marina was reportedly dredged in the 1950s to create deep water mooring for up to 160 boats and the upland portion of the property south of the main building was

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graded to provide on-site parking. Robinson's Marina continued with boat maintenance and engine repair services until 1965 when the property was sold to the Port who subsequently leased the property to Don and Rayetta Wyman to continue the boat repair and fueling services as "Wyman's Marina and Wholesale Supply." Wyman's Marina and Wholesale Supply operated until 1998. At this time, marina and boat maintenance operations ceased and underground storage tanks (USTs) associated with the marine fueling operations were decommissioned and removed. In 2011, the Port replaced the boat ramp (Wyman's Ramp) located west of the former Wyman's building to support the transit of goods and services to and from the San Juan Islands.

As part of the compensatory mitigation package for the Pier 1 Redevelopment Project (United States Army Corps of Engineers [USACE] reference 200501451), the construction of a habitat mitigation area (Robinson Cove) was required by the permitting agencies. To fulfill these mitigation requirements, Wyman's Marina and Wholesale Supply property was selected as the location for replacing the aquatic habitat affected by the Pier 1 Redevelopment Project. In the process of completing the construction of the habitat mitigation site, remedial excavation activities included the removal of six shallow isolated areas containing gasoline-, diesel- and heavy oil-range petroleum hydrocarbon, metal (arsenic, cadmium, copper, lead and mercury), and/or pesticide (4,4 DDD) contamination as part of an independent cleanup action. Following completion of the remedial activities, the Wyman's Marina and Wholesale Supply Site was entered into Ecology's list of confirmed and suspected contaminated sites with Facility Site ID No. 2821735 and Cleanup Site ID No. 2097. Based on the completeness of the cleanup action, the Wyman's Marina and Wholesale Supply Site received a No Further Action (NFA) determination through the Voluntary Cleanup Program (VCP) in 2015.

1.2.4 City of Anacortes Wastewater Treatment Outfall Dredging Project

In 2024, the City constructed a new outfall extending approximately 1,100 feet north of the U Avenue ROW terminus to service the existing Wastewater Treatment Plant (WWTP). The design included installation of an outfall pipe through the eastern portion of the Site. The nearshore segment included the dredging of previously identified contaminated sediment and underlying clean native material to allow for the installation of the new outfall pile with at least 1-foot of suitable import material cover and restore the existing grade. The offshore segment of the outfall pipe and diffuser was placed on top of the existing sediment surface using controlled submergence techniques with the assistance of certified divers.

Sediment sampling was performed by Dalton, Olmsted & Fuglevand, Inc. (DOF) in November 2020 to characterize the sediment conditions within the alignment of the outfall pipeline to be dredged. These characterization activities identified bulk tributyltin (TBT), total carcinogenic polycyclic aromatic hydrocarbons (cPAHs), polychlorinated biphenyl (PCB) Aroclors and total dioxin and furans at concentrations exceeding Sediment Management Standard (SMS) screening levels. As a result, all dredged material generated during the City's outfall installation project was transported from the Site to an upland landfill for permitted disposal.

The City's WWTO Dredging Project area and sampling locations to characterize the dredged material are shown in Figure 3.

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1.3 CURRENT AND FUTURE SITE USE

The land west and south of the Guemes Channel embayment containing the Site is zoned for industrial use (Manufacturing/Shipping [MS]) and is characterized by marine shipping, warehousing, bulk material storage, transportation, and other industrial uses. The west adjacent upland area is currently being used as storage for oil spill response equipment and to support the Port's marine terminal operations. West of the Port's Pier 2 facility is Pier 61 which is used for moorage of commercial vessels. Centrally located along the shoreline south of the Site is Wyman's Ramp which is utilized for the commercial transport goods to Guemes Island and Robinson Cove (Pier 1 Redevelopment Project habitat mitigation site). Further east are residential properties.

Offshore Guemes Channel embayment is the eastern portion of the Pier 2 vessel berth and associated mooring dolphins. As indicated above, the Pier 2 Terminal is primarily used for bulk product exports. Public access to the Port's Pier 2 Terminal facility (including the beach area south of the former log handling area) is restricted with fencing and signage. Access to other portions of the Port owned properties is generally unrestricted.

Based on the structural condition of Pier 61 and commercial demands of this facility, Port plans to demolish and replace the existing pier structure to allow for additional moorage as well as increase the navigational depth within the operational area of Pier 61 and Wyman's Ramp.

1.4 PREVIOUS SEDIMENT CHARACTERIZATION

Multiple environmental investigations have been completed by the Port and others to evaluate sediment conditions at the Site and/or surrounding area, including:

- Limited Environmental Due Diligence Investigation (Floyd|Snider 2004)
- Fidalgo Bay Sediment Investigation (SAIC 2008)
- Chemical and Biological Toxicity Investigation (GeoEngineers 2008)
- Supplemental Sediment Investigation (GeoEngineers 2010)
- Benthic Abundance Investigation (GeoEngineers 2011)
- Pier 2 Dredged Material Characterization (GeoEngineers 2013)
- Nearshore Sediment Characterization (DOF 2021)
- Post-Dredge Sediment Investigation[1] (Geosyntec 2025)

As required by the Agreed Order, investigation activities were completed by the Port to collect sufficient environmental data to define the nature and extent of Site contaminants (RI) and to develop and evaluate cleanup action alternatives for addressing the identified Site contamination resulting from historical land use (FS). To date, the Port has completed the following investigation activities as required by the Agreed

[1] Based on a review of City's post-dredge sediment data, Ecology determined the chemical analytical results for recent sediment samples co-located with previous sample locations supersede the prior results to support characterization of the sediment quality of the Site.

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Order and Ecology to evaluate Site conditions and fill data gaps identified by Ecology to complete the characterization of the Site:

- Initial 2015 RI to characterize Site conditions in accordance with the RI/FS Work Plan (GeoEngineers 2015).
- Additional investigation activities in 2021 under RI/FS Work Plan Addendum No. 1 (GeoEngineers 2021) to further evaluate the nature and extent of Site contaminants in portions of the Site that were not previously identified following sediment investigation activities by the City of Anacortes (City) in 2020 as part of the Nearshore Sediment Characterization (DOF 2021) to support the City's WWTO Project.
- Additional investigation activities in 2023 under RI/FS Work Plan Addendum No. 2 (GeoEngineers 2022a) to define the northern boundary of the Site as required by Ecology based on their review of the sediment data collected under RI/FS Work Plan Addendum No. 1 and the City's WWTO Project.

Sediment investigations completed at the Site and surrounding area are shown in Figure 3. Sediment stratigraphy and quality are further discussed below.

1.4.1 Sediment Stratigraphy

The sediment stratigraphy is based on the information provided by sediment cores collected as part of the Agreed Order RI and Nearshore Sediment Characterization study completed by the City. Based on the sediment core data, the sediment stratigraphy generally consists of recent sediment deposits overlying native glacially consolidated sediment deposits. Accumulations of wood and wood waste from historical log handling operations are present in the intertidal area between Pier 2 and Pier 61 during low tides. Recent deposits and underlying native glacially consolidated sediment deposits identified include the following:

- **Recent (Non-Native) Deposits** – The recent deposits are comprised of silts, sand and wood debris to a maximum depth of 6½ feet below the mudline surface. In the upper intertidal zone, the recent deposits consist of fine to coarse gravel with varying sand and silt content. In the lower intertidal/shallow subtidal zone, the recent deposits consist of silts and fine-grained sands. In the northern portion of the Site near Guemes Channel, the recent deposits consist of sandy silts and gravelly sands. Within the nearshore area between Pier 2 and Pier 61, accumulations of wood and wood waste up to 75 percent are present and as the result of historical log handling operations. The wood debris generally consists of varying amounts of chips, fibers, bark and various wood chunks.
- **Native (Glacial) Deposits** – Native sediment underlying the recent deposits generally consists of very stiff/medium dense to hard/very dense silt and silty sand and is classified as recessional marine (glaciomarine) drift from the Everson interstade of the Fraser glaciation.
- **Bedrock** – Bedrock outcroppings from the Lummi Formation are present along the shoreline to the south and east of the Site. Based on the close proximity of the outcrop, bedrock likely extends into the area underlying the recently deposited sediment and/or native sediment deposits.

1.4.2 Sediment Quality

Sediment data collected by the Port as part of the Agreed Order as well as sediment data collected by others screened relative to the SMS and DMMP criteria (see Table 1) are summarized in Tables 2 through 7. Findings from these investigations identified surface sediment containing up to 75 percent wood debris by

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volume within a matrix of silt and fine sand. Chemical analyses and biological testing (i.e., bioassay) identified SMS exceedances as well as DMMP marine guideline screening values for open-water disposal in the recent sediment deposits extending from the mudline to a maximum depth of 6½ feet below the mudline surface. Specifically, contaminants of concern (COCs) exceeding screening levels presented in Table 1 include the following:

- Metals (cadmium, chromium, copper, lead, silver and zinc);
- TBT;
- Semi-volatile organic compounds (SVOCs) including low molecular weight polycyclic aromatic hydrocarbon (LPAHs), high molecular weight polycyclic aromatic hydrocarbon (HPAHs), cPAHs, phthalates, phenols and miscellaneous extractables;
- PCBs; and
- Dioxins and furans.

Additionally, wood debris which may cause or contribute to sediment impacts is managed by Ecology as a deleterious substance under SMS. Based on bioassay test data, visual wood debris greater than approximately 10 percent by volume is identified as a substance of concern (SOC).

1.5 AQUATIC INVASIVE SPECIES

Online resources from the Washington Department of Fish and Wildlife (WDFW), United States Geological Survey (USGS) and Washington State Department of Agriculture (WSDA) for the known or suspected presence of invasive species were checked within a 5-mile radius of the Site. Search results are summarized below.

- **Aquatic Invasive Species**
  - Invasive species including the invasive New Zealand mud snail (*Potamopyrgus antipodarum*) were not identified within the search radius, mud snails have been found in lakes and rivers in Washington, including Indian Slough, Padilla, Washington, the nearest documented sighting (WSDA 2021). Due to the high salinity of the Guemes Channel, tidal action and developed characteristics, New Zealand mud snails are not expected to be in the project area. No other invasive species are expected to be encountered.
  - The Site is located within the Rosario Strait Coordination Area of the Washington State North Puget Sound Management Area for the European green crab (*Carcinus maenas; WDFW 2025*). Within this management area, no green crab have been observed or removed since monitoring began in 2022 following the issuing of Emergency Proclamation #22-02. Within the adjacent Fidalgo Bay Coordination Area located southeast of the Site, a single green crab was reported to be removed during the 2023 calendar year.
- **Nonindigenous Aquatic Species**
  - Smooth cordgrass (*Sporobolus alterniflorus*) – Perennial deciduous grass found in intertidal wetlands, especially estuarine salt marshes. Listed by the Washington State Noxious Weed Control Board as a Class C weed. Nearest documented sighting is the Strait of Georgia (Padilla Bay) located approximately 4 miles east of the Dredging Project location.
  - Japanese eelgrass (*Zostera japonica*) – Eelgrass species usually found on the upper edge of seagrass beds, typically on mudflats exposed at low tide. Listed by the Washington State Noxious

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Weed Control Board as a Class A weed. Nearest documented sighting is the Strait of Georgia (Padilla Bay) located approximately 3 miles east of the Site.

- Pacific giant oyster (*Crassostrea gigas*) – Introduced in the 1920 to replace dwindling native oyster stocks which tend to attach to hard or rocky surfaces in shallow or sheltered waters up to 120 feet deep. Nearest documented sighting is Weaverling Spit located on the west end of Fidalgo Bay, approximately 3 miles southeast of the Site.

2.0 Pre-Remedial Design Investigation

2.1 BATHYMETRIC AND TOPOGRAPHIC SURVEY

To establish pre-construction conditions for design and volumetric calculations and to provide comparative data for Interim Action construction activities, a bathymetric/topographic survey of the Site and surrounding area will be completed. Approximate coverage of the bathymetric/topographic survey will encompass the entirety of the Site and include an approximate 50-foot to 100-foot buffer surrounding the Site to ensure preconstruction conditions are sufficiently documented. The bathymetric survey will utilize a multibeam echosounder (MBE). The MBE will be supplemented where necessary with a single-beam echosounder (SBE) and a Terrestrial Laser Scanner (TLS) with real-time kinematic (RTK) positioning derived from satellite-based positioning systems (global navigation satellite systems [GNSS]). After collecting the MBE data, standard bathymetric processing will be accomplished on the wide-area survey data to create an up-to-date bathymetric surface of the Site and surrounding area.

The bathymetric surveys will be referenced to North American Datum 1983 (NAD83; horizontal datum) MLLW (vertical datum) and will be completed by a professional surveyor licensed in the State of Washington in accordance with the USACE Engineering and Design Hydrographic Surveying Engineer Manual (EM 1110-2-1003). Additional details on the approach and equipment used to complete the bathymetric/topographic surveys will be determined by the contacted surveyor to meet the overall project objectives.

Additionally, potential mitigation sites identified by the Port will be further evaluated in coordination with the permitting agencies to ensure that compulsory requirements for addressing loss of habitat as a result of the Interim Action are met. Potential mitigation sites include the Quiet Cove Site located approximately 1 mile to the west and nearshore area east of the Anacortes Ferry Terminal. These surveys may include bathymetry, topography, inventory of existing site structures and habitat assessments to evaluate the quality and viability of the potential mitigation sites identified. Although the specific scope of these activities is unknown at this time, the Port will coordinate with the permitting agencies to identify the location and scope of work required to fully evaluate these sites as a component of the overall Site cleanup action, as required.

2.2 NEARSHORE AQUATIC HABITAT ASSESSMENT

2.2.1 Terrestrial and Nearshore Habitat Survey

A reconnaissance level assessment of terrestrial and nearshore habitats will be performed to support design and permitting of the Interim Action. GeoEngineers biologists will assess the nearshore and terrestrial habitat to qualitatively catalog habitat and vegetation types that are present. This work will include an ordinary high-water mark (OHWM) delineation and shoreline habitat assessment of fish and

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wildlife conservation areas to document riparian vegetation and shoreline habitat at low tide to further evaluate shoreline substrate, intertidal vegetation/algae and other intertidal organisms.

To evaluate existing conditions of the Site for suitability as forage fish spawning substrate, three composite samples of the top 6-inches of beach substrate will be collected along two separate transects perpendicular to the southern shoreline to evaluate conditions within the Former Log Haul Out area and area near to Wyman's Ramp. Each composite sample will be comprised of material collected between elevation +4 and +11 feet MLLW. Samples will be submitted for grain size analysis at an off-site laboratory in accordance with ASTM International (ASTM) D6913 methods.

2.2.2 Aerial Drone Survey

An aerial photograph and elevation point data collection of the Site will be taken by drone during low tide conditions. The aerial photographs will be georeferenced and used to identify the habitat distribution at the Site based on digital processing of the collected images to support Interim Action permitting and design. A Federal Aviation Administration (FAA) Licensed Remote Pilot will complete the drone flight and post-flight data processing. Additional details on the approach and equipment used to complete the drone survey will be determined by the contacted surveyor to meet the overall project objectives.

2.2.3 Macrovegetation Survey

A macrovegetation survey will be required to assess the impact of the proposed Interim Action on existing submerged habitats that may contain vegetation. Based on previous habitat surveys completed at the Site in 2015, there is known eelgrass habitat within the project area and therefore, a high-resolution eelgrass survey is necessary to support permitting of the Interim Action. To complete this work, a comprehensive vessel-based survey of potential macrovegetation habitat using a geo-referenced hydroacoustic echosounder will be completed. Data from the hydroacoustic survey will be to develop a plan for completing diver transects and density counts. Diver transects spaced approximately 30 feet apart along shoreline are anticipated with eelgrass shoot density counts within an approximate 1-meter square quadrat collected approximately every 30 feet along each transect.

The macrovegetation survey will provide the information needed to prepare the Biological Assessment (BA), mitigation plan, other regulatory submittals, and design drawings and will be completed during the summer months (June 1 through September 30) before the end of the eelgrass growing season to quantify potential eelgrass coverage in the immediate area of the Interim Action as required by WDFW and USACE. Coordination with permitting agencies will be completed to confirm that the proposed transect and density count layout is acceptable to achieve USACE Tier 2 eelgrass and macrovegetation survey guidelines.

2.3 REVETMENT PROBE SURVEY

The thickness of sediment located on top of the slope revetment armor along Pier 2 and the eastern flank of the Former Log Haul Out is currently not fully delineated. To determine the thickness of sediment on top of armoring in these areas, a probe survey will be completed during minimum -1-foot daytime low tide. In general, the sediment thickness will be measured along transects spaced approximately 40 to 50 feet apart. Each transect will start at the approximate OHWM and waterward until indications of armor rock are no longer present. Along each transect, the sediment thickness will be measured using a push probe inserted to detect the underlying slope armoring at approximately 3- to 5-foot intervals. Each transect will be referenced relative to the existing mooring piling structures for mapping purposes.

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Field procedures for completion of the probe survey to evaluate sediment thickness along the revetment are as follows:

1. Locate the transect where sediment thickness will be measured.
2. Lay out a tape measure starting at the OHWM extending waterward.
3. Starting at the top or bottom of the transect, insert a metal rod into the sediment until the rod is fully inserted or meets refusal.
4. Mark the location of the mudline on the rod and measure the length of the rod that was inserted into the sediment.
5. Record the measurement location and sediment thickness.
6. Move approximately 3 to 5 feet along the transect to the next measurement location until the transect is complete.
7. Move approximately 40 feet to the next transect and repeat Steps 1 through 7 until the survey area is complete.

2.4 SUBSURFACE SEDIMENT ENVIRONMENTAL CHARACTERIZATION

Subsurface sediment samples will be collected at seven locations (PRDI-01 through PRDI-07; Figure 4) using a using a barge-based sonic drill rig capable of achieving the target core penetration depth (i.e., up to -16 feet MLLW) and sample recovery for the expected dense native underlying material. Sonic drilling is the preferred method for acquiring environmental data; however, alternative methods may be used if needed due to sample depth and recovery requirements, and anticipated materials to be encountered. The subsurface sediment sampling objectives are to:

- Confirm the elevation of the base of contaminated sediment within the proposed Interim Action area to support dredge design and refine dredge volume estimates for bidding.
- Characterize the surface to be exposed by the proposed Interim Action dredging. Additional characterization of the surface exposed by dredging will be obtained during construction in coordination with Ecology. Sampling and analysis during construction will be in general accordance with a Compliance Monitoring Plan (CMP; see Attachment 2 of the Interim Action Work Plan).

The subsurface sediment samples will be collected at 1-foot intervals to a maximum elevation of approximately -16 feet MLLW to evaluate sediment quality. The target depth subsurface sediment cores will be at least 3 feet below the base of the proposed dredge prism (Interim Action or Navigational dredged prism). Target sediment core depths, subsurface sample collection intervals and laboratory analysis are summarized in Table 8. The proposed locations of subsurface sediment samples are shown in plain view in Figure 4 and cross-section in Figures 5 through 7 and may be adjusted in coordination with Ecology and/or DMMP during the investigation activities based on field observation and actual conditions encountered. Subsurface sediment samples collected as part of the PRDI below the base of the anticipated contaminated sediment layer will be initially analyzed for Site COCs identified as part of the RI. Archive samples (step-down samples) collected as indicated in Table 8 will be analyzed as follows:

- If the sample at anticipated dredge depth fails the SMS and DMMP screening criteria (Table 1), then analyze the underlying archived step-down sample.

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- If the archived step-down sample fails the SMS and DMMP screening criteria, analyze the next sequential step-down sample.
- If the archived step-down sample meets the SMS and DMMP screening criteria, then no further analysis.

Note that sediment sampling and analysis to verify the base of the Interim Action dredge prism will be completed prior to dredged material characterization of the Navigational dredge prism. Sediment sample collection and processing for DMMP characterization is further discussed in Section 3.0. Sediment processing and chemical analysis for verifying the base of the Interim Action dredged prism is further discussed below.

2.4.1 Sediment Coring Procedures

Sampling will be completed using a sonic drill rig capable of achieving the target core penetration depth (i.e., -17 feet MLLW) and sample recovery for the expected dense native underlying material. Within the four sampling locations representing the operational area (PRDI-04 through PRDI-07), 1-foot samples will be collected beginning at the base of the anticipated depth of contamination and will be collected down to at least 3 feet below the base of the contaminated sediment layer or anticipated future navigational dredge depth (plus 1-foot over-dredge allowance). Sampling and analysis to evaluate the navigational dredge prism (i.e., dredged prism below the contaminated layer) is further discussed in Section 3.0.

Subsurface sediment samples will be collected using sonic drilling methods. The sediment cores will be collected from a barge or other vessel designed for such purposes. The sonic core samples will be continuously collected by advancing a 4.75-inch outer diameter and 4.25-inch inner diameter decontaminated steel core barrel driven through a larger diameter steel casing. The sonic core barrel collects the sediment core, and the casing tube is used to ensure that the borehole remains open and is protected from cave-ins as the core is advanced. The length of the core barrels used is typically 5 feet. The core barrel and casing tube are driven into the sediment using both vibratory and rotatory action. Once the driving of the core barrel is completed to the desired depth, the core barrel is removed and brought to the surface for extrusion of the sediment core. The sediment core collection methodology may be adjusted based on location, thickness of the dredge prism and the anticipated sediment substrate to be sampled (i.e., silt and sand, wood debris, etc.). Subsurface sediment sampling activities will be observed by a GeoEngineers field representative who will maintain field records of the number of sampling attempts, verification of the acceptance criteria, descriptions of the materials encountered, and samples collected for laboratory analysis. The procedures for collecting subsurface sediment samples are as follows:

1. Maneuver the sampling barge or vessel to the proposed sampling location, steady the barge or vessel and verify location control.
2. Record the sampling location, time and depth to mudline below the water surface using the lead-line or depth sounder, adjusted for tide height.
3. Advance the sampler to the target elevation. The objectives of core recovery at each sample location are as follows:
   - Achieve the target core penetration depth.
   - Achieve a minimum of 75 percent recovery (as calculated by the ratio of the drive length to the recovery length of the core).
   - Provide for representative sample intervals that are planned at the sampling location.

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- Provide for sufficient sample material required for planned analysis.

If necessary, cores may be driven deeper than the target core penetration depth to aid in obtaining sufficient representative sample intervals. The excess material collected from below the target depth will be excluded. Additional cores, if the minimum acceptance criteria are not met or additional material is required for sample analysis, will be located within a radius of approximately 10 feet from the target coordinate of the initial core location and within the same depth profile. If multiple cores are performed at a sample location, each core will be assigned a distinct identifier (for example, if two cores are completed at the sampling location PRDI-01, then the first core will be identified as PRDI-01A and the second core will be identified as PRDI-01B), and a core log will be prepared for each core that is processed. Ecology and/or DMMP will be contacted in the event that the target core penetration depth or recovery cannot be achieved for a sample location after three attempts, or where a sample location needs to be adjusted more than approximately 10 feet from the target coordinate.

4. Upon retrieval of the sampling device, open the core and visually classify sediment in accordance with ASTM D2488 methods and the Unified Soil Classification System (USCS; ASTM D2487) and record on a field form/log. In addition to the visual classification, sediment samples shall be observed for physical evidence of contamination as described in Section 2.4.3. Qualitative descriptive parameters including biota, debris and presence of product/staining shall be recorded. If wood debris is present, the type or types of wood debris (i.e. sawdust, bark, chips, chunks, twigs, fibers, etc.), the estimated quantity (i.e. observed percent by volume) of each type of wood debris and the depth interval where the wood is observed will be recorded.
5. Photograph the recovered section of core material. Include in the camera's field of view, a tape measure and a sheet of paper or whiteboard with the sample name written in large black print; use care not to touch the sediment with the paper/whiteboard or with gloved hands in contact with whiteboards, pens or with whiteboard ink. It is likely several photos will be necessary to record the entire length of the core sample. Include the depth interval on the paper/whiteboard. To avoid cross-contamination, a clean hands/dirty hands approach to use of whiteboard pens and erasers and lab pens will be utilized during all sample collection activities where subsequent chemical analyses will be carried out on the samples collected. Gloves that have been in contact with lab pens and whiteboard pens will not be used for sample handling.
6. Section the recovered sample intervals into approximate 1-foot intervals for potential chemical analysis (see Table 8). Recovered sample material will **not** be decompressed (i.e., adjusted for percent sample recovery) consistent with the DMMP User Manual guidelines. Collect sediment from each sectioned interval using a decontaminated stainless-steel spoon. Minimize the collection of sediment that has been in contact with the sides of the core liner or sample barrel, or the core-opening device.
7. Place the sectioned sediment interval into a decontaminated stainless-steel mixing bowl. Homogenize the sectioned sediment sample (from one deployment if adequate sediment volume was achieved, or from multiple deployments if multiple deployments were required) in the stainless-steel bowl using the stainless-steel spoon until the sediment appears generally uniform in color and texture.
8. Place the homogenized sectioned sediment interval into appropriate sample containers and ensure that the samples are properly labeled and tightly closed. Sample containers required for analysis are summarized in Table 9.
9. Clean the exterior of the sample containers and immediately store them in a cooler with ice.

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10. Decontaminate all equipment as described in Section 2.4.4.
11. Double check that field collection forms are completely filled out (see Section 2.4.5).

Extra and discarded sediment from subsurface sediment processing will be collected in a drum and transferred to an appropriate waste handling facility following completion of the field investigation.

2.4.2 Positioning

2.4.2.1 HORIZONTAL POSITIONING

The vessel positioning system will be based on the use of a handheld differential global positioning system (DGPS) capable of providing positional accuracies of 2-meter level or better. The DGPS antenna will be located directly adjacent to the sonic core barrel for accuracy. Sampling positions will be determined in latitude and longitude referenced to NAD83 using a Trimble Pro XRS or similar device. Latitude and longitude coordinates will be recorded to six decimal places for decimal degrees (DD), four decimal places for degrees-minutes (DM) or two decimal places for degrees-minutes-seconds (DMS).

Trimble Pathfinder Office software will be used, if necessary, to perform a differential correction to the field-collected global positioning system (GPS) coordinates, utilizing the closest and/or highest integrity base stations. The base station DGPS data used during post-processing will be from the National Geodetic Survey (NGS) Continuously Operating Reference Stations (CORS) network, a multi-purpose cooperative endeavor involving government, academic, and private organizations. Differential correction is completed to remove errors, both man-made and natural, that affect the DGPS measurement.

2.4.2.2 VERTICAL POSITIONING

Vertical control will be established using tide boards within the project area referenced to one of the following permanent survey control points established as part of a 2015 Site survey:

- Control Point # 54 (“Mag Nail and Washer” on Pier 2)
  - Northing: 560130.97
  - Easting: 1210644.08
  - Elevation: 16.12 feet MLLW
- Control Point # 57 (“Spike” on Pier 61)
  - Northing: 559825.33
  - Easting: 1210753.73
  - Elevation: 12.84 feet MLLW

Vertical elevations will be referenced to MLLW. The actual mudline elevation at each coring location will be determined by subtracting the measured depth of the water column from the real-time tidal elevation. The depth of the water column at each coring location will be measured by lowering a weighted tape measure from the sampling vessel. If conditions (i.e., currents, wind, waves, etc.) prevent direct measurements using a tape measure, the onboard depth sounder will be used as backup. Vertical elevations at each of the sampling locations will be determined directly based on core penetration depth compared to the mudline elevation.

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2.4.3 Field Observation and Testing for Evidence of Contamination

Sediment samples will be observed and tested in the field for evidence of possible contamination. The following screening methods will be used:

- Visual and olfactory observation; and
- Water sheen testing.

All field testing and observation results will be documented on the field log and reported.

2.4.3.1 VISUAL OBSERVATION

The samples will be observed for indicators of recently deposited and native sediment. Specific components of the recently deposited and native sediment include the following:

- **Recently Deposited Sediment** – Comprised of fine to coarse gravel with varying sand and silt content and wood debris accumulated on top of the native sediments at the Site. Wood debris (greater than 10 percent by volume) is located within the nearshore area between Pier 2 and Pier 61 and includes varying amounts of chips, fibers, bark, and various wood chunks.
- **Native Sediment** – Comprised of gray, very stiff/medium dense to hard/very dense silt and silty sand.

2.4.3.2 WATER SHEEN TESTING

This is a qualitative field-testing method that can help identify the presence or absence of petroleum hydrocarbons. A portion of the sediment sample (about a tablespoon) will be placed in a small pan containing distilled water. The water surface will be observed for signs of sheen. The sheen classifications that will be used are described below.

SHEEN CLASSIFICATION

CLASSIFICATION	IDENTIFIER	DESCRIPTION
No Sheen	NS	No visible sheen on the water surface
Slight Sheen	SS	Light, colorless, dull sheen; spread is irregular, not rapid; sheen dissipates rapidly
Moderate Sheen	MS	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface
Heavy Sheen	HS	Heavy sheen with color/iridescence; spread is rapid; entire water surface may be covered with sheen

2.4.4 Sampling Equipment Decontamination

All reusable sampling equipment that will come in contact with sample material will be thoroughly cleaned prior to use. The sampling equipment will be cleaned according to the following procedures:

- Seawater or distilled water rinse over equipment to dislodge and remove any sediment.
- Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water).
- Distilled water rinse.

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After decontamination, sampling equipment that is not used immediately will be wrapped in aluminum foil and/or stored in plastic bags. The rule of "potential for contaminants" will be used such that any sampling equipment suspected of contamination will be re-decontaminated prior to use. Disposable nitrile gloves will be used and will be replaced after handling each individual sample to prevent sample contamination. Wash water generated will be collected in a drum and transferred to an appropriate waste handling facility following completion of the field investigation.

2.4.5 Disposal of Investigation-Derived Materials

2.4.5.1 SEDIMENT GENERATED DURING SAMPLING COLLECTION

Sediment material generated from cuttings and decontamination water will be placed in labeled and sealed 55-gallon drums. The drums will be temporarily stored on Site at a secure location pending receipt of analytical results and off-site disposal at a permitted facility.

2.4.5.2 DISPOSITION OF INCIDENTAL WASTE

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

2.4.6 Field Documentation

Documentation of the stratigraphy and material encountered will be completed at each core location. Logs and field notes of all cores and sample material will be maintained during the field investigation. The following will be included in the logs:

- Sample location designation.
- Number of sampling attempts made at each sampling location. Each sampling attempt will be designated as "failed/discarded" or "successful/retained".
- Real-time tidal elevation, water depth at the time of sampling and calculated mudline elevation.
- Description of resistance of core advancement, if noted by the drilling contractor.
- Sample identification number assigned for individual core sections.
- Geographic coordinates of the sampling location.
- Date and time of sample collection.
- Names of field person(s) collecting and logging the sample.
- The penetration depth, actual length of recovery and calculated percent recovery for each core sample.
- Description of core and sample characteristics including grain size, density, stratification, color, odor, presence of anthropogenic and/or woody debris, vegetation, biological activity, results of field screening or any observations indicating presence of contaminants (i.e., staining, sheen, etc.).
- Photograph of each core.
- Type of sampling equipment used.
- Sample preservation (if used).

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- Weather condition.
- Deviation from the approved sampling plan.

Sample containers used to collect core samples will be clearly labeled with the following:

- Project name.
- Sample identification number.
- Sample preservation (if used).
- Sample date and time.

2.4.7 Sample Custody and Transport Procedures

Standard chain-of-custody procedures will be used to track sample handling from field collection through delivery of the samples to the laboratory. A chain-of-custody form will be completed at the end of each field day for samples being shipped to the laboratory. Information to be included in the chain-of-custody form includes the following:

- Project name and number.
- Sample identification numbers.
- Date and time of sampling.
- Sample matrix (sediment, etc.) and number of containers for each sample.
- Analyses to be completed.
- Names of sampling personnel.

The original chain-of-custody record will be signed by a member of the field team. Upon transfer of sample possession, the chain-of-custody will be signed by the person relinquishing the samples and by the party receiving the samples. Field personnel shall retain carbon copies and transport the original and remaining copies to the laboratory with the sample shipment. This chain-of-custody will accompany the samples during transit to the laboratory. The samples will be transported to Analytical Resources, LLC (ARL) in Tukwila, Washington. Transport of the samples to the laboratory will be completed as follows:

- Sample containers will be placed in plastic bags and packed to prevent breakage.
- Ice will be placed in separate bags and sealed.
- A temperature blank provided by the laboratory will be placed in each cooler.
- The chain-of-custody forms will be enclosed in a plastic bag and taped to the inside lid of the cooler (if transported by personnel other than GeoEngineers).
- The sample shipment coolers will be clearly labeled with sufficient information (name of project, time and date container was sealed, person sealing the cooler, and GeoEngineers office name and address) to enable positive identification.
- Signed and dated chain-of-custody seals will be placed on all coolers prior to shipping (if transported by personnel other than GeoEngineers).

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The laboratory will follow their standard operating procedures to document sample handling from time of receipt (sample log-in) to reporting.

2.4.8 Laboratory Analysis

Subsurface samples collected to confirm the base of the Interim Action dredge prism will be submitted for analysis of the Site COCs (see Section 1.4.2). Samples that are not initially selected for analyses from a specific location will be archived for potential future analysis based on the initial sample results. Sample results will be reported in both dry weight and organic carbon-normalized concentration for evaluation of the data. Samples collected from the base of the Interim Action dredge prism will be submitted for the following:

- Total organic carbon (TOC);
- TBT;
- Metals including cadmium, chromium, copper, lead, silver and zinc;
- SVOCs including LPAHs, HPAHs, cPAHs, phthalates, phenols and miscellaneous extractables;
- PCB congeners; and
- Dioxins and furans.

Additionally, due to hold time limitations, samples for sulfide and ammonia will also be analyzed. Sulfide and ammonia results will be used to inform biological testing of the Navigational dredge prism or underlying surface exposed (i.e., Z-layer) if elected by the Port (see Section 3.3.2).

Sample methods, containers and preservation are presented in Table 9. Sediment samples will be submitted to ARL for analysis as presented in Table 8 and described in Section 2.4. Samples not initially submitted for analysis will be archived by ARL for potential follow up analysis to verify the contact between the contaminated sediment layer and underlying clean native layer.

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3.0 Navigational Dredged Material Characterization

The Port is planning to increase the navigation depth within the Pier 61/Wyman's Ramp operational area to meet commercial needs. As discussed above, Interim Action dredging will be completed to remove previously identified sediment contamination prior to dredging activities to increase the navigation berth depth within the operational area. Navigational dredged material characterization will be completed in conjunction with the PRDI to evaluate the suitability of the underlying clean native material for unconfined open-water disposal determination by the DMMP. Mechanical dredging methods, including a clamshell dredge and/or excavator, are anticipated to be used to complete the navigational dredging for the project; however, final equipment selection will be made by the contractor.

The proposed Navigational Dredge area is shown in plan view in Figure 4 and in cross-section in Figures 5 through 7 is -12 feet MLLW plus a 1-foot over-dredge allowance. To achieve the target dredge elevation of -12 feet MLLW (plus the allowance of 1-foot over-dredge) within the proposed navigational dredge area, an estimated total in-situ dredge volume of 6,130 bank cubic yards (BCY) will be removed. The proposed dredge volume includes side-slopes of 5H:1V (horizontal to vertical) along the western, southern and

eastern portions of the navigational dredge area to match existing conditions and/or proposed backfill grades. The average dredge thickness for the proposed dredging is approximately 2.5 feet. The estimate of total in-situ dredge volume is based on the existing bathymetric survey completed in June 2015 and includes the calculated baseline volume to achieve dredge elevation of -12 feet MLLW, volume associated with the 1-foot over-dredge allowance and volume associated with an uncertainty factor of 20 percent. Table 10 summarizes the calculated baseline volume to achieve the target dredge elevation of -12 feet MLLW, and the volume to account for project uncertainty and over-dredge allowance.

The proposed dredged material, if determined to be suitable by the DMMP, will be transported to, and disposed at the Rosario Strait open-water disposal site.

3.1 CHARACTERIZATION OBJECTIVES AND APPROACH

3.1.1 Objectives

The objective is to characterize navigational area dredged material that will be generated below the contaminated sediment layer for the purpose of determining the suitability of the dredged material for open-water disposal. Sediment representing the post-dredge surface (i.e., Z layer) will also be collected to evaluate the surface exposed by dredging, if necessary, based on the results of the dredged material characterization. Evaluation of navigational area dredged material from the subsurface Dredged Material Management Unit (DMMU) and Z-layer will be based on the observed sediment stratigraphy, grain size and laboratory testing completed as part of the PRDI to verify the contact between the contaminated sediment layer and underlying clean native material (see Section 2.4). The characterization of navigational dredged material and the Z-layer will be completed in accordance with the guidelines specified in the DMMP User Manual.

Dredged material ranking, DMMU designation and sampling approach to be used to characterize the material to be dredged as part of the Navigational Dredged Material Characterization are described below.

3.1.2 Dredged Material Ranking

The management area rank dictates the maximum volume of material that can be included in a single DMMU. Based on the vertical heterogeneity of contamination and the location of the dredging project within a MTCA cleanup site, the Site is assumed to have a “high” management area rank. A high ranking indicates that many known chemical sources and high concentrations of chemicals of concern exist in the vicinity of the project area. A high ranking for the DMMP dredging project is used as the basis for identifying the number of DMMUs and sampling intensity for the dredge area. Although a high ranking is assumed, the subject underlying material composed of native glaciomarine deposits is anticipated to be free of Site COCs.

A high ranking is used as the basis for identifying the number of DMMUs and sampling density for the proposed dredge area presented in Sections 3.1.3 and 3.1.4, respectively.

3.1.3 Dredged Material Management Units

The dredge prism design for the navigational area takes into consideration the overlying contaminated sediment layer, depths and physical characteristics of the underlying native sediment, side slopes, practicable dredge cut depths and width and other logistical constraints. Available dredging methods and equipment and conventional construction practices at similar dredging projects are also considered in the dredge prism layout. In accordance with the DMMP User Manual, the depositional environment is assumed

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to be heterogeneous with a high dredged material rank. Target dredge depth within the navigational area is -12 feet MLLW with a 1-foot over-dredge allowance. In accordance with the DMMP User Manual, the dredged prism for open-water disposal is below the recommended 4-foot surface DMMU depth. Therefore, it is proposed that the navigational dredged material characterization be managed with subsurface DMMUs. Based on the anticipated dredge volume (Table 10), one subsurface DMMU is proposed to meet the DMMP User Manual recommended maximum volume of 12,000 cubic yards (CY) for a single subsurface DMMU. As described above, the estimated dredge volumes include the baseline volume, uncertainty factor and 1-foot over-dredge allowance.

The proposed subsurface DMMU is shown relative to the Interim Action Area in plan view in Figure 4 and in cross-section in Figures 5 through 7.

3.1.4 Characterization and Sampling Approach and Sampling Density

Characterization of the native material within the navigational area includes collecting sample material representative of the dredge prism (i.e., subsurface DMMU layer) and the underlying post-dredge surface (i.e., Z-layer). Samples representative of the navigational dredge prism will be collected from the base of the Interim Action plus 1-foot over-dredge allowance (variable depth based on PRDI results) to the base of the navigational dredge prism plus over-dredge allowance (i.e., -12 feet MLLW +1 foot over depth, or -13 feet MLLW). The Z-layer samples will consist of the material collected from the base of the navigational dredge prism plus over-dredge allowance to a depth of 2 feet below the over-dredge allowance (i.e., -13 feet MLLW +2 feet, or -15 feet MLLW). As per DMMP's sampling guidelines, field sample collection is planned such that the maximum dredged material volume represented by a single field sample is not greater than 4,000 BCY for high ranked project sites. Sediment cores will be collected from four locations (PRDI-04 through PRDI-07) as shown in Figure 4.

The sample core locations have been distributed within the Project area to provide representative aerial coverage, and for the purpose of providing representative samples of the dredged material that will be generated as part of the Navigational Dredging. The procedures for characterization and sampling of the material within the proposed dredge prism and Z-layer include the following:

- The stratigraphy and grain size of material of the proposed dredge prism material and Z-layer will be documented in field logs at each sampling location.
- Sediment material collected from each sample location within the subsurface DMMU will be collected at 1-foot intervals below the base of the contaminated sediment layer based on previous investigation results and initially archived pending verification of the contact layer as part of the PRDI. Based on the result of the PRDI (see Section 2.4), archived sample intervals representing material below the base of the contaminated sediment layer will be combined by the testing laboratory into a representative composite sample for characterization of the proposed subsurface DMMU dredge prism. Discrete Z-layer sediment samples will also be collected from each location and archived for potential follow-up analysis.
- **DMMU Sample Analysis** – DMMU sample analysis will be performed in a tiered approach as follows:
  - Analyses with short hold times (i.e., sulfides and ammonia) representing the proposed subsurface DMMU dredge prism will be initially analyzed as part of the PRDI to inform on potential future biological testing (see Sections 3.3.2 and 3.3.3), if elected by the Port. Following verification of the Interim Action dredge prism base, the remaining volume to reach the navigational depth will define

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the open-water dredge prism. Conventional and chemical analysis listed in Section 3.3.1 will then be completed on the laboratory generated composite sample that is representative of the subsurface DMMU material.

- **Discrete DMMU/Z-layer Sample Analysis** – In the event that one or more chemicals are detected at a concentration greater than the DMMP guideline values, follow up analysis of discrete DMMU and/or Z-layer samples will be completed to evaluate sediment quality and/or antidegradation of the surface that will be exposed by dredging. Any follow-up analysis will be coordinated with the Dredged Material Management Office (DMMO) prior to initiating the test.
- **Bioassay Testing** – In the event that there are one or more DMMP Screening Level (SL) exceedances, and the Port desires to continue to pursue open-water disposal and/or beneficial reuse, bioassay testing (Section 3.3.2) may be performed to further evaluate sediment quality. Sufficient sample material will be collected for potential bioassay testing as part of the PRDI. Bioassay testing, if elected by the Port, will be coordinated with the DMMO.
- **Bioaccumulation Testing** – In the event of one or more DMMP Bioaccumulation Trigger (BT) exceedances, and the Port desires to continue to pursue open-water disposal and/or beneficial reuse, bioaccumulation testing (Section 3.3.3) may be performed to further evaluate sediment quality. If elected by the Port, sample collection for bioaccumulation testing will be coordinated with the DMMO with the collection of additional material for testing completed under a separate mobilization.

3.2 SAMPLE STATION AND COLLECTION PROCEDURES

The sample collection procedures for the Dredging Project have been determined in accordance with the dredged material rankings and dredge volumes as discussed above and summarized in Table 10. The sample core locations have been distributed within each DMMU to provide representative aerial coverage, and for the purposes of providing representative samples of the dredged material that will be generated as part of the Navigational Dredging. Figure 4 identifies the proposed sample core stations that will be used to characterize the suitability of the subsurface DMMU for open-water disposal.

Sampling, as described in Section 2.4, will be completed using sonic drilling equipment achieving the target core penetration depth and sample recovery. Sample material collected from within the over-dredge allowance interval will be considered part of the subsurface DMMU sample material (i.e., base of contaminated layer to -13 feet MLLW). Sample material collected from a 2-foot interval below the base of the over-dredge allowance depth will be considered Z-layer sample material (i.e., -13 feet to -15 feet MLLW). The core logs for each sample station will provide information on core length included in the dredge prism composite sample, archived Z-layer sample or discarded material. An acceptable core must achieve the target penetration depth, meet sample recovery requirements and be within the target 10-foot radius from the initial core location as described in Section 2.4.1.

If field confirmation reveals that the proposed dredge prism is less than 2 feet in thickness at a given sample station, the sample station will be moved to a new nearby location with a field-confirmed proposed dredge prism thickness of 2 feet or more. The DMMO will be contacted in the event that the target core penetration depth or recovery cannot be achieved for any sample location, or where a sample location needs to be moved more than approximately 10 feet from the initial target location.

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Coordinates for the proposed sample core stations as well as target penetration depths, sample intervals and sample identification are summarized in Table 8. Sample core processing, positioning including horizontal and vertical controls, equipment decontamination, field documentation, and sample custody and transport procedures for the Navigational Dredged Material Characterization will follow the procedures described above (see Section 2.4) for use during the PRDI and are in accordance with the DMMP User Manual.

3.3 LABORATORY ANALYSIS

3.3.1 Physical and Chemical Testing

The analyses to be completed for the subsurface DMMU have been developed to evaluate open-water disposal suitability and/or beneficial reuse in general accordance with the DMMP User Manual. Analysis of the sediment samples will consist of the standard DMMP required conventional and chemical analytes as well as analysis of TBT and dioxins and furans as discussed in Sections 3.3.1.2 and 3.3.1.3.

- Conventional analyses will include total solids (TS), total volatile solids (TVS), TOC and grain size.
- Chemical analysis will include TBT, DMMP metals and SVOCs, pesticides, PCB Aroclors and dioxins and furans.

As discussed in Section 3.1, composite DMMU samples will be submitted for physical and chemical analysis to evaluate the suitability of the proposed dredged material for open-water disposal. Discrete DMMU and Z-Layer samples not submitted for analysis will be archived by the laboratory pending review of the composite DMMU sample results. Follow-up physical and chemical analysis of the discrete surface DMMU samples and/or Z-layer samples may be completed in the event that one or more chemical is detected at a concentration greater or is non-detect with a reporting limit than the DMMP guideline value. Any analysis of discrete DMMU and/or Z-layer samples will be coordinated with the DMMO prior to testing following review of the composite DMMU samples.

The analytical results for sediment samples will be compared to the current DMMP Guideline Chemistry Values (see Table 1) to evaluate the proposed dredged material suitability for open-water disposal and/or beneficial reuse. Analytical protocols, including sample holding times and reporting limits, will be in accordance with Puget Sound Estuary Program (PSEP) protocols and requirements (PSEP 1996). Sample holding times and methods are presented in Table 10.

3.3.1.1 GRAIN SIZE

Particle grain-size distribution for each composite sample will be determined in accordance with ASTM International (ASTM) D 422 (modified). The sand and gravel fraction will be determined using modified United States Environmental Protection Agency (EPA) sieve numbers 4, 10, 18, 35, 60, 120, and 230. Hydrometer analysis will be used for particle sizes finer than the 230 mesh. Hydrogen peroxide will not be used in preparations for grain-size analysis. Water content will be determined using ASTM D 2216. Sediment will be classified as follows:

GRAIN TYPE	PHI SIZE	SIEVE SIZE (NO.)	GRAIN SIZE (µM)
Gravel	< -1	>10	>2,000
Very Coarse Sand	-1 to 0	10 to 18	2,000 to 1,000

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GRAIN TYPE	PHI SIZE	SIEVE SIZE (NO.)	GRAIN SIZE (µM)
Coarse Sand	0 to 1	18 to 35	1,000 to 500
Medium Sand	1 to 2	35 to 60	500 to 250
Fine Sand	2 to 3	60 to 120	250 to 125
Very Fine Sand	3 to 4	120 to 230	125 to 62.5
Coarse Silt	4 to 5	>230	62.5 to 31
Medium Silt	5 to 6	>230	31 to 15.6
Fine Silt	6 to 7	>230	15.6 to 7.8
Very Fine Silt	7 to 8	>230	7.8 to 3.9
Clay	8 to >10	>230	3.9 to <1
Total Fines	>4	>230	<62.5

Notes:

A description of the visual grain size observed at the individual sampling locations will be documented on the field logs as described in Section 2.4.5.

3.3.1.2 TRIBUTYLTIN

TBT contamination in marina environments is typically associated with vessel repair and maintenance activities. Based on a review of the previous environmental studies results, concentrations of TBT in the recent sediment deposits at concentrations exceeding the DMMP Guideline Values within the proposed Interim Action area have been identified. As a result, TBT will also be evaluated on the composite subsurface DMMU sample to support open-water suitability determination.

3.3.1.3 DIOXINS AND FURANS

Dioxin/furan contamination can be associated with both point and non-point sources. Based on a review of the previous environmental studies results, dioxin and furan toxic equivalent quotient (TEQ) concentrations were detected greater than the DMMP dispersive and non-dispersive disposal site management objective of 4 parts per trillion (pptr; Table 2). As a result, dioxins and furans will also be evaluated in the composite subsurface DMMU sample to support open-water suitability determination.

3.3.1.4 SULFIDES

Total bulk sulfides samples will be collected from the homogenized sediment representative of the subsurface DMMU material and the Z-layer. Samples for sulfide analysis will be preserved with 5 milliliters of 2 Normal zinc acetate per 30 grams of sediment. The sulfides sample sediments will be placed in the laboratory-provided jar with the preservative, covered, and shaken vigorously to completely expose the sediment to the zinc acetate.

Samples for sulfide analysis will be clearly labeled with the project name, sample/composite identification, type of analysis to be completed, date and time, and initials of person(s) preparing the sample and referenced by the field logs. The sulfides sampling jars will indicate that zinc acetate has been added as a preservative.

As discussed above, representative samples for sulfide analysis will be completed in conjunction with the PRDI due to hold time constraints and will be used to inform biological testing, if elected by the Port based

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on the results of the navigational dredged material characterization. Biological testing is further described in Sections 3.3.2 and 3.3.3.

3.3.1.5 SEDIMENT REFERENCE SAMPLES

Certified reference material (CRM) will be utilized as part of the laboratory quality assurance/quality control (QA/QC) requirements as specified in Tables 11 through 17. CRMs will be used by the testing laboratory for semi-volatile, pesticide, metal and TOC analysis. In addition, a Puget Sound Sediment Reference Material (PS-SRM) will be used for PCB and dioxin/furan analysis. The DMMP guidance document for Requesting, Analyzing, Validation, and Reporting Data (DMMP 2024) will be followed for PS-SRM samples.

3.3.2 Bioassay Testing

Bioassay testing may be performed, if elected by the Port, to assess the suitability of sediment from the proposed Navigational Dredge area for open-water disposal, should the chemical analysis identify exceedances of DMMP SL marine guideline levels (see Table 1). Sufficient material will be collected in conjunction with the sampling and analysis for conventional and chemical tested as described above to complete bioassay analysis. This material will be archived by the laboratory pending review of the initial sample results. The DMMO project manager will be kept informed of analytical progress to support biological testing decisions.

The standard suite of bioassays includes both acute and chronic tests to characterize toxicity of whole sediment. Bioassay testing for marine evaluations will include:

- 10-day amphipod mortality test (acute toxicity);
- 20-day juvenile infaunal polychaete growth test (chronic toxicity).
- Sediment larval development test (acute larval toxicity).

EcoAnalysts, Inc., an Ecology-certified laboratory located in Port Gamble, Washington, will conduct the bioassay testing and reference sample collection. Bioassay testing requires that test sediments be matched and run with appropriate reference sediment to factor out background conditions and sediment grain size effects on bioassay organisms.

Field collection and processing methods, bioassay specific QA/QC, and data reporting procedures will be followed in accordance with PSEP guidelines and the DMMP User Manual. Bioassay testing procedures are summarized in the following sections.

3.3.2.1 BIOASSAY SPECIES

The DMMP recommended list of species will be used for marine bioassay testing. If the DMMP recommended species are not available, the DMMO will be contacted for approval prior to initiating testing with a non-recommended species.

- Recommended species for the 10-day amphipod mortality test include:
  - ***Eohaustorius estuarius*** – Most commonly used species; can be considered for use over grain size distributions ranging from 100 percent sand to 0.6 percent sand, as long as the clay fraction is less than 20 percent. This species can generally tolerate the widest range of salinities ranging from 2 parts per thousand (ppt) to 28 ppt.

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- ***Ampelisca abdita*** – Recommended if test sediment contains greater than 20 percent clay. This species prefer salinities of 28 ± 1 ppt.
- ***Rhepoxynius abronius*** – Alternative species for use in coarser-grained sediments (i.e. fines less than 60 percent). This species prefers salinities of 28 ± 1 ppt.
- ***Leptocheirus plumulosus*** – Cultured species which may be considered when other species are not available for field collection or not in a healthy condition suitable for testing. This species is generally considered tolerant of a wide range of grain sizes.

- Recommended species for the 20-day juvenile infaunal polychaete growth test include:
  - ***Neanthes arenaceodentata*** (Los Angeles karyotype).
- Recommended species for the larval test include:
  - **Bivalve** – *Mytilus galloprovincialis*.
  - **Echinoderm** – *Dendraster excentricus*.

Bioassay species will be selected by the testing laboratory based on sediment material type and composition and/or seasonal availability. The DMMO will be contacted prior to acquiring the selected test species.

3.3.2.2 REFERENCE SEDIMENT

Bioassays will be run with a reference sediment with physical characteristics (grain size and organic carbon) that matches the test sediment as closely as possible. The fines content (silt and clay) of the reference material should ideally fall within 10 percent of the fines content of the test sediment. Reference sediments will also be analyzed in the laboratory for TS, TVS, TOC, grain size, ammonia and sulfides. The methods and quality assurance guidelines used for analysis of sediment conventionals in test sediments will be used for reference sediments. Reference sediment will be collected by the testing laboratory in coordination with the DMMP.

Reference sediment will be collected from one of the reference sediment collection sites in Puget Sound (Carr Inlet, Samish Bay, Holmes Harbor and Sequim Bay) approved in the DMMP User Manual. Analysis of DMMP chemicals of concern is not required on reference sediment collected from one of the approved sediment collection sites. The location coordinates and water depth of the reference sediment sampling location will be recorded. Reference sediment samples will be collected using a grab-type sampler and processed using the same methods as the test sediment samples.

3.3.2.3 BIOASSAY LABORATORY PROTOCOLS

Sediment samples for bioassays will be stored at 4 degrees Celsius (°C) with no headspace, pending initiation of any required bioassay testing. Bioassay testing, including retests, will commence within 56 days (holding time constraints for bioassay) after collection of the sediment composite to be analyzed. Chain-of-custody procedures will be maintained by the laboratory throughout biological testing period.

As initial chemistry data becomes available, close coordination will be maintained between the project proponent, the bioassay laboratory and the DMMO to expedite biological testing decisions. DMMO will be provided with the results of conventional and chemical testing to facilitate biological testing decisions, help determine the grain size for the reference sediment and evaluate the potential for non-treatment effects.

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Ammonia and sulfides are potential non-treatment factors that may affect the results of bioassay. Need for purging and/or reference toxicity (Ref Tox) testing prior to the commencement of actual bioassay testing will be determined in accordance with the DMMP User Manual, DMMP Clarification Paper: Modifications to Ammonia and Sulfide Triggers for Purging and Reference Toxicant Testing (DMMP 2015), and in consultation with DMMO.

3.3.2.4 BIOASSAY SPECIFIC PROCEDURES

- **Amphipod 10-day Survival Bioassay** – The amphipod mortality test will be run for a 10-day exposure period, followed by counting the surviving test organisms. Daily emergence data and the number of amphipods failing to re-bury at the end of the test will be recorded.
- **Juvenile Infaunal Polychaete Growth Bioassay** – The sediment juvenile infaunal bioassay will be run for a 20-day exposure period, followed by counting and weighing of the surviving test organisms (PSEP 1995). At the end of the test, the mean individual growth rate is calculated for each replicate exposure as the difference between final and initial weights divided by the exposure duration. Results will be reported on an ash-free dry-weight (AFDW) basis in accordance with DMMP Neanthes protocol adjustments (DMMP 2013).
- **Larval Development Bioassay** – The sediment larval bioassay has a variable endpoint (not necessarily 48 hours) that is determined by the developmental stage of organisms in a sacrificial seawater control (PSEP 1995). At the end of the test, larvae from each test sediment replicate exposure are examined to quantify abnormality and mortality. For the larval bioassay, the standard PSEP protocol will be used. The standard PSEP protocol is applicable for sediment with lower fractions of fines, wood waste, or flocculent material. The resuspension procedure is used instead of the standard PSEP protocol to test sediments with high concentrations of fines, wood waste, or other flocculent material (DMMP 2013). The resuspension procedure can also be elected if there are concerns about false positives due to entrapment. The decision to use the resuspension protocol will be made in coordination with DMMO for approval before use. If bioassays are performed, it will be ensured that the larval test receives adequate aeration.

3.3.2.5 BIOASSAY TEST INTERPRETATION

The response of bioassay organisms exposed to the sediment sample representing each DMMU will be compared to the response of these organisms in both control and reference treatments. This comparison will determine whether the material is suitable for unconfined, open-water disposal and potentially also used to evaluate beneficial reuse under the SMS Biological Effects Criteria (WAC 173-204).

The determination of an environmentally significant response involves two conditions: first, that the response in the tested DMMU must be greater than 20 percent different from the control response; and second, that a comparison between mean test and mean reference responses be statistically significant. The interpretation of bioassay results will be completed in accordance with the guidelines presented in the DMMP User Manual. Additional interpretation may also be conducted against the SMS Biological Effects Criteria (WAC 173-204) to evaluate beneficial reuse.

3.3.3 Bioaccumulation Testing

Bioaccumulation testing evaluates accumulation of contaminants in the tissues of organisms through any route, including respiration, ingestion, or direct contact with contaminated water, sediment, or dredged material. Bioaccumulation testing may be elected to assess the suitability of sediment from the proposed Dredging Project for open-water disposal, should the chemical analysis identify exceedances of BT levels

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(see Table 1). The DMMP User Manual identifies 13 primary bioaccumulative chemicals of concern (BCOCs), which includes arsenic, lead, mercury, selenium, TBT, fluoranthene, pyrene, hexachlorobenzene, pentachlorophenol, total DDT (sum of 4,4'-DDD, 4,4'-DDE and 4,4'-DDT), chlordane (cis-chlordane, trans-chlordane, cis-nonachlor, trans-nonachlor, and oxychlordane), dioxin/furans and total PCB Aroclors.

Bioaccumulation testing requires a large volume of sediment beyond the amount needed for standard conventional/chemical testing. Volume could range from 24 liters per sample (for dioxin/furans only) to a maximum 72 liters (potentially for all BCOCs). Test design can be modified depending on the target analytes and required tissue mass. Therefore, the sediment sample volume for bioaccumulation testing is not planned to be collected during the initial sampling event completed to collect samples for conventional and chemical testing. An addendum to this SAP will be prepared to identify bioaccumulation test organisms, testing protocols, interpretation guidelines, and DMMUs and sampling locations for the purpose of bioaccumulation testing, along with conventional and chemical re-testing, for DMMO's review and approval prior to analysis.

EcoAnalysts, Inc., an Ecology-certified laboratory located in Port Gamble, Washington, will conduct the bioaccumulation testing and reference sample collection. The purpose of the reference sediment in bioaccumulation testing is to represent relatively uncontaminated sediments (EPA/USACE 1998).

Field collection and processing methods, bioaccumulation-specific QA/QC, and data reporting procedures will be followed in accordance with the DMMP User Manual. Bioaccumulation testing procedures are summarized in the following sections.

3.3.3.1 BIOACCUMULATION TEST SPECIES

The DMMP user manual identifies that the time required for any given species to achieve a steady-state tissue concentration of a chemical of concern may vary or is not well known. As such, for a given chemical triggering a bioaccumulation test, the applicant should consider selecting species that will assimilate the target chemical near its steady-state concentration (if known) within the exposure period or consider extending the exposure period. The species recommended by the DMMP User Manual for marine bioaccumulation test include the following:

- Adult bivalve (M*acoma nasuta*), and
- Alitta virens (formerly known as Nereis virens). An alternative to using Alitta virens is to use adult polychaete (*Nephtys caecoides*), if approved by DMMO.

3.3.3.2 BIOACCUMULATION TEST PROTOCOLS

Bioaccumulation test utilizes the EPA protocol (Lee et al. 1989) and a 45-day exposure period, after which a chemical analysis is conducted of the tissues of the test species to determine the concentration of BCOCs identified in the sediments. For 45-day tests, supplemental additions of sediment will need to be made once a week to each test chamber, including all test, reference and control replicates. Protocols for tissue digestion and chemical analysis will be in accordance with the PSEP-recommended procedures for metals and organic chemicals.

A considerable volume of sediment would be required to test species individually. Therefore, to conserve laboratory space and reduce the volume of sediment required, the DMMP User Manual allows applicants to expose *Macoma nasuta* and *Nephtys caecoides* together to the test sediment in the same test chambers.

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The EPA protocol also requires monitoring of survival, moisture and lipid content to assess the general health of the test organisms. In addition, for DMMP bioaccumulation testing, the wet-weight biomass (of a subset of 10 individual organisms per replicate) should be measured at the beginning and end of the bioaccumulation exposure period for each test, control and reference sample. These data can be used to calculate net individual growth during the exposure period, which provides an additional metric to evaluate the health of the test animals.

3.3.3.3 BIOACCUMULATION TEST INTERPRETATION

The DMMP User Manual identifies that the DMMP guidelines for the interpretation of bioaccumulation data are currently being revisited. The guidelines provided in the User Manual are those that have been used historically by the DMMP. For projects requiring bioaccumulation testing, the interpretive framework for evaluating the analytical results will be determined by the DMMP agencies prior to testing and on a case-by-case basis in coordination with the project proponent.

The interpretive approach used by DMMP includes an evaluation of both human health and ecological effects. These effects are evaluated through comparison of tissue concentrations resulting from exposure to dredged material to target tissue levels (TTLs) and to tissue concentrations resulting from exposure to a reference sediment. Decision-making is also informed by consideration of practical quantitation limits (PQLs), in-situ tissue data from disposal site environs and the effect of non-detects on statistical comparisons. A TTL is defined as the tissue concentration of a BCOC, measured in the tissues of the bioaccumulation test organisms, above which potential harm to the target organism (via bioaccumulative effects) is inferred. The TTL for 10 of 13 BCOCs are presented in the DMMP User Manual. For those BCOCs with a TTL, tissue residues from bioaccumulation testing are compared to the TTL. In addition, for all BCOCs except TBT, a comparison is also made to the tissue residues from a reference sediment exposure to assess potential ecological effects. For TBT, the ecological risk-based TTL is considered a sufficient benchmark for the assessment of potential ecological effects and a comparison to reference is not necessary.

Dioxins/furans are BCOCs for human health; however, a TTL has not yet been established. In the absence of a TTL, comparison to a reference sediment is required. The evaluation of testing results for dioxins/furans is complicated by the fact that 17 congeners are involved, and tissue concentrations may be at or below practical quantitation limits. A weight-of-evidence approach was used by DMMP agencies to evaluate tissue data from dioxin/furan bioaccumulation testing for the Port of Everett Marina (DMMP 2019a) and the Kenmore Federal Navigation Channel (DMMP 2019b). The weight-of-evidence approach included consideration of practical quantitation limits, the effect of non-detects on statistical comparisons, the magnitude of bioaccumulation, and a comparison to tissue concentrations in comparable species in the vicinity of the Port Gardner disposal site. The interpretation of bioaccumulation test results will be completed in accordance with the guidelines presented in the DMMP User Manual and in coordination with the DMMP agencies.

4.0 Quality Assurance/Quality Control

4.1 PROJECT TEAM ORGANIZATION AND RESPONSIBILITIES

4.1.1 Project Leadership and Management

The GeoEngineers Project Manager for the Project is Robert Trahan. The Project Manager has overall responsibility for executing the project in accordance with contractual requirements. The Project Manager

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is also responsible for selecting project team members, assigning and coordinating project tasks, determining subcontractor participation, establishing and adhering to budgets and schedules, providing technical oversight and coordinating production and review of project deliverables. The Project Manager is the primary technical representative for field investigation activities.

4.1.2 Field Coordinator

The GeoEngineers Field Coordinator for the Project is Jeff Pratt. The Field Coordinator is responsible for the daily management of activities in the field and will be responsible for QA/QC oversight of the laboratory programs.

4.1.3 Quality Assurance Specialist

The QA Specialist for the Project is Dennell Warren. The QA Specialist is responsible for coordinating QA/QC activities as they relate to chemical analytical data. The QA Specialist will review laboratory QA/QC data to assure validity of data and conformance to QA/QC requirements and will provide a written QA/QC report.

4.1.4 Laboratory Management

The subcontracted laboratories conducting sample analyses for this project are required to obtain approval from the GeoEngineers Project Manager and QA Specialist before the initiation of sample analysis to ensure that the laboratory QA plan complies with the project QA objectives. The Laboratory's QA Coordinator administers the Laboratory QA Plan and is responsible for QC. ARL of Tukwila, Washington will perform chemical analysis for this project. If bioassay or bioaccumulation testing is deemed necessary, EcoAnalysts, Inc. of Port Gamble, Washington will perform this analysis for this project.

4.2 CHEMICAL QUALITY OBJECTIVES AND CRITERIA

The quality assurance objective for technical data is to collect environmental monitoring data of known, acceptable and documentable quality. The QA objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis and data reporting that will facilitate consistency and thoroughness of data generated.
- Achieve the acceptable level of confidence and quality required so that data generated are scientifically valid and of known and documented quality. This will be performed by establishing criteria for precision, accuracy, representativeness, completeness and comparability, and by testing data against these criteria.

The sampling design, field procedures, laboratory procedures and QC procedures are set up to provide high-quality data for use in this project. Specific data quality factors that may affect data usability include quantitative factors (bias, detection limits, precision, accuracy and completeness) and qualitative factors (representativeness and comparability). The chemistry QA/QC requirements summarized in Tables 11 through 18 will be followed so that data of adequate quality is generated to support verification of the contamination layer base to meet SMS and DMMP suitability determination for the navigational dredged material. Table 19 presents toxicity equivalency factors (TEFs) for cPAHs, dioxin-like PCBs and dioxins and furans that will be used to calculate TEQ concentrations for comparison to the screening levels. Calculation of chemical sums is further described in Section 4.2.20.

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4.2.1 Detection Limits and Reporting Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight to site conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the limits of quantification (LOQ) or PQL, which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL. Ideally, the reporting limits (i.e., LOQ or PQL) for all chemicals will be below the SMS and DMMP SLs. In cases where the PQL is observed to be above the SMS and DMMP SL, the laboratory will report the compound as either detected between the MDL and PQL (with a J qualifier) or not detected at the MDL level.

The reporting limits presented in Table 18 are the laboratory PQLs that are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions of sediment affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. This includes the following:

- Non-detected results will be accompanied by a "U" qualifier. Laboratory will report both the reporting limit and the sample detection limit for any chemical concentration that is accompanied by a "U" flag.
- Laboratory will report estimated concentrations that fall between the sample detection limit and reporting limit. Such estimated concentrations will be accompanied by a "J" qualifier.
- For mixtures of chemicals, such as total PCBs, the reported values of detected constituents, including "J" values falling between the sample detection limit and the reporting limit, will be summed. In the event that all constituents are undetected, the single highest constituent's detection limit will be used as the value for the mixture in a given sample and will be accompanied by a "U" qualifier.

4.2.2 Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicate or split samples, replicate analyses and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample comparisons of various matrices and field duplicate comparisons for samples. This value is calculated by:

$$RPD\,(\%) = \frac{|\,D_1 - D_2\,|}{(\,D_1 + D_2\,)/2}\,X\,100,$$

Where:

D_1 = Concentration of analyte in sample.

D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates) and laboratory control duplicates. The RPD will be calculated for samples and

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compared to the applicable criteria. Precision can also be expressed as the percent difference (%D) between replicate analyses. Project RPD goals for all analyses are 50 percent for sediment samples, unless the primary and duplicate sample results are less than 5 times the method reporting limit (MRL), in which case RPD goals will not apply for data quality assessment purposes.

4.2.3 Accuracy

Accuracy is a measure of bias in the analytic process. The closer the measurement value is to the true value, the greater the accuracy. This measure is defined as the difference between the reported values versus the actual value and is often measured with the addition of a known compound to a sample. The amount of known compound reported in the sample, or percent recovery, assists in determining the performance of the analytical system in correctly quantifying the compounds of interest. Since most environmental data collected represent one point spatially and temporally rather than an average of values, accuracy plays a greater role than precision in assessing the results. In general, if the percent recovery is low, non-detect results may indicate that compounds of interest are not present when in fact these compounds are present. Detected compounds may be biased low or reported at a value less than actual environmental conditions. The reverse is true when recoveries are high. Non-detect values are considered accurate while detected results may be higher than the true value.

For this project, accuracy will be expressed as the percent recovery of a known surrogate spike, matrix spike or laboratory control sample (blank spike), concentration:

$$Recovery\,(\%) = \frac{Spiked\ Result - Unspiked\ Result}{Known\ Spike\ Concentration}\ X\ 100$$

Persons performing the evaluation must review one or more pertinent documents (EPA 2004) that address criteria exceedances and courses of action.

4.2.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those specified in this document.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative.

Only representative data will be used in subsequent data reduction, validation and reporting activities.

4.2.5 Completeness

Completeness establishes whether a sufficient number of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes a comparative basis for completeness. Completeness goals are 95 percent usable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

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$$Completeness = \frac{number\ of\ valid\ measurements}{total\ number\ of\ data\ points\ planned} x\ 100$$

4.2.6 Comparability

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

4.2.7 Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis is exceeded, then the possibility exists that some of the organic constituents may have volatilized from the sample or degraded. Results for that analysis would be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Holding times are presented in Table 10.

4.2.8 Laboratory Custody Procedures

The laboratory will follow their standard operating procedures to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include at a minimum, the analyst's name and initial, time and date.

4.2.9 Laboratory Calibration Procedures

For analytical chemistry, calibration procedures will be performed in general accordance with the methods cited and laboratory standard operating procedures. Calibration documentation will be retained at the laboratory and readily available for a period of 6 months.

4.2.10 Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data quality assessment process. The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements as specified in Tables 11 through 16. These requirements will vary by method, but generally include:

- Method Blank or Equipment Blank Contamination.
- Instrument Initial Calibrations and Instrument Continuing Calibrations.
- Matrix Spikes/Matrix Spike Duplicates (MS/MSD) Outliers.
- Laboratory Control Sample (LCS)/Ongoing Precision and Recovery (OPR) Sample Outliers.
- Laboratory Replicates or Duplicates.
- Surrogates/Labeled Compounds Outliers.
- High Resolution Gas Chromatography/Mass Spectrometer (HRGC/HRMS) system performance checks:

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- Mass Calibration and Resolution.
- Selected Ion Monitoring switching times.
- GC Resolution.

- MDLs, Contracted Reporting Limits (CRLs) and Estimated Detection Limits (EDLs).

4.2.11 Laboratory Blanks

Laboratory procedures utilize several types of blanks, but the most commonly used blanks for QC monitoring are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process, or reagent (contaminant-free) water. Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. If a substance is detected in a method blank, then one (or more) of the following occurred:

- Sample containers, measurement equipment and/or analytical instruments were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.
- Volatile substances in ambient laboratory air with high solubility or affinities toward the sample matrix contaminated the samples during preparation or analysis.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. If target analytes are detected in method blanks, data validation guidelines assist in determining which substances in project samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines state, "… there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example."

Analytical results for laboratory method or prep blanks will be evaluated in general accordance with EPA National Functional Guidelines for Inorganic Data Review (EPA 2020a), National Functional Guidelines for Organic Data Review (EPA 2020b) and National Functional Guidelines for High Resolution Data Review (EPA 2020c). In general, whenever evidence suggests that the source of a positive result in a field sample is something other than the environmental media, the analyte is qualified as not-detected (U) or estimated (UJ) with elevated reporting (quantitation) limits.

4.2.12 Calibrations

Several types of instrument calibrations are used, depending on the analytical method, to assess the linearity of the calibration curve and assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations and continuing calibration verification.

4.2.13 Matrix Spike/Matrix Spike Duplicates

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH can affect the results for SVOCs. The presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix

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effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a project sample with a known amount of one or more of the target analytes, ideally at a concentration that is 5 to 10 times higher than the sample result. A percent recovery is then calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the known concentration of the spike, and multiplying by 100.

MS/MSD samples will be analyzed at a frequency of one MS/MSD per analytical batch or one per every 20 samples analyzed (whichever is more frequent). The samples for the MS/MSD analyses should be collected from a boring or sampling location that is believed to have only low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for the MS/MSD analyses as required by the laboratory.

4.2.14 Laboratory Control Samples/Laboratory Control Sample Duplicates

Also known as blanks spikes, LCS are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared sample medium, and a percent recovery of the spiked substances is calculated. The primary difference between LCS and MS samples is that the LCS uses a contaminant-free sample medium. For example, reagent water is typically used for LCS water analyses. The purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance and analyst performance.

4.2.15 Laboratory Replicates/Duplicates

Laboratories utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process and most commonly consist of a second analysis on the extracted media.

4.2.16 Surrogates/Labeled Compounds

Surrogate spikes are used to verify proper extraction procedures and the accuracy of the analytical instrument. Surrogates are substances with characteristics similar to the target analytes. A known concentration of surrogate is added to the project sample and passed through the instrument and the percent recovery is calculated. Each surrogate used has acceptance limits (i.e., an acceptable range) for percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified acceptance limits, a possibility of false positives exists, although non-detect results are considered accurate.

4.2.17 Review of Field Documentation and Laboratory Receipt Information

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;

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- Sample collection protocol;
- Sample containers, preservation and volume;
- Field QC samples collected at the frequency specified;
- Chain of custody protocols; and
- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

4.2.18 Data Deliverables

Laboratories will report data in digital formats. Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the field sample identification, the laboratory identification, reporting units, data qualifiers, analytical method, analyte tested, analytical result, extraction and analysis dates and quantitation limits. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues. Laboratory electronic data deliverable (EDD) requirements will be established by GeoEngineers, Inc. with the contract laboratory.

The laboratory will ultimately send final analytical reports to the Project Manager in the form of (1) a Portable Document Format (PDF) file and (2) EDD files. At a minimum, the following will be included in the report**:**

- Results of the laboratory analyses and QA/QC results.
- All special protocols used during analyses.
- Chain-of-custody information including an explanation of any deviation from those identified herein.
- List of internal, laboratory defined qualifiers.
- List of sample results, reporting limits and method detection limits.
- A list of data qualifier code definitions.
- Sample preparation, extraction, dilution, and cleanup logs.
- Instrument tuning data.
- Initial and continuing calibration data, including instrument printouts and quantification summaries, for all analytes.
- Results for method and calibration blanks.
- Results for all QA/QC checks, including surrogate spikes, internal standards, laboratory control samples, matrix spike samples, matrix spike duplicate samples, and laboratory duplicate or triplicate samples.
- Original data quantification reports for all analysis and samples.
- All laboratory worksheets and standards preparation logs.

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- An EDD in Environmental Information Management (EIM) database format.

4.2.19 Data Review, Verification, and Validation

Project decisions, conclusions and recommendations will be based upon data that have been formally verified and validated. The purpose of data verification and validation is to ensure that data used for subsequent evaluations and calculations are scientifically valid, of known and documented accuracy and precision and legally defensible. Field data verification will be used to eliminate data not collected or documented.

The QA Specialist will validate data collected from the sediment investigation to ensure that the data are valid and usable for the purposes of this project. This data quality assessment will help to achieve an acceptable level of confidence in the decisions that are to be made based upon the project data. Data packages will be checked for completeness immediately upon receipt from the laboratory to ensure that data and QA/QC information requested are present. At a minimum, the following items will be reviewed to verify the data as applicable:

- Holding times.
- Initial calibrations.
- Continuing calibrations.
- Method blanks.
- Labeled Compound recoveries.
- Estimated and Method Detection limits/Contract Required Reporting Limits.
- Ongoing Precision and Recovery Samples.
- Matrix spike/matrix spike duplicate samples.

An EPA-defined Stage 2B validation will be performed on organic and inorganic analytical data in general accordance with EPA National Functional Guidelines for Inorganic Data Review (EPA 2020a), National Functional Guidelines for Organic Data Review (EPA 2020b) and National Functional Guidelines for High Resolution Data Review (EPA 2020c). Additional specifications and professional judgment by the QA Specialist may be incorporated when appropriate data from specific matrices and field samples are available.

Following the validation, a report will be prepared to document the overall quality of the data relative to the quality assurance guidelines of the DMMP User Manual. Major components of the data quality assessment report include:

- **Data Validation Summary** – Summarizes the data validation conclusions for all sample delivery groups by analytical method. The summary identifies any systematic problems, data generation trends, general conditions of the data and reasons for any data qualification.
- **Assessment of Data Quality** – An assessment of the quality of data measured and generated in terms of accuracy, precision and completeness relative to objectives established for the project.

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- **Summary of Data Usability** – Summarizes the usability of data, based on the assessment performed in the preceding steps.

4.2.20 Calculating Chemical Sums

Some of the SMS and DMMP numerical criteria are for sums of individual compounds (e.g., total LPAHs, total HPAHs), isomers (e.g., total benzofluoranthenes), or groups of compounds (e.g., total PCB Aroclors). Additionally, some bioaccumulative chemicals with common modes of action are summed for the purposes of human health risk assessment and determination of cleanup standards. The following methods will be used for the summation of individual compounds for comparison to the SMS and DMMP numerical criteria:

- **Total LPAH** represents the sum of the concentrations of the following LPAHs: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. Note that 2-Methylnaphthalene is not included in the sum.
- **Total HPAH** represents the sum of the concentrations of the following HPAHs: benzo[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes.
- **Total benzofluoranthenes** represents the sum of concentrations of the b, j, and k isomers of benzofluoranthenes. Note that some laboratories report the total benzofluoranthenes concentration rather than concentrations of individual compounds since they may not be able to resolve all three isomers.
- **Total PCBs** represents the sum of the following Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. If present, Aroclor-1262 and 1268 will be reported but not included in the summation.
- **Toxicity Equivalence Calculations** – TEQs should be calculated two different ways: (1) non-detected values U = ½ EDL or U = ½ estimated maximum possible concentration (EMPC), when EMPC is qualified as non-detect in data validation and (2) with non-detected values U = 0. Table 19 presents the TEFs for cPAHs, dioxin/furans and dioxin-like PCBs. When non-detects are present in a dataset, Ecology recommends the Kaplan-Meier method for estimating the TEQ sums when < 50 percent of individual analytes are not detected within a sample.
- **Organic Carbon Normalization** – To normalize to total organic carbon, the dry weight concentration for each contaminant of concern is divided by the decimal fraction representing the percent total organic carbon content (e.g., 0.01 means 1 percent) of the sediment sample per equation:

$$OC = \frac{Dry\ Weight\ Concentrtaion}{Percent\ TOC\ x\ 1000}$$

Where:

OC = Organic Carbon Normalized Concentration in parts per million (ppm)

Dry Weight Concentration is in parts per billion (ppb)

TOC is in decimal form

1000 is used as a unit conversion from ppb to ppm

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5.0 Health and Safety

Field activities will be completed in accordance with the requirements of the Washington Industrial Safety and Health Act (RCW 49.17) and the Federal Occupational Safety and Health Act (29 CFR 1910, 1926). These regulations include requirements that workers are to be protected from exposure to contaminants. A Site-specific Health and Safety Plan (HASP) describing actions that will be taken to protect the health and safety of GeoEngineers personnel is presented in Appendix A. Companies providing services for this project on a subcontracted basis will be responsible for developing and implementing their own HASP.

6.0 Inadvertent Discovery of Cultural Resources

This work is being conducted under an Ecology remedial action grant. As such, Ecology initiated a 05-05 cultural resource consultation with the Department of Archaeology and Historic Preservation (DAHP). In Ecology's determination letter dated September 15, 2020 (Ecology 2020), the Site has a low risk of encountering archeological resources within the marine area and does not require archaeological oversight during sediment sampling activities. However, the potential to encounter archaeological materials remains.

To address this potential, an Inadvertent Discovery Plan (IDP) has been prepared for the sampling activities described above using Ecology's IDP form to outline procedures that will be followed in the event that archaeological materials or human remains are discovered during sediment sampling activities. A copy of the IDP is presented in Attachment 3 to the Interim Action Work Plan and will be available on Site during the investigation activities.

7.0 Reporting

7.1 PRE-REMEDIAL DESIGN INVESTIGATION

A written report will be prepared by GeoEngineers documenting the activities associated with the PRDI. At a minimum, the following will be included:

- Type of sampling equipment used.
- Protocols used during sampling and testing and an explanation of any deviations from the sampling plan protocols.
- Logs of the borings showing descriptions of each sample, penetration depth and percent recovery data.
- Methods used to locate the sampling positions.
- Coordinates, measured water depth, tidal elevation at the time of sampling and calculated mudline elevation (referenced to MLLW for actual sampling locations and depths of each sample interval (referenced both to the mudline and MLLW) that was composited. Coordinates will be reported in latitude and longitude to the nearest hundredths of a second.
- A plan view of the project showing the target and actual sampling locations and Interim Action boundary.

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- Data tables presenting laboratory results, both laboratory and validation qualifiers with definitions of codes used and MDLs and RLs (PQLs) for non-detects. The data tables will highlight SMS exceedances.
- Copies of the chemical analytical laboratory reports as an appendix.
- Data validation report (as appendix) presenting the results of a Stage 2B validation to ensure that all chemistry QA/QC requirements are met and to assign appropriate final data validation flags consistent with Ecology reporting requirements.

7.2 DREDGED MATERIAL CHARACTERIZATION REPORT

A written report shall be prepared by GeoEngineers documenting the activities associated with the dredged material characterization to support open-water disposal determination. At a minimum, the following will be included:

- Type of sampling equipment used.
- Protocols used during sampling and testing and an explanation of any deviations from the sampling plan protocols.
- Logs of the borings showing descriptions of each sample, penetration depth and percent recovery data.
- Methods used to locate the sampling positions.
- Coordinates, measured water depth, tidal elevation at the time of sampling, and calculated mudline elevation (referenced to MLLW) for actual sampling locations and depths of each sample interval (referenced both to the mudline and MLLW) that was composited. Coordinates will be reported in latitude and longitude to the nearest hundredths of a second.
- Description of sampling and composting procedures.
- A plan view of the project showing the target and actual sampling locations and DMMU boundary.
- Data tables presenting laboratory results, both laboratory and validation qualifiers with definitions of codes used, and MDLs and RLs for non-detects. The data tables will highlight any DMMP guideline exceedances.
- Copies of the chemical analytical laboratory reports as an appendix. If biological testing is completed, the final characterization report will also include summary tables of biological testing results, QA data and interpretations and copies biological laboratory reports (as an appendix).
- Data validation report (as appendix) presenting the results of a Stage 2B validation to ensure that all chemistry QA/QC requirements are met and to assign appropriate final data validation flags consistent with DMMP reporting requirements. QA2 data will be reported in electronic format only.
- Data submittal to DMMO in the EIM format, using guidance provided by DMMO.
- Copy of the approved Dredged Material Characterization SAP as an appendix.

8.0 Schedule

Field activities for the PRDI and dredged material characterization will occur within the permitted, allowed in-water work windows and will utilize existing in-water work permits previously established for the Site. The

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field investigation is currently scheduled to be initiated mid-summer 2026, however, is subject to Ecology and DMMP review and contactor availability to complete the scope of work described above.

9.0 Limitations

This SAP has been prepared for the exclusive use of the Port, their authorized agents and regulatory agencies in their evaluation of the Anacortes Port Log Yard Site. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

Within the limitations of scope, schedule and budget, our services were executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

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Tables

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Table 1

SMS and DMMP Sediment Screening Levels

Anacortes Port Log Yard

Anacortes, Washington

Analyte	CAS Number	Units	Natural Background[1]	Practical Quantitation Limit (PQL)	Proposed Benthic Cleanup Level[2,3,4]	Proposed Human Health Cleanup Level[5,6]		Dredged Material Management Program Marine Guidline Values[7]		
					SCO/ LAET	Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (Below -3 ft MLLW)	Screening Level (SL)	Bioaccumulation Trigger (BT)	Maximum Level (ML)
Metals										
Antimony	7440-36-0	mg/kg	--	--	--	--	--	150	--	200
Arsenic	7440-38-2	mg/kg	11	5.0	57	11	11	57	507	700
Cadmium	7440-43-9	mg/kg	0.8	0.2	5.1	0.8	0.8	5.1	--	14
Chromium	16065-83-1	mg/kg	62	0.5	260	62	62	260	--	--
Copper	7440-50-8	mg/kg	45	0.2	390	45	45	390	--	1,300
Lead	7439-92-1	mg/kg	21	2.0	450	21	21	450	975	1,200
Mercury	7439-97-6	mg/kg	0.2	0.05	0.41	--	--	0.41	1.5	2.3
Selenium	7782-49-2	mg/kg	--	--	--	--	--	--	3.0	--
Silver	7440-22-4	mg/kg	0.24	0.3	6.1	0.3	0.3	6.1	--	8.4
Zinc	7440-66-6	mg/kg	93	1.0	410	93	93	410	--	3,800
Organometallic Compounds										
Tributyltin Ion (Bulk Sediment)	56-35-9	µg/kg	--	3.9	--	73[7]	73[7]	--	73	--
Tributyltin Ion (Interstitial Water)	56-35-9a	µg/L	--	0.0052	--	0.15[7]	0.15[7]	--	0.15	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized)										
Sum of LPAHs[8]	n/a	mg/kg OC	--	--	370	--	--	--	--	--
2-Methylnaphthalene	91-57-6	mg/kg OC	--	--	38	--	--	--	--	--
Acenaphthene	83-32-9	mg/kg OC	--	--	16	--	--	--	--	--
Acenaphthylene	208-96-8	mg/kg OC	--	--	66	--	--	--	--	--
Anthracene	120-12-7	mg/kg OC	--	--	220	--	--	--	--	--
Fluorene	86-73-7	mg/kg OC	--	--	23	--	--	--	--	--
Naphthalene	91-20-3	mg/kg OC	--	--	99	--	--	--	--	--
Phenanthrene	85-01-8	mg/kg OC	--	--	100	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry Weight)										
Sum of LPAHs[8]	n/a	µg/kg	--	5.0	5,200	--	--	5,200	--	29,000
2-Methylnaphthalene	91-57-6	µg/kg	--	5.0	670	320,000	4,500,000	670	--	1,900
Acenaphthene	83-32-9	µg/kg	--	5.0	500	4,800,000	67,000,000	500	--	2,000
Acenaphthylene	208-96-8	µg/kg	--	5.0	1,300	4,800,000	67,000,000	560	--	1,300
Anthracene	120-12-7	µg/kg	--	5.0	960	4,800,000	67,000,000	960	--	13,000
Fluorene	86-73-7	µg/kg	--	5.0	540	3,200,000	45,000,000	540	--	3,600
Naphthalene	91-20-3	µg/kg	--	5.0	2,100	1,600,000	22,000,000	2,100	--	2,400
Phenanthrene	85-01-8	µg/kg	--	5.0	1,500	4,800,000	67,000,000	1,500	--	21,000
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized)										
Sum of HPAHs[9]	n/a	mg/kg OC	--	--	960	--	--	--	--	--
Benzo(a)anthracene	56-55-3	mg/kg OC	--	--	110	--	--	--	--	--
Benzo(a)pyrene	50-32-8	mg/kg OC	--	--	99	--	--	--	--	--
Benzofluoranthenes[10] (Total)	n/a	mg/kg OC	--	--	230	--	--	--	--	--
Benzo(g,h,i)perylene	191-24-2	mg/kg OC	--	--	31	--	--	--	--	--
Chrysene	218-01-9	mg/kg OC	--	--	110	--	--	--	--	--
Dibenzo(a,h)anthracene	53-70-3	mg/kg OC	--	--	12	--	--	--	--	--
Fluoranthene	206-44-0	mg/kg OC	--	--	160	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	193-39-5	mg/kg OC	--	--	34	--	--	--	--	--
Pyrene	129-00-0	mg/kg OC	--	--	1,000	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry Weight)										
Sum of HPAHs[9]	n/a	µg/kg	--	5.0	12,000	--	--	12,000	--	69,000
Benzo(a)anthracene	56-55-3	µg/kg	--	5.0	1,300	See cPAH TEQ	See cPAH TEQ	1,300	---	5,100
Benzo(a)pyrene	50-32-8	µg/kg	21	5.0	1,600	See cPAH TEQ	See cPAH TEQ	1,600	--	3,600
Benzofluoranthenes[10] (Total)	n/a	µg/kg	--	5.0	3,200	See cPAH TEQ	See cPAH TEQ	3,200	--	9,900
Benzo(g,h,i)perylene	191-24-2	µg/kg	--	5.0	670	See cPAH TEQ	See cPAH TEQ	670	--	3,200
Chrysene	218-01-9	µg/kg	--	5.0	1,400	See cPAH TEQ	See cPAH TEQ	1,400	---	21,000
Dibenzo(a,h)anthracene	53-70-3	µg/kg	--	5.0	230	See cPAH TEQ	See cPAH TEQ	230	--	1,900
Fluoranthene	206-44-0	µg/kg	--	5.0	1,700	3,200,000	45,000,000	1,700	4,600	30,000
Indeno(1,2,3-c,d)pyrene	193-39-5	µg/kg	--	5.0	600	See cPAH TEQ	See cPAH TEQ	600	--	4,400
Pyrene	129-00-0	µg/kg	--	5.0	2,600	2,400,000	34,000,000	2,600	11,980	16,000
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)										
Total cPAHs - TEQ	see Benzo(a)pyrene	µg/kg	21	5.0	--	21	21	--	--	--
Chlorinated Hydrocarbons (OC Normalized)										
1,2,4-Trichlorobenzene	120-82-1	mg/kg OC	--	--	0.81	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	mg/kg OC	--	--	2.3	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	mg/kg OC	--	--	3.1	--	--	--	--	--
Hexachlorobenzene	118-74-1	mg/kg OC	--	--	0.38	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)										
1,2,4-Trichlorobenzene	120-82-1	µg/kg	--	20	31	38,000	88,000	31	--	64
1,2-Dichlorobenzene (o-Dichlorobenzene)	95-50-1	µg/kg	--	20	35	21,000,000	230,000,000	35	--	110
1,4-Dichlorobenzene (p-Dichlorobenzene)	106-46-7	µg/kg	--	20	110	200,000	470,000	110	--	120
Hexachlorobenzene	118-74-1	µg/kg	--	1.0	22	690	1,600	22	168	230
Phthalates (OC Normalized)										
Bis(2-Ethylhexyl) Phthalate	117-81-7	mg/kg OC	--	--	47	--	--	--	--	--
Butyl benzyl Phthalate	85-68-7	mg/kg OC	--	--	4.9	--	--	--	--	--
Dibutyl Phthalate	84-74-2	mg/kg OC	--	--	220	--	--	--	--	--
Diethyl Phthalate	84-66-2	mg/kg OC	--	--	61	--	--	--	--	--
Dimethyl Phthalate	131-11-3	mg/kg OC	--	--	53	--	--	--	--	--
Di-N-Octyl Phthalate	117-84-0	mg/kg OC	--	--	58	--	--	--	--	--
Phthalates (Dry Weight)										
Bis(2-Ethylhexyl) Phthalate	117-81-7	µg/kg	--	50	1,300	24,000	63,000	1,300	--	8,300
Butyl benzyl Phthalate	85-68-7	µg/kg	--	20	63	180,000	460,000	63	--	970
Dibutyl Phthalate	84-74-2	µg/kg	--	20	1,400	6,100,000	88,000,000	1,400	--	5,100
Diethyl Phthalate	84-66-2	µg/kg	--	20	200	49,000,000	700,000,000	200	--	1,200
Dimethyl Phthalate	131-11-3	µg/kg	--	20	71	--	--	71	--	1,400
Di-N-Octyl Phthalate	117-84-0	µg/kg	--	20	6,200	610,000	8,800,000	6,200	--	6,200
Phenols (Dry Weight)										
2,4-Dimethylphenol	105-67-9	µg/kg	--	25	29	1,200,000	18,000,000	29	--	210
2-methylphenol (o-Cresol)	95-48-7	µg/kg	--	20	63	3,000,000	44,000,000	63	--	77
4-methylphenol (p-Cresol)	106-44-5	µg/kg	--	20	670	6,100,000	88,000,000	670	--	3,600
Pentachlorophenol	87-86-5	µg/kg	--	100	360	550	1,400	400	504	690
Phenol	108-95-2	µg/kg	--	100	420	18,000,000	260,000,000	420	--	1,200
Miscellaneous Extractables (OC Normalized)										
Dibenzofuran	132-64-9	mg/kg OC	--	--	15	--	--	--	--	--
Hexachlorobutadiene	87-68-3	mg/kg OC	--	--	3.9	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	mg/kg OC	--	--	11	--	--	--	--	--

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Analyte	CAS Number	Units	Natural Background[1]	Practical Quantitation Limit (PQL)	Proposed Benthic Cleanup Level[2,3,4]	Proposed Human Health Cleanup Level[5,6]		Dredged Material Management Program Marine Guidline Values[7]		
					SCO/ LAET	Intertidal Sediment (Above -3 ft MLLW)	Subtidal Sediment (Below -3 ft MLLW)	Screening Level (SL)	Bioaccumulation Trigger (BT)	Maximum Level (ML)
Miscellaneous Extractables (Dry Weight)										
Dibenzofuran	132-64-9	µg/kg	--	20	540	170,000	2,000,000	540	--	1,700
Hexachlorobutadiene	87-68-3	µg/kg	--	1.0	11	14,000	33,000	11	--	270
N-Nitrosodiphenylamine (as diphenylamine)	86-30-6	µg/kg	--	20	28	70,000	180,000	28	--	130
Benzoic Acid	65-85-0	µg/kg	--	20	650	240,000,000	3,500,000,000	650	--	760
Benzyl Alcohol	100-51-6	µg/kg	--	2.0	57	6,100,000	88,000,000	57	--	870
Pesticides (Dry Weight)										
4,4'-DDD	72-54-8	µg/kg	--	--	--	--	--	16	--	--
4,4'-DDE	72-55-9	µg/kg	--	--	--	--	--	9.00	--	--
4,4'-DDT	50-29-3	µg/kg	--	--	--	--	--	12	50	69
Total DDT (4,4 isomers)	--	µg/kg	--	--	--	--	--	--	--	--
Aldrin	309-00-2	µg/kg	--	--	--	--	--	10	--	--
Total Chlordane[11]	--	µg/kg	--	--	--	--	--	2.8	37	--
Dieldrin	60-57-1	µg/kg	--	--	--	--	--	1.9	--	1,700
Heptachlor	76-44-8	µg/kg	--	--	--	--	--	1.5	--	270
Polychlorinated Biphenyls (PCBs; OC Normalized)										
Total PCBs Aroclors	1336-36-3	mg/kg OC	--	--	12	--	--	--	38	--
Total PCBs Congeners	1336-36-3a	mg/kg OC	--	--	12	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)										
Total PCBs Aroclors	1336-36-3	µg/kg	3.5	2.0	130	3.5	3.5	130	--	3,100
Total PCBs Congeners	1336-36-3a	µg/kg	3.5	2.0	130	3.5	3.5	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)										
Total Dioxin-Like PCB Congeners TEQ	see Total Dioxins/Furans	ng/kg	0.20	0.20	--	0.20	0.20	--	--	--
Dioxins and Furans										
Total Dioxin/Furan TEQ	1746-01-6	ng/kg	4.0	5[12]	--	5.0	5.0	4.0	--	--

Notes:

[1] Natural background values referenced from Tabel 10-1 of Ecology's SCUM guidance (Ecology 2026).

[2] Sediment Management Standards (SMS; Washington Administrative Code [WAC] Chapter 173-204).

[3] Apparent Effects Threshold (AET) Criteria from Ecology's SCUM guidance (Table 8-1; Ecology 2021).

0.5 to 3.5 percent. Results for sediment samples with TOC

[5] Sediment screening levels for the protection of human health via direct contact are calculated using equations and input parameters provided in Ecology's SCUM guidance (Ecology 2026). The toxicity equivalency factors (TEFs) used to calculate the screening levels are from Table 708-1 (chlorinated dibenzo-p-dioxins and chlorinated dibenzofurans congeners) and Table 708-2 (cPAHs) of the Model Toxics Control Act (MTCA) Cleanup regulation (Chapter 173-340 WAC).

[6] The screening levels presented in this table are to provide a preliminary evaluation of human health and ecological risk for higher trophic level ecological receptors. Human health and higher trophic level ecological receptor screening levels are chosen from lowest of bioaccumulative and direct contact pathways. The risk-based value adjusted for the higher of natural background and PQL is the SCO. The human health screening level for intertidal areas includes marine areas at elevations higher than -3 feet mean lower low water (MLLW) and the applicable direct contact pathways include beach play, clamming and net fishing. The human health screening levels for subtidal areas include marine areas at elevations below -3 feet MLLW and the applicable direct contact pathway is net fishing.

[7] Established as the Dredged Material Management Program (DMMP) BT Marine Guidelines Value (DMMP User Manual; Table 8-3; USACE 2025).

[8] Total LPAHs are the total of naphthalene, acenaphthylene, acenaphthene, fluorene, phenanthrene and anthracene. The concentraion of 2-methylnapthalene is not included in the sum of LPAHs.

[9] Total HPAHs are the total of fluoranthene, pyrene, benzo(a)anthracene, chrysene, benzofluoranthenes, benzo(a)pyrene, indeno(1,2,3-c,d)pyrene, dibenzo(a,h)anthracene and benzo(g,h,i)perylene.

[10] Total benzofluoranthenes is the sum of benzo(b)fluoranthene, benzo(j)fluoranthene and benzo(k)fluoranthene.

[11] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[12] PQL for total dioxin/furan TEQ is the programmatic PQL value from Ecology's SCUM guidance (Table 11-1; Ecology 2021).

-- = criterion not applicable or not available

µg/kg = microgram per kilogram

DMMP = Dredged Material Management Program

HPAHs = high molecular weight polycyclic aromatic hydrocarbons

LAET = lowest Apparent Effects Threshold

LPAHs = low molecular weight polycyclic aromatic hydrocarbons

mg/kg = milligram per kilogram

mg/kg OC = milligram per kilogram normalized to organic carbon

n/a = not available

SCO = Sediment Cleanup Objective

SMS = Sediment Management Standard

TEQ = toxic equivalent quotient

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Table 2

Summary of Sediment Analytical Results

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF	P2-1-3
Sample Identification			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)	P2-1-A-COMP (P2-1/P2-2/P2-3)
Sample Date			07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10	11/16/12
Sample Interval (dbm)			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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	Surface Layer Composite (0-4ft)
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NS
Visual Wood Content[3]	%	10	**10**	**50**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Conventionals																			
Total Organic Carbon (TOC)	%	NE	**15.00**	**10.30**	**0.95**	**0.26**	**0.29**	**2.25**	**0.89**	**4.47**	**6.64**	**2.35**	**2.36**	**2.33**	**4.35**	**2.96**	**2.20**	**2.40**	**0.21**
Total Volatile Solids (TVS)	%	NE	**10.10**	**28.70**	**2.46**	**2.35**	**2.40**	**5.16**	**3.35**	--	--	**15.15**	**16.01**	**17.35**	**17.78**	**14.29**	--	--	**1.83**
Total Solids (TS)	%	NE	**49.0**	**38.8**	**79.1**	**76.8**	**76.5**	**64.6**	**70.1**	**42.5**	**47.5**	**47.3**	**40.8**	**40.4**	**44.4**	**46.0**	--	--	**79.4**
Total Ammonia	mg-N/kg	NE	**47.9**	**22.5**	**5.9**	**5.9**	**12.3**	**6.3**	**7.2**	**53.4**	**14.4**	**11.8**	**24.2**	**61.3**	**29.6**	**67.3**	--	--	**2.2**
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	**520**	**1,900**	**6.7**	**6.7**	**6.7**	**224**	**2.3**	**3,210**	**1,890**	**2,320**	**1,720**	**2,370**	**3,440**	**3,340**	--	--	**94**
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	**53.9**	**28.8**	--	**59.9**	**35**	**4.44**	**6.82**	--	--	--	--	--	--	--	--	--	**1.2**
Very Coarse Sand	%	NE	**9**	**3.5**	--					--	--	--	--	--	--	--	--	--	**1.3**
Coarse Sand	%	NE	**7.5**	**4.6**	--					--	--	--	--	--	--	--	--	--	**1.6**
Medium Sand	%	NE	**6.5**	**6.2**	--	**7.29**	**15.1**	**4.64**	**8.83**	--	--	--	--	--	--	--	--	--	**9**
Fine Sand	%	NE	**6.2**	**9.6**	--					--	--	--	--	--	--	--	--	--	**15.3**
Very Fine Sand	%	NE	**4.3**	**13.6**	--					--	--	--	--	--	--	--	--	--	**12.6**
Coarse Silt	%	NE	**5**	**9.1**	--					--	--	--	--	--	--	--	--	--	**18.8**
Medium Silt	%	NE	**2.4**	**13.2**	--	**3.52**	**17.6**	**14.4**	**8.16**	--	--	--	--	--	--	--	--	--	**16.5**
Fine Silt	%	NE	**1.4**	**3.2**	--					--	--	--	--	--	--	--	--	--	**9.5**
Very Fine Silt	%	NE	**0.5**	**1.1**	--					--	--	--	--	--	--	--	--	--	**6.1**
Clay	%	NE	**3.3**	**7.1**	--	**1.25**	**3.62**	**5.57**	**3.67**	--	--	--	--	--	--	--	--	--	**8.3**
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**6 J**
Arsenic	mg/kg	11	10 U	10 U	**2.37**	**2.1**	**3.2**	**5.6**	**4.3**	**4.52**	**5.3**	10 U	10 U	10 U	10 U	9 U	10 U	11 U	6 U
Cadmium	mg/kg	0.8	0.5 U	0.5 U	**0.09**	0.08 U	**0.12**	**0.41**	**0.39**	**0.698**	**0.642**	**0.6**	**0.7**	**1**	**1**	**0.9**	1 U	1.1 U	**0.3**
Chromium	mg/kg	62	**12**	**29**	**12.3**	**13.5**	**21.2**	**20.4**	**21.2**	**31.2**	**31.9**	**33**	**51**	**39**	**41**	**36.6**	**39**	**41**	**26.5 J**
Copper	mg/kg	45	**17.1**	**31.7**	**10.4**	**9.49**	**15.4**	**12.6**	**11.3**	**28.5**	**29.7**	**40.8**	**248**	**38.2**	**39.8**	**33.9**	**42**	**120**	**22.2**
Lead	mg/kg	21	5 U	**8**	**2.23**	**1.63**	**3.39**	**5.74**	**3.48**	**9.29**	**9.32**	**8**	**23**	**10**	**11**	**11**	**11**	**14**	**4**
Mercury	mg/kg	0.41	0.1 U	0.09 U	**0.01 J**	**0.01**	**0.01**	**0.04**	**0.03**	**0.033**	**0.037**	**0.07**	**0.06**	**0.08**	**0.08**	**0.07**	0.1 U	0.11 U	0.03 U
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.6 U
Silver	mg/kg	0.3	0.8 U	0.8 U	0.02 U	**0.03**	**0.043**	**0.07**	**0.06**	**0.15**	**0.1**	0.6 U	0.7 U	0.7 U	0.7 U	0.6 U	1 U	1.1 U	0.4 U
Zinc	mg/kg	93	**35**	**69**	**20.9**	**19.1**	**32.6**	**37.8**	**28.3**	**784**	**711**	**79**	**105**	**102**	**96**	**78**	**79**	**73**	**48**
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	**0.38**
Tributyltin Ion (Bulk Sediment)	µg/kg	73	--	--	--	--	--	**160**	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC Normalized)																			
Sum of LPAHs[4]	mg/kg OC	370	NA	NA	**1.01**	NA	NA	**6.37**	**7.51**	NA	NA	**8.13 J**	**9.11 J**	**11.93 J**	NA	**2.67 J**	**4.64**	**9.88**	NA
2-Methylnaphthalene	mg/kg OC	38	NA	NA	1.02 U	NA	NA	**0.39**	**0.55**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	0.64 U	0.58 U	NA
Acenaphthene	mg/kg OC	16	NA	NA	1.02 U	NA	NA	**0.25**	1.12 U	NA	NA	0.85 U	0.85 U	**0.52 J**	NA	0.68 U	0.64 U	0.58 U	NA
Acenaphthylene	mg/kg OC	66	NA	NA	**0.15**	NA	NA	**0.71**	**0.6**	NA	NA	**0.43 J**	0.85 U	**0.56 J**	NA	0.68 U	0.64 U	0.58 U	NA
Anthracene	mg/kg OC	220	NA	NA	1.02 U	NA	NA	**1.69**	**0.91**	NA	NA	**1.91**	**1.31**	**1.89**	NA	**0.57 J**	**1.82**	**3.38**	NA
Fluorene	mg/kg OC	23	NA	NA	1.02 U	NA	NA	**0.39**	**0.49**	NA	NA	**0.68 J**	**0.59 J**	**0.82 J**	NA	0.68 U	0.64 U	**0.67**	NA
Naphthalene	mg/kg OC	99	NA	NA	1.02 U	NA	NA	**1.47**	**2.92**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	0.64 U	0.58 U	NA
Phenanthrene	mg/kg OC	100	NA	NA	**0.86**	NA	NA	**1.87**	**2.58**	NA	NA	**5.11**	**7.2**	**8.15**	NA	**2.09**	**2.82**	**5.83**	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry Weight)																			
Sum of LPAHs[4]	µg/kg	5,200	32 U	**204**	**9.6**	9.1 U	**2.4**	**152.1**	**71.7**	**288.8 J**	**292 J**	**191 J**	**215 J**	**278 J**	**283 J**	**79 J**	**102**	**237**	**35 J**
2-Methylnaphthalene	µg/kg	670	32 U	20 U	9.7 U	9.1 U	9.7 U	**8.7**	**4.9**	**13**	**10 J**	20 U	20 U	20 U	**12**	20 U	14 U	14 U	19 U
Acenaphthene	µg/kg	500	32 U	**28**	9.7 U	9.1 U	9.7 U	**5.7**	10 U	**8.8 J**	**7 J**	20 U	20 U	**12 J**	**14 J**	20 U	14 U	14 U	19 U
Acenaphthylene	µg/kg	560	32 U	20 U	**1.4**	9.1 U	9.7 U	**16**	**5.3**	**13**	**69**	**10 J**	20 U	**13 J**	**15 J**	20 U	14 U	14 U	19 U
Anthracene	µg/kg	960	32 U	**55**	9.7 U	9.1 U	9.7 U	**38**	**8.1**	**73**	**47**	**45**	**31**	**44**	**48**	**17 J**	**40**	**81**	19 U
Fluorene	µg/kg	540	32 U	**27**	9.7 U	9.1 U	9.7 U	**8.7**	**4.4**	**18**	**19**	**16 J**	**14 J**	**19 J**	**26**	20 U	14 U	**16**	19 U
Naphthalene	µg/kg	2,100	32 U	20 U	9.7 U	9.1 U	9.7 U	**33**	**26**	**16**	**10**	20 U	20 U	20 U	20 U	20 U	14 U	14 U	**17 J**
Phenanthrene	µg/kg	1,500	32 U	**94**	**8.2**	9.1 U	**2.4**	**42**	**23**	**160**	**140**	**120**	**170**	**190**	**180**	**62**	**62**	**140**	**18 J**

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Sample Location[1]			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF	P2-1-3
Sample Identification			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)	P2-1-A-COMP (P2-1/P2-2/P2-3)
Sample Date			07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10	11/16/12
Sample Interval (dbm)		SMS and DMMP Screening Level[2]	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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	Surface Layer Composite (0-4ft)
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC Normalized)																			
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	**12.78**	NA	NA	**20.49**	**23.21**	NA	NA	**47.35 J**	**37.43**	**62.84**	NA	**18.36 J**	**51.23**	**56.04**	NA
Benzo(a)anthracene	mg/kg OC	110	NA	NA	**0.43**	NA	NA	**2.62**	**2.02**	NA	NA	**3.49**	**2.2**	**3.61**	NA	**1.62**	**3.59**	**4.17**	NA
Benzo(a)pyrene	mg/kg OC	99	NA	NA	**0.27**	NA	NA	**2**	**1.91**	NA	NA	**3.06**	**2.12**	**3.95**	NA	**1.18**	**4.45**	**3.71**	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	**1.04**	NA	NA	**1.11**	**4.22**	NA	NA	**2.2**	**1.8**	**2.8**	NA	**1**	**10.91**	**9.83**	NA
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	**0.21**	NA	NA	**1.2**	**1.24**	NA	NA	**1.87**	**1.36**	**2.06**	NA	**0.47 J**	**2.5**	**2.13**	NA
Chrysene	mg/kg OC	110	NA	NA	**1.89**	NA	NA	**3.69**	**2.92**	NA	NA	**6.38**	**4.24**	**6.44**	NA	**2.36**	**7.27**	**7.92**	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	**0.68 J**	0.85 U	**0.86**	NA	0.68 U	0.64 U	0.58 U	NA
Fluoranthene	mg/kg OC	160	NA	NA	**5.26**	NA	NA	**3.64**	**4.61**	NA	NA	**19.57**	**19.07**	**32.19**	NA	**8.78**	**9.09**	**13.75**	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	**0.19**	NA	NA	**1.33**	**1.35**	NA	NA	**1.57**	**1.14**	**1.93**	NA	**0.47 J**	**2.5**	**2.46**	NA
Pyrene	mg/kg OC	1,000	NA	NA	**3.47**	NA	NA	**4.89**	**4.94**	NA	NA	**8.51**	**5.51**	**9.01**	NA	**2.94**	**10.91**	**12.08**	NA
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry Weight)																			
Sum of HPAHs[5]	µg/kg	12,000	**228**	**726**	**121.4**	**2.2**	**5.8**	**402**	**206.6**	**1,700**	**3,182**	**1,113 J**	**883**	**1,464**	**1,562**	**557 J**	**1,127**	**1,345**	**539**
Benzo(a)anthracene	µg/kg	1,300	32 U	**40**	**4.1**	9.1 U	9.7 U	**59**	**18**	**140**	**320**	**82**	**52**	**84**	**94**	**48**	**79**	**100**	**15**
Benzo(a)pyrene	µg/kg	1,600	**32**	**38**	**2.6**	9.1 U	9.7 U	**45**	**17**	**100**	**330**	**72**	**50**	**92**	**100**	**35**	**98**	**89**	**58**
Benzofluoranthenes[6] (Total)	µg/kg	3,200	82 U	125	**9.9**	9.1 U	9.7 U	**25**	**37.6**	**241**	**398**	**51.7**	**42.48**	**65.24**	**320**	**29.6**	**240**	**236**	**100**
Benzo(g,h,i)perylene	µg/kg	670	32 U	20 U	**2**	9.1 U	9.7 U	**27**	**11**	**54**	**150**	**44**	**32**	**48**	**44**	**14 J**	**55**	**51**	**26**
Chrysene	µg/kg	1,400	**38**	**73**	**18**	9.1 U	9.7 U	**83**	**26**	**280**	**430**	**150**	**100**	**150**	**160**	**70**	**160**	**190**	**30**
Dibenzo(a,h)anthracene	µg/kg	230	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	**19**	**44**	**16 J**	20 U	**20**	20 U	20 U	14 U	14 U	**15**
Fluoranthene	µg/kg	1,700	**110**	**320**	**50**	**2.2**	**3.1**	**82**	**41**	**490**	**560**	**460**	**450**	**750**	**630**	**260**	**200**	**330**	**26**
Indeno(1,2,3-c,d)pyrene	µg/kg	600	32 U	20 U	**1.8**	9.1 U	9.7 U	**30**	**12**	**66**	**160**	**37**	**27**	**45**	**44**	**14 J**	**55**	**59**	**19**
Pyrene	µg/kg	2,600	**48**	**130**	**33**	9.1 U	**2.7**	**110**	**44**	**310**	**790**	**200**	**130**	**210**	**170**	**87**	**240**	**290**	**250**
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	**41.72 L4**	**56.69**	**4.92**	12.83Lmax	13.68Lmax	**58.06**	**24.28**	**149.40**	**426.50**	**92.17**	**64.15**	**114.92**	**149.00**	**45.91**	**138.40**	**127.55**	**73.20**
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
Hexachlorobenzene	mg/kg OC	0.38	NA	NA	0.1 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.1 U	2.8 U	NA	NA	NA	6.1 U	NA	NA	NA	**3.2 J**
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.5 U	3.1 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	3.5 U	3.1 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
Hexachlorobenzene	µg/kg	22	32 U	20 U	NA	9.1 U	9.7 U	NA	NA	1.5 U	1.3 U	NA	NA	NA	6.1 U	NA	NA	NA	4.7 U
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	NA	NA	10.21 U	NA	NA	**0.76**	**1.69**	NA	NA	**4.26**	**28.81**	**16.74**	NA	**3.72**	**2.23**	1.46 U	NA
Butyl benzyl Phthalate	mg/kg OC	4.9	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.64 U	0.68 U	0.64 U	NA	0.51 U	1.59 U	1.46 U	NA
Dibutyl Phthalate	mg/kg OC	220	NA	NA	**0.97**	NA	NA	**0.84**	**2.7**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	1.59 U	1.46 U	NA
Diethyl Phthalate	mg/kg OC	61	NA	NA	**0.2**	NA	NA	0.44 U	**0.22**	NA	NA	0.85 U	0.85 U	0.86 U	NA	0.68 U	7.73 U	7.5 U	NA
Dimethyl Phthalate	mg/kg OC	53	NA	NA	**0.11**	NA	NA	0.44 U	1.12 U	NA	NA	**2.85**	0.85 U	0.86 U	NA	0.68 U	1.59 U	1.46 U	NA
Di-N-Octyl Phthalate	mg/kg OC	58	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.85 U	0.85 U	0.86 U	NA	**4.39**	1.59 U	1.46 U	NA
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	32 U	**25**	97 U	91 U	**11**	**17**	**15**	**75**	**44**	**100**	**680**	**390**	**150**	**110**	**49**	35 U	34 U
Butyl benzyl Phthalate	µg/kg	63	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3.8 U	3.4 U	15 U	16 U	15 U	**20**	15 U	35 U	35 U	4.7 U
Dibutyl Phthalate	µg/kg	1,400	32 U	20 U	**9.2**	**16**	**20**	**19**	**24**	**22**	26 U	20 U	20 U	20 U	20 U	20 U	35 U	35 U	19 U
Diethyl Phthalate	µg/kg	200	32 U	20 U	**1.9**	9.1 U	9.7 U	10 U	**2**	**10 J**	1.4 U	20 U	20 U	20 U	20 U	20 U	170 U	180 U	47 U
Dimethyl Phthalate	µg/kg	71	32 U	20 U	**1.0**	9.1 U	9.7 U	10 U	10 U	**5.9 J**	**10 J**	**67**	20 U	20 U	20 U	20 U	35 U	35 U	4.7 U
Di-N-Octyl Phthalate	µg/kg	6,200	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	2.0 U	1.8 U	20 U	20 U	20 U	20 U	**130**	35 U	35 U	19 U
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	32 U	20 U	20 U	46 R	49 R	50 R	50 R	6.5 U	5.8 U	**6.6**	6.2 U	6 U	6.1 U	6 U	870 U	880 U	19 U
2-methylphenol (o-Cresol)	µg/kg	63	32 U	20 U	20 U	9.1 U	**2.1**	10 U	10 U	1.8 U	1.6 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U	4.7 U
4-methylphenol (p-Cresol)	µg/kg	670	32 U	**70**	20 U	9.1 U	**65**	10 U	**4**	**130**	**26**	**48**	**47**	**82**	**66**	**55**	35 U	35 U	38 U
Pentachlorophenol	µg/kg	360	160 U	99 U	49 U	91 U	97 U	100 U	100 U	**32 J**	22 U	30 U	31 U	30 U	**71**	30 U	170 U	180 U	47 U
Phenol	µg/kg	420	32 U	20 U	49 U	13 U	**80**	16 U	17 U	**12**	2.2 U	20 U	20 U	**15**	20 U	20 U	**240**	35 U	19 U

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Sample Location[1]		SMS and DMMP Screening Level[2]	LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	LHO-REF	P2-1-3
Sample Identification			LP-1	LP-2	FB-A4-14	FB-A4-15	FB-A4-19	FB-A4-20	FB-A4-21	S-1	S-2	S-3	S-4	S-5	S-6	S-7	LHO-REF	DUP (LHO-REF)	P2-1-A-COMP (P2-1/P2-2/P2-3)
Sample Date			07/13/04	07/13/04	09/06/07	09/06/07	09/05/07	09/05/07	09/05/07	08/28/08	08/28/08	09/01/09	09/01/09	09/01/09	09/01/09	09/01/09	10/14/10	10/14/10	11/16/12
Sample Interval (dbm)			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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	Surface Layer Composite (0-4ft)
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	NA	NA	1.02 U	NA	NA	**0.25**	**0.31**	NA	NA	0.85 U	**0.42 J**	**0.52 J**	NA	0.68 U	1.59 U	1.46 U	NA
Hexachlorobutadiene	mg/kg OC	3.9	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	NA	1.02 U	NA	NA	0.44 U	1.12 U	NA	NA	0.26 U	0.26 U	0.26 U	NA	0.2 U	1.59 U	1.46 U	NA
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	32 U	20 U	9.7 U	9.1 U	9.7 U	**5.7**	**2.8**	**9.0 J**	**7.3 J**	20 U	**10 J**	**12 J**	**20**	20 U	35 U	35 U	19 U
Hexachlorobutadiene	µg/kg	11	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	3.0 U	2.7 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U	4.7 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	32 U	20 U	9.7 U	9.1 U	9.7 U	10 U	10 U	1.9 U	1.7 U	6 U	6.2 U	6 U	6.1 U	6 U	35 U	35 U	19 U
Benzoic Acid	µg/kg	650	320 U	200 U	**200**	19 U	200 R	200 R	200 R	**120 J**	110 U	200 U	200 U	200 U	200 U	200 U	35 U	35 U	380 U
Benzyl Alcohol	µg/kg	57	32 U	20 U	**6.2**	190 R	20 U	20 U	10 U	2.5 U	2.3 U	30 U	31 U	30 U	30 U	30 U	35 U	35 U	19 U
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97 U
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97 U
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97 U
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97 U
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.48 U
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97 U
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.97 U
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.48 U
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	NA	NA	2.11 U	NA	NA	0.71 U	1.69 U	NA	NA	0.17 U	0.17 U	0.17 U	NA	0.14 U	4.55 U	4.58 U	NA
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	16 U	16 U	20 U	20 U	14 U	16 U	15 U	14 U	7.5 U	3.9 U	4 U	4 U	**4.6 J**	4 U	100 U	110 U	3.8 U
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	--	--	--	--	--	**1.43**	--	--	--	**8.07**	--	--	--	--	--	--	**0.16 JL14**
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	Pass	--	**Fail**	Pass	Pass	Pass	Pass	Pass	Pass	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	Pass	--	Pass	Pass	Pass	Pass	Pass	**Fail**	Pass	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	Pass	--	Pass	Pass	Pass	Pass	Pass	**Fail**	Pass	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**	**Fail**	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	**Fail**	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
ft = feet
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
mg-N/L = milligrams of nitrogen per liter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05	LY-05	LY-05
Sample Identification			P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10	LY-SC-05_ 1-2	LY-SC-05_ 3-4
Sample Date			11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15	11/19/15	11/19/15
Sample Interval (dbm)			Subsurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm	1 - 2	3 - 4
Sample Type			Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit			Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	–	–	–	–	–	<5	Absent	**5**	**5**	**75**	**10**	**20**	**40**	**40**	**10**	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	**0.13**	**0.15**	–	–	–	**1.21**	**0.56**	**5.56**	**2.95**	**8.74**	**9.29**	**2.75**	**1.21**	**0.905 J**	**21.50**	**0.55**	–
Total Volatile Solids (TVS)	%	NE	**1.37**	**1.14**	–	–	–	**1.69**	**0.98**	**13.75**	**11.81**	**28.21**	–	**10.10**	**2.34**	**2.01 J**	**8.23**	–	–
Total Solids (TS)	%	NE	**80.5**	**82.1**	–	–	–	**85.9**	**89.9**	**48.2**	**55.4**	**39.9**	**45.5**	**46.9**	**75.4**	**87.7 J**	**54.7**	**77.7**	–
Total Ammonia	mg-N/kg	NE	**0.9**	**0.9**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Porewater Ammonia	mg-N/L	NE	–	–	–	–	–	–	–	**15.4**	**15.8**	**16.7**	–	**34.0**	–	**22.1**	**8.2**	–	**8.0**
Total Sulfide	mg/kg	NE	1.24 U	1.21 U	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Porewater Sulfide	mg/L	NE	–	–	–	–	–	–	–	0.05 U	**37.5**	**44.0**	–	**161.0**	–	–	**7.2**	–	–
Grain Size																			
Gravel	%	NE	**0.3**	**0.2**	–	–	–	**60.2**	**63.3**	**1.7**	**1.2**	**18.1**	–	**0.6**	**26.6**	**35.4**	**3.3**	–	–
Very Coarse Sand	%	NE	**0.3**	**0.3**	–	–	–	**5.4**	**12.3**	**2.1**	**1.4**	**3.8**	–	**1.5**	**2.2**	**2.6**	**2.4**	–	–
Coarse Sand	%	NE	**0.5**	**0.6**	–	–	–	**7.3**	**12.9**	**3.2**	**2.7**	**4.8**	–	**1.4**	**2.6**	**2.7**	**2.7**	–	–
Medium Sand	%	NE	**7.2**	**8.4**	–	–	–	**13.2**	**8.7**	**4.8**	**4.6**	**7**	–	**2.4**	**11.1**	**10.9**	**4.6**	–	–
Fine Sand	%	NE	**21.8**	**31.3**	–	–	–	**8.1**	**1.6**	**6**	**8.4**	**7.9**	–	**3.3**	**26.2**	**24.8**	**13.5**	–	–
Very Fine Sand	%	NE	**20.9**	**12.8**	–	–	–	**0.6**	**0.4**	**10.4**	**12**	**8.4**	–	**7**	**15.7**	**13.8**	**18.9**	–	–
Coarse Silt	%	NE	**22.2**	**13.4**	–	–	–	**4.6**	0.7 U	**22.9**	**21.8**	**6.5**	–	**28**	**5.2**	**1.7**	**17.8**	–	–
Medium Silt	%	NE	**12.8**	**11.5**	–	–	–	**0.1**	0.7 U	**20.8**	**19.8**	**15**	–	**18**	**3.1**	**2.1**	**12.2**	–	–
Fine Silt	%	NE	**6.3**	**8.9**	–	–	–	**0.1**	0.7 U	**10**	**10.2**	**8**	–	**14.2**	**1.6**	**1.2**	**7.5**	–	–
Very Fine Silt	%	NE	**3.3**	**5.5**	–	–	–	**0.1**	0.7 U	**4.3**	**4.5**	**5.2**	–	**5.6**	**1.3**	**1**	**3.4**	–	–
Clay	%	NE	**4.5**	**7**	–	–	–	0.3 U	0.7 U	**13.8**	**13.6**	**15.2**	–	**17.9**	**4.4**	**3.7**	**13.5**	–	–
Metals																			
Antimony	mg/kg	150	**6 J**	**6 J**	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Arsenic	mg/kg	11	6 U	6 U	–	–	–	**5.6 J**	**5.15 J**	**9.7 J**	**8 J**	**8.6 J**	–	**8.3 J**	**11**	**14**	**10**	**11**	–
Cadmium	mg/kg	0.8	**0.3**	**0.2**	–	–	–	0.072 U	0.023 U	**1.1**	**1.2**	**0.8**	–	**1**	**0.5**	**0.5**	**0.6**	**1.6**	**1.1**
Chromium	mg/kg	62	**19 J**	**19.9 J**	–	–	–	**42.4**	**53.8**	**40**	**40**	**35**	–	**41**	**15.7**	**18.6**	**33.4**	–	–
Copper	mg/kg	45	**16.2**	**14.5**	–	–	–	**17.2**	**42.4**	**34.6**	**36.8**	**41.1**	–	**33.8**	**9.6**	**10.8**	**30**	–	–
Lead	mg/kg	21	**2**	**4**	–	–	–	**11**	**11**	**18**	**17**	**13**	–	**18**	**2.11 J**	**2.21 J**	**14**	–	–
Mercury	mg/kg	0.41	0.03 U	0.02 U	–	–	–	**0.0052 J**	**0.0026 J**	**0.08**	**0.08**	**0.08**	–	**0.06**	**0.0182 J**	**0.0141 J**	**0.05**	–	–
Selenium	mg/kg	3.0	0.6 U	0.6 U	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Silver	mg/kg	0.3	0.4 U	0.3 U	–	–	–	0.4 U	0.3 U	0.6 U	0.6 U	0.7 U	–	0.6 U	0.4 U	0.4 U	0.5 U	–	–
Zinc	mg/kg	93	**32**	**30**	–	–	–	**61**	**57**	**95**	**89**	**90**	–	**93**	**27**	**34**	**73**	–	–
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	–	–	**4.9 J**	**0.45 J**	**0.02 J**	–	–	–	–	–	–	–	–	–	–	–	–
Tributyltin Ion (Bulk Sediment)	µg/kg	73	**3.7**	**2.9 J**	**280 J**	**91 J**	**10 J**	–	–	–	–	–	–	–	–	–	–	–	–
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	NA	NA	–	–	–	**0.93 J**	**0.71**	NA	**11.49 J**	NA	–	**97.35**	**4.17 J**	**6.21 J**	**3.29**	**16.15 J**	–
2-Methylnaphthalene	mg/kg OC	38	NA	NA	–	–	–	0.39 U	**0.43 J**	NA	**2.17 J**	NA	–	**2.29**	**0.3 J**	**0.49 J**	**0.33**	**0.91**	–
Acenaphthene	mg/kg OC	16	NA	NA	–	–	–	0.39 U	0.84 U	NA	**0.78**	NA	–	**58.18**	0.4 U	**0.52 J**	**0.3**	**0.73 J**	–
Acenaphthylene	mg/kg OC	66	NA	NA	–	–	–	0.39 U	0.84 U	NA	**0.54**	NA	–	**0.98**	**0.2 J**	0.54 U	**0.14**	**0.65 J**	–
Anthracene	mg/kg OC	220	NA	NA	–	–	–	0.39 U	0.84 U	NA	**1.56 J**	NA	–	**7.27**	**0.45**	**0.9**	**0.33**	**1.45**	–
Fluorene	mg/kg OC	23	NA	NA	–	–	–	0.39 U	0.84 U	NA	**1.15 J**	NA	–	**10.18**	**0.38 J**	**0.71**	**0.34**	**1.34**	–
Naphthalene	mg/kg OC	99	NA	NA	–	–	–	**0.26 J**	0.84 U	NA	**3.39**	NA	–	**3.64**	**1.9**	**2.21**	**1.3**	**7.44**	–
Phenanthrene	mg/kg OC	100	NA	NA	–	–	–	**0.68 J**	**0.71 J**	NA	**4.07**	NA	–	**17.09**	**1.24**	**1.88**	**0.88**	**4.54**	–
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	18 U	19 U	–	–	–	**11.3 J**	**6.4**	**472 J**	**403 J**	**1252**	–	**2,740**	**54.1 J**	**60.6 J**	**780**	**89 J**	–
2-Methylnaphthalene	µg/kg	670	18 U	19 U	–	–	–	4.7 U	**2.4 J**	**140 J**	**64 J**	**99**	–	**63**	**3.6 J**	**4.4 J**	**72**	**5**	–
Acenaphthene	µg/kg	500	18 U	19 U	–	–	–	4.7 U	4.7 U	**25**	**23**	**140**	–	**1,600**	4.8 U	**4.7 J**	**64**	**4.0 J**	–
Acenaphthylene	µg/kg	560	18 U	19 U	–	–	–	4.7 U	4.7 U	**29**	**16**	**42**	–	**27**	**2.4 J**	4.9 U	**30**	**3.6 J**	–
Anthracene	µg/kg	960	18 U	19 U	–	–	–	4.7 U	4.7 U	**69 J**	**46 J**	**210**	–	**200**	**5.5**	**8.1**	**70**	**8**	–
Fluorene	µg/kg	540	18 U	19 U	–	–	–	4.7 U	4.7 U	**49 J**	**34 J**	**180**	–	**280**	**4.6 J**	**6.4**	**74**	**7.4**	–
Naphthalene	µg/kg	2,100	18 U	19 U	–	–	–	**3.1 J**	4.7 U	**160**	**100**	**340**	–	**100**	**23**	**20**	**280**	**41**	–
Phenanthrene	µg/kg	1,500	18 U	19 U	–	–	–	**8.2 J**	**4.0 J**	**140**	**120**	**340**	–	**470**	**15**	**17**	**190**	**25**	–

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Sample Location[1]			P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05	LY-05	LY-05
Sample Identification			P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10	LY-SC-05_ 1-2	LY-SC-05_ 3-4
Sample Date			11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15	11/19/15	11/19/15
Sample Interval (dbm)			Subsurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm	1 - 2	3 - 4
Sample Type		SMS and DMMP Screening Level[2]	Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit			Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	--	--	--	**9.03 J**	**6.4 J**	NA	**34.14 J**	NA	NA	**72.58**	**5.37 J**	**10.25 J**	**4.76**	**18.73 J**	--
Benzo(a)anthracene	mg/kg OC	110	NA	NA	--	--	--	**0.55 J**	0.84 U	NA	**2.17 J**	NA	NA	**2.98**	**0.31 J**	**0.7**	**0.31**	**1.11**	--
Benzo(a)pyrene	mg/kg OC	99	NA	NA	--	--	--	**0.55**	**0.59 J**	NA	**1.76**	NA	NA	**1.6**	**0.51**	**0.41 J**	**0.22**	**1.07**	--
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	--	--	--	**2.23 J**	**1.96**	NA	**5.08**	NA	NA	**4.73**	**0.63**	**1.1**	**0.6**	**2.18**	--
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	--	--	--	**1.32**	**0.66 J**	NA	**1.19**	NA	NA	**0.98**	**0.55**	**0.46 J**	**0.19**	**0.78 J**	--
Chrysene	mg/kg OC	110	NA	NA	--	--	--	**1.24 J**	**0.98**	NA	**4.07 J**	NA	NA	**4.36**	**0.48**	**0.95**	**0.42**	**1.34**	--
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.51 U	NA	NA	0.51 U	0.4 U	0.54 U	0.08 U	0.91 U	--
Fluoranthene	mg/kg OC	160	NA	NA	--	--	--	**1.49 J**	**0.84 J**	NA	**11.53**	NA	NA	**35.64**	**1.49 J**	**3.76 J**	**1.35**	**5.99**	--
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	--	--	--	**0.67**	**0.55 J**	NA	**0.88**	NA	NA	**0.84**	0.4 U	0.54 U	**0.13**	**0.64 J**	--
Pyrene	mg/kg OC	1,000	NA	NA	--	--	--	**0.99 J**	**0.82 J**	NA	**7.46**	NA	NA	**21.45**	**1.4 J**	**2.87 J**	**1.53**	**5.63**	--
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **																			
Sum of HPAHs[5]	µg/kg	12,000	**10 J**	19 U	--	--	--	**109.3 J**	**35.9 J**	**1,332 J**	**1,007 J**	**3,012**	**2,717**	**1,996**	**65 J**	**92.8 J**	**1,023**	**103 J**	--
Benzo(a)anthracene	µg/kg	1,300	18 U	19 U	--	--	--	**6.6 J**	4.7 U	**99 J**	**64 J**	**190**	**200**	**82**	**3.8 J**	**6.3**	**66**	**6.1**	--
Benzo(a)pyrene	µg/kg	1,600	18 U	19 U	--	--	--	**6.6**	**3.3 J**	**64**	**52**	**110**	**120**	**44**	**6.2**	**3.7 J**	**48**	**5.9**	--
Benzofluoranthenes[6] (Total)	µg/kg	3,200	37 U	37 U	--	--	--	**27 J**	**11**	**220**	**150**	**300**	**350**	**130**	**7.6**	**10**	**130**	**12**	--
Benzo(g,h,i)perylene	µg/kg	670	18 U	19 U	--	--	--	**16**	**3.7 J**	**43**	**35**	**60**	**68**	**27**	**6.6**	**4.2 J**	**40**	**4.3 J**	--
Chrysene	µg/kg	1,400	18 U	19 U	--	--	--	**15 J**	**5.5**	**220 J**	**120 J**	**320**	**320**	**120**	**5.8**	**8.6**	**91**	**7.4**	--
Dibenzo(a,h)anthracene	µg/kg	230	18 U	19 U	--	--	--	4.7 U	4.7 U	**11 J**	15 U	**18**	**17**	14 U	4.8 U	4.9 U	17 U	5.0 U	--
Fluoranthene	µg/kg	1,700	18 U	19 U	--	--	--	**18 J**	**4.7 J**	**360**	**340**	**1,200**	**1,000**	**980**	**18 J**	**34 J**	**290**	**33**	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	18 U	19 U	--	--	--	**8.1**	**3.1 J**	**35**	**26**	**54**	**52**	**23**	4.8 U	4.9 U	**28**	**3.5 J**	--
Pyrene	µg/kg	2,600	**10 J**	19 U	--	--	--	**12 J**	**4.6 J**	**280**	**220**	**760**	**590**	**590**	**17 J**	**26 J**	**330**	**31**	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	27.28Lmax	28.59Lmax	--	--	--	**11.07**	**5.13 J**	**102.70**	**78.40**	**169.40**	**185.10**	**69.90**	**7.84**	**5.59 J**	**72.22**	**8.35**	--
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	0.54 U	0.02 U	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	**0.17 J**	0.02 U	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	0.54 U	0.02 U	--	--
Hexachlorobenzene	mg/kg OC	0.38	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	--	0.17 U	0.4 U	0.54 U	0.02 U	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	--	NA	NA	NA	NA	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	**2.8 J**	--	NA	NA	NA	NA	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	--	NA	NA	NA	NA	--	--
Hexachlorobenzene	µg/kg	22	4.6 U	4.6 U	--	--	--	NA	NA	4.8 U	NA	5 U	--	NA	NA	NA	NA	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	NA	NA	--	--	--	**90.91**	**5.88 J**	NA	**6.1**	NA	--	**9.45**	**52.07 J**	**4.86 J**	**2.23**	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	NA	NA	--	--	--	**0.4**	0.84 U	NA	**1.05 J**	NA	--	**0.29**	0.4 U	**0.43 J**	0.02 U	--	--
Dibutyl Phthalate	mg/kg OC	220	NA	NA	--	--	--	1.57 U	3.39 U	NA	0.68 U	NA	--	0.69 U	1.57 U	2.21 U	0.09 U	--	--
Diethyl Phthalate	mg/kg OC	61	NA	NA	--	--	--	2.73 U	3.39 U	NA	0.68 U	NA	--	1.24 U	1.57 U	2.21 U	**0.26**	--	--
Dimethyl Phthalate	mg/kg OC	53	NA	NA	--	--	--	1.57 U	3.39 U	NA	0.68 U	NA	--	0.69 U	1.57 U	2.21 U	0.09 U	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	NA	NA	--	--	--	1.57 U	3.39 U	NA	0.68 U	NA	--	0.69 U	1.57 U	2.21 U	0.09 U	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	24 U	27 U	--	--	--	**1,100**	**33 J**	**160**	**180**	250 U	--	**260**	**630 J**	**44 J**	**480**	--	--
Butyl benzyl Phthalate	µg/kg	63	4.6 U	4.6 U	--	--	--	**4.9**	4.7 U	**5.4**	**31 J**	5 U	--	**7.9**	4.8 U	**3.9 J**	4.9 U	--	--
Dibutyl Phthalate	µg/kg	1,400	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	**35 J**	--	19 U	19 U	20 U	20 U	--	--
Diethyl Phthalate	µg/kg	200	4.6 U	4.6 U	--	--	--	33 U	19 U	37 U	20 U	100 U	--	34 U	19 U	20 U	**55**	--	--
Dimethyl Phthalate	µg/kg	71	4.6 U	4.6 U	--	--	--	19 U	19 U	19 U	20 U	100 U	--	19 U	19 U	20 U	20 U	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	100 U	--	19 U	19 U	20 U	20 U	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	18 U	19 U	--	--	--	24 U	24 U	24 U	**13 J**	**17 J**	**12 J**	24 U	24 U	24 U	25 U	--	--
2-methylphenol (o-Cresol)	µg/kg	63	4.6 U	4.6 U	--	--	--	19 U	19 U	19 U	20 U	100 U	19 U	19 U	19 U	20 U	20 U	--	--
4-methylphenol (p-Cresol)	µg/kg	670	37 U	37 U	--	--	--	19 U	19 U	**800 J**	**460 J**	**3,900**	**1,100**	**1,100**	**53**	**46**	**330**	--	--
Pentachlorophenol	µg/kg	360	46 U	46 U	--	--	--	95 U	94 U	96 U	98 U	**480 J**	95 U	96 U	97 U	98 U	98 U	--	--
Phenol	µg/kg	420	18 U	19 U	--	--	--	19 U	19 U	**42 J**	**76 J**	**560**	**370**	**67 J**	**20**	**20**	**300 J**	--	--

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Sample Location[1]		SMS and DMMP Screening Level[2]	P2-1-3	P2-1-3	P2-1	P2-2	P2-3	LY-01	LY-02	LY-03	LY-03	LY-03	LY-03	LY-04	LY-04	LY-04	LY-05	LY-05	LY-05
Sample Identification			P2-1-B-COMP (P2-1/P2-2/P2-3)	P2-1-Z-COMP (P2-1/P2-2/P2-3)	P2-1-A	P2-2-A	P2-3-A	LY-SS-01_ 0-10	LY-SS-02_ 0-10	LY-SS-03_ 0-10	LY-SS-Dup-01 (LY-SS-03_0-10)	LY-SC-03_ 3-4	LY-SC-03_ 4-5	LY-SS-04_ 0-10	LY-SC-04_ 3-4	LY-SC-Dup-02 (LY-SC-04_3-4)	LY-SS-05_ 0-10	LY-SC-05_ 1-2	LY-SC-05_ 3-4
Sample Date			11/16/12	11/16/12	11/14/12	11/15/12	11/16/12	11/17/15	11/17/15	11/17/15	11/17/15	11/18/15	11/18/15	11/17/15	11/18/15	11/18/15	11/17/15	11/19/15	11/19/15
Sample Interval (dbm)			Subsurface Layer Composite (4-5ft)	Z-Layer Composite (5-6ft)	Surface Layer Discrete	Surface Layer Discrete	Surface Layer Discrete	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	3 - 4	3 - 4	0 - 10 cm	1 - 2	3 - 4
Sample Type			Core	Core	Core	Core	Core	Surface	Surface	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core
Stratigraphic Unit			Native	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Intertidal	Intertidal	Intertidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	NA	NA	--	--	--	**0.26 J**	0.84 U	NA	**1.22**	NA	NA	**12.36**	**0.29 J**	**0.53**	**0.38**	--	--
Hexachlorobutadiene	mg/kg OC	3.9	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	NA	0.17 U	0.4 U	0.54 U	0.02 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	NA	--	--	--	0.39 U	0.84 U	NA	0.17 U	NA	NA	0.17 U	0.4 U	0.54 U	0.02 U	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	18 U	19 U	--	--	--	**3.1 J**	4.7 U	**48**	**36**	**130**	**140**	**340**	**3.5 J**	**4.8 J**	**82**	--	--
Hexachlorobutadiene	µg/kg	11	4.6 U	4.6 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5 U	4.8 U	4.8 U	4.8 U	4.9 U	4.9 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	18 U	19 U	--	--	--	4.7 U	4.7 U	4.8 U	4.9 U	5 U	4.8 U	4.8 U	4.8 U	4.9 U	4.9 U	--	--
Benzoic Acid	µg/kg	650	370 U	370 U	--	--	--	190 U	190 U	**200**	**220**	**4,300 J**	**160 J**	**110 J**	190 U	200 U	**110 J**	--	--
Benzyl Alcohol	µg/kg	57	18 U	19 U	--	--	--	19 U	19 U	19 U	20 U	100 U	19 U	19 U	19 U	20 U	20 U	--	--
Pesticides																			
4,4'-DDD	µg/kg	16	0.96 U	0.96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	0.96 U	0.96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	0.96 U	0.96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	0.96 U	0.96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	0.48 U	0.48 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	0.96 U	0.96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	0.96 U	0.96 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	0.48 U	0.48 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	NA	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	NA	**0.043 J**	NA	--	**0.067 J**	--	--	**0.01 J**	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	3.8 U	3.8 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	**1.71 J**	**0.043 J**	**3.0 J**	--	**1.83 J**	--	--	**2.06 J**	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	**0.101 J**	**0.108 J**	**0.302 J**	--	**0.074 J**	--	--	**0.143 J**	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	**0.12 JL16**	**0.12 JL13**	--	--	--	**0.95 JL10**	--	**11.26**	**7.53**	--	--	--	--	--	--	--	--
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
mg/kg OC = milligram per kilogram normalized to organic carbon
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
cm = centimeter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09	LY-10	LY-10	LY-11
Sample Identification			LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4	LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10
Sample Date			11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015	11/17/15	11/18/15	11/17/15
Sample Interval (dbm)			4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4	0 - 10 cm	0 - 1	0 - 10 cm
Sample Type			Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	Absent	**10**	**10**	**10**	Absent	Absent	Absent	Absent	**10**	**40**	<5	**10**	<5	<5	<5	<5	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	--	**1.75**	**2.24**	--	**0.56**	**0.73**	**0.19**	--	**1.86**	**6.32**	**3.17**	**1.52**	**2.70**	--	**1.84**	**2.65**	**1.32**
Total Volatile Solids (TVS)	%	NE	--	**6.43**	**8.42**	--	--	--	--	--	**6.61**	**16.08**	--	**6.15**	--	--	**5.49**	--	--
Total Solids (TS)	%	NE	--	**55.1**	**55.4**	--	**76.5**	--	**75.8**	--	**55.0**	**47.4**	**51.1**	**56.3**	**47.9**	--	**53.0**	**50.9**	**57.0**
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	**6.2**	**7.0**	**29.6**	--	--	--	--	**7.8**	**41**	--	**7.7**	--	**76.2**	**6.2**	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	**0.2**	**49.2**	**16.2**	--	--	--	--	**1.6**	**8.3**	--	**1.6**	--	**0.3**	**0.9**	--	--
Grain Size																			
Gravel	%	NE	--	**2.9**	**2.8**	--	--	**2.8**	--	--	**1.8**	**6.8**	--	**2.2**	--	--	**2**	--	--
Very Coarse Sand	%	NE	--	**1.5**	**2.1**	--	--	**2.1**	--	--	**1.4**	**3.4**	--	**1.2**	--	--	**1.2**	--	--
Coarse Sand	%	NE	--	**2.5**	**2.9**	--	--	**2.9**	--	--	**1.8**	**3.4**	--	**2.2**	--	--	**0.8**	--	--
Medium Sand	%	NE	--	**5.9**	**6.4**	--	--	**6.4**	--	--	**3.5**	**4.1**	--	**3.9**	--	--	**1.8**	--	--
Fine Sand	%	NE	--	**22.4**	**21.4**	--	--	**21.4**	--	--	**14.5**	**7.5**	--	**10.8**	--	--	**10.6**	--	--
Very Fine Sand	%	NE	--	**17.7**	**18.1**	--	--	**18.1**	--	--	**22.4**	**9.8**	--	**23.7**	--	--	**20.8**	--	--
Coarse Silt	%	NE	--	**13.9**	**12.3**	--	--	**12.3**	--	--	**20.8**	**13.4**	--	**26.2**	--	--	**21.8**	--	--
Medium Silt	%	NE	--	**8.7**	**8.8**	--	--	**8.8**	--	--	**11.2**	**15.7**	--	**11.7**	--	--	**15.1**	--	--
Fine Silt	%	NE	--	**6.4**	**6.7**	--	--	**6.7**	--	--	**5.8**	**9**	--	**4.2**	--	--	**6.4**	--	--
Very Fine Silt	%	NE	--	**3.7**	**4.1**	--	--	**4.1**	--	--	**3.6**	**5.9**	--	**2.9**	--	--	**4.1**	--	--
Clay	%	NE	--	**14.3**	**14.5**	--	--	**14.5**	--	--	**13.2**	**21**	--	**11**	--	--	**15.4**	--	--
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	--	**12**	**11**	--	**7**	--	--	--	**10**	**10**	--	**8.4 J**	10 U	--	**8.29 J**	--	--
Cadmium	mg/kg	0.8	**0.8**	**0.5**	**0.4**	--	**0.7**	--	--	--	**0.7**	**0.6**	--	**0.7**	**0.7**	--	**0.7**	--	--
Chromium	mg/kg	62	--	**31.8**	**32.1**	--	--	--	--	--	**33**	**38**	--	**29.6**	--	--	**31.5**	--	--
Copper	mg/kg	45	--	**31.7**	**28.3**	--	--	--	--	--	**25.8**	**32.2**	--	**27.2**	--	--	**22.2**	--	--
Lead	mg/kg	21	--	**9**	**8**	--	--	--	--	--	**10**	**14**	--	**7**	--	--	**8**	--	--
Mercury	mg/kg	0.41	--	**0.06**	**0.05**	--	--	--	--	--	**0.0435 J**	**0.15**	--	**0.05**	--	--	**0.09**	--	--
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	--	0.6 U	0.5 U	--	--	--	--	--	0.6 U	0.6 U	--	**0.5**	--	--	0.5 U	--	--
Zinc	mg/kg	93	--	**67**	**70**	--	--	--	--	--	**79**	**86**	--	**67**	--	--	**68**	--	--
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	**0.013**	**0.011**	**0.009**	--	0.005 U	--	0.043 U	**0.013**	**0.007**	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	--	**40.11 J**	**32.72 J**	--	--	--	--	--	**144.25**	NA	**75.43**	**163.62**	**35.96**	--	**23.59**	--	--
2-Methylnaphthalene	mg/kg OC	38	--	**4.63**	**3.08**	--	--	--	--	--	**3.82**	NA	**5.05**	**4.8**	**2.56**	--	**2.72**	--	--
Acenaphthene	mg/kg OC	16	--	**3.31**	**2.81**	--	--	--	--	--	**6.45**	NA	**5.36**	**1.71**	**2.81**	--	**1.3**	--	--
Acenaphthylene	mg/kg OC	66	--	**2.34**	**2.1**	--	--	--	--	--	**5**	NA	**1.92**	**3.36**	**1.3**	--	**1.63**	--	--
Anthracene	mg/kg OC	220	--	**3.89 J**	**4.02 J**	--	--	--	--	--	**9.14**	NA	**15.46**	**85.53**	**9.26**	--	**3.32**	--	--
Fluorene	mg/kg OC	23	--	**3.71**	**2.81**	--	--	--	--	--	**9.14**	NA	**8.52**	**16.45**	**5.93**	--	**2.12**	--	--
Naphthalene	mg/kg OC	99	--	**16.57**	**12.5**	--	--	--	--	--	**12.37**	NA	**24.92**	**9.21**	**5.93**	--	**8.15**	--	--
Phenanthrene	mg/kg OC	100	--	**10.29**	**8.48**	--	--	--	--	--	**102.15**	NA	**19.24**	**47.37**	**10.74**	--	**7.07**	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	--	**783 J**	**802 J**	--	--	--	--	--	**2,754**	**4,230**	**4,350**	**2,400**	**2,560**	--	**484**	--	--
2-Methylnaphthalene	µg/kg	670	--	**81**	**69**	--	--	--	--	--	**71**	**120**	**120**	**160**	**73**	--	**50**	--	--
Acenaphthene	µg/kg	500	--	**58**	**63**	--	--	--	--	--	**120**	**620**	**620**	**170**	**26**	--	**24**	--	--
Acenaphthylene	µg/kg	560	--	**41**	**47**	--	--	--	--	--	**93**	**100**	**100**	**61**	**51**	--	**30**	--	--
Anthracene	µg/kg	960	--	**68 J**	**90 J**	--	--	--	--	--	**170**	**800**	**800**	**490**	**1,300**	--	**61**	--	--
Fluorene	µg/kg	540	--	**65**	**63**	--	--	--	--	--	**170**	**750**	**750**	**270**	**250**	--	**39**	--	--
Naphthalene	µg/kg	2,100	--	**290**	**280**	--	--	--	--	--	**230**	**860**	**860**	**790**	**140**	--	**150**	--	--
Phenanthrene	µg/kg	1,500	--	**180**	**190**	--	--	--	--	--	**1,900**	**1,100**	**1,100**	**610**	**720**	--	**130**	--	--

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Sample Location[1]		SMS and DMMP Screening Level[2]	LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09	LY-10	LY-10	LY-11
Sample Identification			LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4	LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10
Sample Date			11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015	11/17/15	11/18/15	11/17/15
Sample Interval (dbm)			4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4	0 - 10 cm	0 - 1	0 - 10 cm
Sample Type			Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	–	**87.37 J**	**59.51**	–	–	–	–	–	**369.57**	NA	**143.15**	**619.54**	**182.26**	–	**62.01 J**	**196.64**	–
Benzo(a)anthracene	mg/kg OC	110	–	**8**	**4.46**	–	**3.59**	–	NA	–	**11.83**	NA	**10.09**	**72.37**	**12.96**	–	**5.98**	**21.89**	**9.85**
Benzo(a)pyrene	mg/kg OC	99	–	**5.31**	**3.71**	–	**2.51**	–	NA	–	**6.99**	NA	**5.68**	**55.26**	**7.04**	–	**4.46**	**12.08**	**8.33**
Benzofluoranthenes[6] (Total)	mg/kg OC	230	–	**10.86**	**8.93**	–	**4.67**	–	NA	–	**32.26**	NA	**12.93**	**111.84**	**3.19**	–	**12.5**	**30.94**	**20.45**
Benzo(g,h,i)perylene	mg/kg OC	31	–	**2.63**	**1.96**	–	–	–	–	–	**3.39**	NA	**3.47**	**21.05**	**20.74**	–	**2.23**	**4.91**	–
Chrysene	mg/kg OC	110	–	**8.57**	**6.25**	–	**3.23**	–	NA	–	**41.94**	NA	**12.93**	**118.42**	**23.33**	–	**9.78**	**30.94**	**14.39**
Dibenzo(a,h)anthracene	mg/kg OC	12	–	**0.69 J**	0.63 U	–	0.86 U	–	NA	–	**0.97**	NA	**0.73**	**5.72**	**0.96**	–	**0.65 J**	**1.55**	**1.29**
Fluoranthene	mg/kg OC	160	–	**17.71**	**14.29**	–	–	–	–	–	**161.29**	NA	**56.78**	**125**	**66.67**	–	**10.33**	**33.21**	–
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	–	**2.17**	**1.61**	–	**1.33**	–	NA	–	**3.39**	NA	**2.68**	**17.76**	**2.93**	–	**1.96**	**4.53**	**3.71**
Pyrene	mg/kg OC	1,000	–	**31.43**	**18.3**	–	–	–	–	–	**107.53**	NA	**37.85**	**92.11**	**44.44**	–	**14.13**	**56.6**	–
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **																			
Sum of HPAHs[5]	µg/kg	12,000	–	**1,529 J**	**1,333**	–	–	–	–	–	**6,874**	**8,086**	**4,500**	**9,417**	**4,900**	–	**1,141 J**	**5,200**	–
Benzo(a)anthracene	µg/kg	1,300	–	**140**	**100**	–	**20**	–	**5**	–	**220**	**540**	**320**	**1,100**	**350**	–	**110**	**580**	**130**
Benzo(a)pyrene	µg/kg	1,600	–	**93**	**83**	–	**14**	–	**4.2 J**	–	**130**	**240**	**180**	**840**	**190**	–	**82**	**320**	**110**
Benzofluoranthenes[6] (Total)	µg/kg	3,200	–	**190**	**200**	–	**26**	–	**11**	–	**600**	**660**	**410**	**1,700**	**86**	–	**230**	**820**	**270**
Benzo(g,h,i)perylene	µg/kg	670	–	**46**	**44**	–	–	–	–	–	**63**	**95**	**110**	**320**	**560**	–	**41**	**130**	–
Chrysene	µg/kg	1,400	–	**150**	**140**	–	**18**	–	**6.3**	–	**780**	**750**	**410**	**1,800**	**630**	–	**180**	**820**	**190**
Dibenzo(a,h)anthracene	µg/kg	230	–	**12 J**	14 U	–	4.8 U	–	4.8 U	–	**18**	**23**	**23**	**87**	**26**	–	**12 J**	**41**	**17**
Fluoranthene	µg/kg	1,700	–	**310**	**320**	–	–	–	–	–	**3,000**	**3,500**	**1,800**	**1,900**	**1,800**	–	**190**	**880**	–
Indeno(1,2,3-c,d)pyrene	µg/kg	600	–	**38**	**36**	–	**7.4**	–	4.8 U	–	**63**	**78**	**85**	**270**	**79**	–	**36**	**120**	**49**
Pyrene	µg/kg	2,600	–	**550**	**410**	–	–	–	–	–	**2,000**	**2,200**	**1,200**	**1,400**	**1,200**	–	**260**	**1,500**	–
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	–	**132.50**	**119.40**	–	**19.70**	–	**5.99 J**	–	**227.90**	**377.60**	**267.90**	**1173.70**	**250.40**	–	**122.60**	**484.30**	**158.50**
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	–	0.27 U	0.21 U	–	–	–	–	–	0.26 U	NA	NA	0.33 U	–	–	0.26 U	–	–
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	–	0.27 U	0.21 U	–	–	–	–	–	0.26 U	NA	NA	0.33 U	–	–	0.26 U	–	–
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	–	0.27 U	**0.11 J**	–	–	–	–	–	0.26 U	NA	NA	0.33 U	–	–	0.26 U	–	–
Hexachlorobenzene	mg/kg OC	0.38	–	0.27 U	0.21 U	–	–	–	–	–	0.26 U	NA	NA	0.33 U	–	–	0.26 U	–	–
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	–	NA	NA	–	–	–	–	–	NA	4.8 U	–	NA	–	–	NA	–	–
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	–	NA	NA	–	–	–	–	–	NA	**3.5 J**	–	NA	–	–	NA	–	–
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	–	NA	NA	–	–	–	–	–	NA	**11**	–	NA	–	–	NA	–	–
Hexachlorobenzene	µg/kg	22	–	NA	NA	–	–	–	–	–	NA	4.8 U	–	NA	–	–	NA	–	–
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	–	**3.43**	**2.86**	–	–	–	–	–	**3.6**	NA	–	**3.68**	–	–	**2.28 J**	–	–
Butyl benzyl Phthalate	mg/kg OC	4.9	–	0.27 U	0.21 U	–	–	–	–	–	**0.7**	NA	–	**1.32**	–	–	**0.52**	–	–
Dibutyl Phthalate	mg/kg OC	220	–	1.09 U	0.85 U	–	–	–	–	–	1.08 U	NA	–	1.32 U	–	–	1.03 U	–	–
Diethyl Phthalate	mg/kg OC	61	–	1.09 U	1.7 U	–	–	–	–	–	1.08 U	NA	–	2.83 U	–	–	3.1 U	–	–
Dimethyl Phthalate	mg/kg OC	53	–	1.09 U	0.85 U	–	–	–	–	–	1.08 U	NA	–	1.32 U	–	–	1.03 U	–	–
Di-N-Octyl Phthalate	mg/kg OC	58	–	1.09 U	0.85 U	–	–	–	–	–	1.08 U	NA	–	1.32 U	–	–	1.03 U	–	–
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	–	**60**	**64**	–	–	–	–	–	**67**	**62 J**	–	**56**	–	–	**42 J**	–	–
Butyl benzyl Phthalate	µg/kg	63	–	4.8 U	4.8 U	–	–	–	–	–	**13**	4.8 U	–	**20**	–	–	**9.5**	–	–
Dibutyl Phthalate	µg/kg	1,400	–	19 U	19 U	–	–	–	–	–	20 U	19 U	–	20 U	–	–	19 U	–	–
Diethyl Phthalate	µg/kg	200	–	19 U	38 U	–	–	–	–	–	20 U	19 U	–	43 U	–	–	57 U	–	–
Dimethyl Phthalate	µg/kg	71	–	19 U	19 U	–	–	–	–	–	20 U	19 U	–	20 U	–	–	19 U	–	–
Di-N-Octyl Phthalate	µg/kg	6,200	–	19 U	19 U	–	–	–	–	–	20 U	19 U	–	20 U	–	–	19 U	–	–
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	–	24 U	**14 J**	–	24 U	–	–	–	24 U	**12 J**	–	25 U	–	–	24 U	–	–
2-methylphenol (o-Cresol)	µg/kg	63	–	19 U	19 U	–	19 U	–	–	–	20 U	**15 J**	–	20 U	–	–	19 U	–	–
4-methylphenol (p-Cresol)	µg/kg	670	–	**310 J**	**550 J**	–	19 U	–	–	–	**280**	**330**	–	**200**	–	–	**370**	–	–
Pentachlorophenol	µg/kg	360	–	97 U	97 U	–	96 U	–	–	–	97 U	96 U	–	99 U	–	–	96 U	–	–
Phenol	µg/kg	420	–	**50 J**	**78 J**	–	**8.6 J**	–	–	–	**41 J**	**160**	–	**47 J**	–	–	**46 J**	–	–

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Sample Location[1]			LY-05	LY-06	LY-06	LY-06	LY-06	LY-07	LY-07	LY-07	LY-08	LY-08	LY-08	LY-09	LY-09	LY-09	LY-10	LY-10	LY-11
Sample Identification			LY-SC-05_ 4-5	LY-SS-06_ 0-10	LY-SS-Dup-02 (LY-SS-06_0-10)	LY-SC-06_ 3-4	LY-SC-06_ 4-5	LY-SS-07_ 0-10	LY-SC-07_ 0-1	LY-SC-07_ 3-4	LY-SS-08_ 0-10	LY-SC-08_ 3-4	LY-SC-08_ 5-6	LY-SS-09_ 0-10	LY-SC-09_ 2-3	LY-SC-09_ 3-4	LY-SS-10_ 0-10	LY-SC-10_ 0-1	LY-SS-11_ 0-10
Sample Date			11/19/15	11/17/15	11/17/15	11/19/15	11/19/15	11/17/15	11/20/15	11/20/15	11/17/15	11/20/15	11/20/15	11/17/15	11/18/2015	11/18/2015	11/17/15	11/18/15	11/17/15
Sample Interval (dbm)			4 - 5	0 - 10 cm	0 - 10 cm	3 - 4	4 - 5	0 - 10 cm	0 - 1	3 - 4	0 - 10 cm	3 - 4	5 - 6	0 - 10 cm	2 - 3	3 - 4	0 - 10 cm	0 - 1	0 - 10 cm
Sample Type		SMS and DMMP Screening Level[2]	Core	Surface	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Native	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Intertidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	**3.49**	**2.37**	--	--	--	--	--	**5.91**	NA	--	**4.41**	--	--	**1.79**	--	--
Hexachlorobutadiene	mg/kg OC	3.9	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	--	0.33 U	--	--	0.26 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	0.27 U	0.21 U	--	--	--	--	--	0.26 U	NA	--	0.33 U	--	--	0.26 U	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	**61**	**53**	--	--	--	--	--	**110**	**370**	--	**67**	--	--	**33**	--	--
Hexachlorobutadiene	µg/kg	11	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	4.8 U	--	5.0 U	--	--	4.8 U	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	4.8 U	4.8 U	--	--	--	--	--	4.9 U	4.8 U	--	5.0 U	--	--	4.8 U	--	--
Benzoic Acid	µg/kg	650	--	**130 J**	**78 J**	--	--	--	--	--	**92 J**	**360**	--	**96 J**	--	--	**110 J**	--	--
Benzyl Alcohol	µg/kg	57	--	19 U	19 U	--	--	--	--	--	20 U	19 U	--	20 U	--	--	19 U	--	--
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	mg/kg OC	12	--	**0.61 J**	**0.16 J**	--	**0.009 J**	**0.06 J**	--	--	**0.06 J**	--	--	--	--	--	**0.05**	--	**0.04**
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total PCBs Congeners	µg/kg	3.5	--	**10.7 J**	**3.62 J**	--	**0.0479 J**	**0.458 J**	--	--	**1.1 J**	--	--	--	--	--	**0.997 J**	--	**0.489 J**
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	**1.149 J**	**0.22 J**	--	**0.043 JL10**	**0.069 J**	--	--	**0.108 J**	--	--	--	--	--	**0.094 J**	--	**0.097 J**
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	--	**3.56 J**	**2.64 J**	--	--	--	--	--	**8.04**	--	--	--	--	--	**4.02 J**	--	--
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
mg/kg OC = milligram per kilogram normalized to organic carbon
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
cm = centimeter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	LY-11	LY-13	LY-14	LY-14	LY-14	LY-15	LY-15	LY-16	LY-16	LY-17	LY-17	LY-18	LY-18	LY-19	LY-19	LY-19	LY-20
Sample Identification			LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	LY-SS-15_ 0-10	LY-SC-15_ 0-1	LY-SS-16_ 0-10	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1	LY-SS-19_ 0-10	LY-SC-19_ 1-2	LY-SC-19_ 2-3	LY-SS-20_ 0-10
Sample Date			11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/30/21	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21
Sample Interval (dbm)			0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm
Sample Type			Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	<5	Absent	Absent	Absent	Absent	10	Absent	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	5
Conventionals																			
Total Organic Carbon (TOC)	%	NE	1.25	1.29	1.11	1.55	0.10	0.84	0.49	1.35	1.00	0.49	0.09	--	--	1.73	1.44 J	1.07	2.23
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	53.2	59.1	64.3	77.3	79.0	62.3	64.5	68.9	71.6	70.3	84.9	--	--	47.1	61.4	67.1	51.3
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	--	--	--	--	--	--	--	4.17	1.9	0.809	0.559	--	--	5.72	--	--	97.9
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg OC	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg OC	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	mg/kg OC	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg OC	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg OC	99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	mg/kg OC	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	560	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	2,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-11	LY-13	LY-14	LY-14	LY-14	LY-15	LY-15	LY-16	LY-16	LY-17	LY-17	LY-18	LY-18	LY-19	LY-19	LY-19	LY-20
Sample Identification			LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	LY-SS-15_ 0-10	LY-SC-15_ 0-1	LY-SS-16_ 0-10	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1	LY-SS-19_ 0-10	LY-SC-19_ 1-2	LY-SC-19_ 2-3	LY-SS-20_ 0-10
Sample Date			11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	08/30/21	09/02/21	08/30/21	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21
Sample Interval (dbm)			0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft	0 - 10 cm	1 - 2 ft	2 - 3 ft	0 - 10 cm
Sample Type		SMS and DMMP Screening Level[2]	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Native	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	mg/kg OC	110	**13.6**	**5.81**	**0.9**	**2.53**	--	*3.83*	*5.1*	*0.79*	**1.27**	**2.59**	**3.73 J**	--	--	*2.5*	**1.2**	--	*11.79*
Benzo(a)pyrene	mg/kg OC	99	**13.6**	**10.08**	**0.91**	**2.28**	--	*3*	*5.39*	*1.17*	**1.73**	**3.53**	**3.44 J**	--	--	*2.1*	**1.85**	--	*10.85*
Benzofluoranthenes[6] (Total)	mg/kg OC	230	**32.8**	**25.58**	**1.33**	**5.17**	--	*5.7*	*8.12*	*1.99*	**2.56**	**5.21**	**3.57 J**	--	--	*4.72*	**3.1**	--	*36.77*
Benzo(g,h,i)perylene	mg/kg OC	31	--	--	**0.81**	**1.17**	--	*1.99*	*4.16*	*0.88*	**1.26**	**2.57**	**1.3 J**	--	--	*1.66*	**1.38**	--	*6.55 J*
Chrysene	mg/kg OC	110	**26.4**	**10.08**	**1.15**	**5.52**	--	*5.32*	*7.63*	*1.31*	**2.08**	**4.24**	**5.14 J**	--	--	*5.05*	**2.15**	--	*40*
Dibenzo(a,h)anthracene	mg/kg OC	12	**1.84**	**1.55**	**0.35 J**	**0.46**	--	*0.67*	*1.62*	*0.32 J*	**0.41 J**	**0.84 J**	5.54 U	--	--	*0.54*	**0.36**	--	*1.5 J*
Fluoranthene	mg/kg OC	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	**5.6**	**4.81**	**0.56**	**0.98**	--	*1.73*	*3.71*	*0.67*	**1.16**	**2.37**	**1.24 J**	--	--	*1.38*	**1.04**	--	*6.5 J*
Pyrene	mg/kg OC	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry V																			
Sum of HPAHs[5]	µg/kg	12,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	µg/kg	1,300	**170**	**75**	**10**	**39.2**	--	*32.2*	*25*	*376*	**10.7**	**12.7**	**3.36 J**	**2.29 J**	4.97 U	*43.3*	**17.3**	--	*263*
Benzo(a)pyrene	µg/kg	1,600	**170**	**130**	**10.1**	**35.3**	--	*25.2*	*26.4*	*276*	**15.8**	**17.3**	**3.1 J**	**2.96 J**	4.97 U	*36.3*	**26.7**	--	*242*
Benzofluoranthenes[6] (Total)	µg/kg	3,200	**410**	**330**	**14.76**	**80.1**	--	*47.9*	*39.8*	*602*	**26.84**	**25.55**	**3.21 J**	**3.88 J**	4.97 U	*81.6*	**44.6**	--	*820*
Benzo(g,h,i)perylene	µg/kg	670	--	--	**8.98**	**18.1**	--	*16.7*	*20.4*	*98.7*	**11.9**	**12.6**	**1.17 J**	**2.65 J**	4.97 U	*28.8*	**19.9**	--	*146 J*
Chrysene	µg/kg	1,400	**330**	**130**	**12.8**	**85.6**	--	*44.7*	*37.4*	*640*	**17.7**	**20.8**	**4.63 J**	**4.02 J**	4.97 U	*87.3*	**30.9**	--	*892*
Dibenzo(a,h)anthracene	µg/kg	230	**23**	**20**	**3.84 J**	**7.17**	--	*5.63*	*7.93*	*44.6*	**4.38 J**	**4.14 J**	4.99 U	5 U	4.97 U	*9.31*	**5.17**	--	*33.4 J*
Fluoranthene	µg/kg	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	**70**	**62**	**6.26**	**15.2**	--	*14.5*	*18.2*	*107*	**9**	**11.6**	**1.12 J**	**2.09 J**	4.97 U	*23.9*	**15**	--	*145 J*
Pyrene	µg/kg	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	**240.60**	**180.00**	**13.71**	**50.32**	--	*35.67*	*35.87*	*395.36*	**21.07**	**22.91**	**4.12 J**	**4.04 J**	7.01Lmax	*52.98*	**35.22**	--	*377.06*
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-11	LY-13	LY-14	LY-14	LY-14	*LY-15*	*LY-15*	*LY-16*	LY-16	LY-17	LY-17	LY-18	LY-18	*LY-19*	LY-19	LY-19	*LY-20*
Sample Identification			LY-SC-11_ 0-1	LY-SS-13_ 0-10	LY-SS-14_ 0-10	LY-SC-14_ 0-1	LY-SC-14_ 1-2	*LY-SS-15_ 0-10*	*LY-SC-15_ 0-1*	*LY-SS-16_ 0-10*	LY-SC-16_ 1-2	LY-SS-17_ 0-10	LY-SC-17_ 1-2	LY-SS-18_ 0-10	LY-SC-18_ 0-1	*LY-SS-19_ 0-10*	LY-SC-19_ 1-2	LY-SC-19_ 2-3	*LY-SS-20_ 0-10*
Sample Date			11/19/15	11/17/15	08/30/21	08/31/21	08/31/21	*08/30/21*	*09/02/21*	*08/30/21*	09/02/21	08/31/21	09/01/21	08/30/21	09/01/21	*08/30/21*	08/31/21	08/31/21	*08/30/21*
Sample Interval (dbm)			0 - 1	0 - 10 cm	0 - 10 cm	0 - 1 ft	1 - 2 ft	*0 - 10 cm*	*0 - 1 ft*	*0 - 10 cm*	1 - 2 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 1 ft	*0 - 10 cm*	1 - 2 ft	2 - 3 ft	*0 - 10 cm*
Sample Type		SMS and DMMP Screening Level[2]	Core	Surface	Surface	Core	Core	*Surface*	*Core*	*Surface*	Core	Surface	Core	Surface	Core	*Surface*	Core	Core	*Surface*
Stratigraphic Unit			Recent	Recent	Recent	Recent	Native	*Recent*	*Recent*	*Recent*	Recent	Recent	Native	Recent	Recent	*Recent*	Recent	Recent	*Recent*
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	*Subtidal*	*Subtidal*	*Subtidal*	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	*Subtidal*	Subtidal	Subtidal	*Subtidal*
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	--	--	**0.08 J**	**0.64 J**	NA	*14.4*	*NA*	*11.9*	0.16 U	NA	NA	--	--	*0.53 J*	**2.64 J**	**0.11 J**	*0.43 J*
Total PCBs Congeners	mg/kg OC	12	--	**1.01 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	--	--	**0.9 J**	**5.8 J**	1.6 U	*121*	*13.9*	*160.6*	1.6 U	1.6 U	1.6 U	--	--	*9.2 J*	**38 J**	**1.2 J**	*9.6 J*
Total PCBs Congeners	µg/kg	3.5	--	**13.0 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	**0.46**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	*2.68*
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
mg/kg OC = milligram per kilogram normalized to organic carbon
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
cm = centimeter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24	LY-24	LY-25	LY-25	LY-25	LY-26
Sample Identification			LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1	LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10
Sample Date			08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21	09/01/21	08/30/21	09/02/21	09/02/21	08/31/21
Sample Interval (dbm)			1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm
Sample Type			Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
Visual Wood Content[3]	%	10	Absent	Absent	5	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	--	**1.20**	1.92	**3.09**	1.68 J	1.36	**1.24**	--	**2.33**	--	--	1.62	--	1.60	**1.78**	--	0.61 J
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	--	**64.2**	56.4	**50.1**	69.6	70.3	**58.8**	--	**53.7**	--	--	55.1	--	47.1	**55.5**	--	63.4
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	--	--	21.9	**4.31**	42.3 J	17.6 J	**17.9 J**	--	--	--	--	267	--	15.5 J	**97.8**	**87.9 J**	12 J
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	mg/kg OC	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	mg/kg OC	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	mg/kg OC	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	mg/kg OC	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	mg/kg OC	99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	mg/kg OC	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-Methylnaphthalene	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthene	µg/kg	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Acenaphthylene	µg/kg	560	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Anthracene	µg/kg	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fluorene	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Naphthalene	µg/kg	2,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenanthrene	µg/kg	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24	LY-24	LY-25	LY-25	LY-25	LY-26
Sample Identification			LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1	LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10
Sample Date			08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21	09/01/21	08/30/21	09/02/21	09/02/21	08/31/21
Sample Interval (dbm)			1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm
Sample Type		SMS and DMMP Screening Level[2]	Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	mg/kg OC	110	--	**8.33**	*12.4*	**5.6**	*4.5 J*	*3.68*	**4.74**	--	**7.77**	--	--	--	--	*1.88*	**7.02**	--	*74.59 J*
Benzo(a)pyrene	mg/kg OC	99	--	**6.06**	*9.95*	**4.08**	*3.85 J*	*6.79*	**6.36**	--	**6.18**	--	--	--	--	*2.04*	**8.09**	--	*54.43 J*
Benzofluoranthenes[6] (Total)	mg/kg OC	230	--	**9.81**	*36.51*	**7.4**	*10.57 J*	*15.1*	**12.37**	--	**12.36**	--	--	--	--	*5.38*	**18.15**	--	*89.84 J*
Benzo(g,h,i)perylene	mg/kg OC	31	--	**3.25**	*5.57*	**2.82**	*2.4 J*	*3.64*	**3.44**	--	**3.53**	--	--	--	--	*1.28*	**5.62**	--	*23.61 J*
Chrysene	mg/kg OC	110	--	**8.42**	*50.31*	**9.58**	*13.04 J*	*9.85*	**8.47**	--	**16.09**	--	--	--	--	*4.23*	**14.33**	--	*109.02 J*
Dibenzo(a,h)anthracene	mg/kg OC	12	--	**2.25**	*2.21 J*	**0.87**	*0.72*	*1.17*	**1.23**	--	**1.25**	--	--	--	--	*0.38*	**1.96**	--	*7.8 J*
Fluoranthene	mg/kg OC	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	--	**3.11**	*6.04*	**2.69**	*2.29 J*	*3.57*	**3.6**	--	**3.56**	--	--	--	--	*1.19*	**5.62**	--	*25.41 J*
Pyrene	mg/kg OC	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **																			
Sum of HPAHs[5]	µg/kg	12,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzo(a)anthracene	µg/kg	1,300	**229**	**100.0**	*238*	**173**	*75.6 J*	*50.1*	**58.8**	**89.2**	**181**	**198**	*11.8*	--	**68.1**	*30*	**125**	**34.6**	*455 J*
Benzo(a)pyrene	µg/kg	1,600	**154**	**72.7**	*191*	**126**	*64.7 J*	*92.4*	**78.9**	**56.1**	**144**	**172**	*14*	--	**114**	*32.6*	**144**	**46.6**	*332 J*
Benzofluoranthenes[6] (Total)	µg/kg	3,200	**324**	**117.7**	*701*	**228.6**	*177.5 J*	*205.3*	**153.4**	**110.7**	**288**	**247.5**	*23.43*	--	**223**	*86.1*	**323**	**71.9**	*548 J*
Benzo(g,h,i)perylene	µg/kg	670	**86.9**	**39.0**	*107*	**87.1**	*40.4 J*	*49.5*	**42.6**	**34.6**	**82.3**	**103**	*12.2*	--	**64.6**	*20.4*	**100**	**35.5**	*144 J*
Chrysene	µg/kg	1,400	**445**	**101.0**	*966*	**296**	*219 J*	*134*	**105**	**235**	**375**	**258**	*18.5*	--	**119**	*67.7*	**255**	**47.8**	*665 J*
Dibenzo(a,h)anthracene	µg/kg	230	**27.7**	**27.0**	*42.4 J*	**26.8**	*12.1*	*15.9*	**15.2**	**11.7**	**29.2**	**24**	*3.4 J*	--	**21.4**	*6.13*	**34.9**	**6.1**	*47.6 J*
Fluoranthene	µg/kg	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Indeno(1,2,3-c,d)pyrene	µg/kg	600	**81.5**	**37.3**	*116*	**83**	*38.5 J*	*48.6*	**44.7**	**31.8**	**82.9**	**81.7**	*9.27*	--	**61.3**	*19*	**100**	**23.5**	*155 J*
Pyrene	µg/kg	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	**224.67**	**101.91**	*310.40*	**180.10**	*97.26 J*	*125.73*	**107.16**	**82.79**	**205.86**	**229.70**	*18.98*	--	**152.57**	*47.40*	**204.84**	**60.69**	*459.21 J*
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			LY-20	LY-20	LY-21	LY-21	LY-22	LY-22	LY-22	LY-23	LY-23	LY-23	LY-24	LY-24	LY-24	LY-25	LY-25	LY-25	LY-26
Sample Identification			LY-SC-20_ 1-2	LY-SC-20_ 2-3	LY-SS-21_ 0-10	LY-SC-21_ 1-2	LY-SS-22_ 0-10	LY-SS-22_Dup-1 (LY-SS-22_0-10)	LY-SC-22_ 1-2	LY-SS-23_ 0-10	LY-SC-23_ 2-3	LY-SC-23_ 5-6	LY-SS-24_ 0-10	LY-SC-24_ 0-1	LY-SC-24_ 1-2	LY-SS-25_ 0-10	LY-SC-25_ 1-2	LY-SC-25_ 3-4	LY-SS-26_ 0-10
Sample Date			08/31/21	08/31/21	08/30/21	09/02/21	08/31/21	08/31/21	09/01/21	08/30/21	08/31/21	08/31/21	08/30/21	09/01/21	09/01/21	08/30/21	09/02/21	09/02/21	08/31/21
Sample Interval (dbm)			1 - 2 ft	2 - 3 ft	0 - 10 cm	1 - 2 ft	0 - 10 cm	0 - 10 cm	1 - 2 ft	0 - 10 cm	2 - 3 ft	5 - 6 ft	0 - 10 cm	0 - 1 ft	1 - 2 ft	0 - 10 cm	1 - 2 ft	3 - 4 ft	0 - 10 cm
Sample Type		SMS and DMMP Screening Level[2]	Core	Core	Surface	Core	Surface	Surface	Core	Surface	Core	Core	Surface	Core	Core	Surface	Core	Core	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	--	**0.31 J**	*0.42 J*	**0.76 J**	*0.58 J*	*0.68 J*	**0.85 J**	--	**0.54 J**	--	--	*1.58 J*	--	*0.53*	**1.74**	--	*1.44 J*
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	--	**3.7 J**	*8.1 J*	**23.4**	*9.8 J*	*9.2 J*	**10.5 J**	--	**12.5 J**	--	--	*25.6 J*	--	*8.5 J*	**31 J**	--	*8.8 J*
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	**8.09**	--	--	--	--	--	--	--	--	--	--	--	--	*4.38*	**10.62**	--	*1.83 J*
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
J = The analyte was detected and the detected concentration is considered an estimate.
n/a = not applicable
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
µg/L = microgram per liter
mg/kg OC = milligram per kilogram normalized to organic carbon
NE = not established
cm = centimeter
mg/L = milligram per liter
ng/kg = nanogram per kilogram
dbm = depth below mudline
mg-N/kg = milligrams of nitrogen per kilogram
U = The analyte was not detected at a concentration greater than the value identified.
mg/kg OC = milligram per kilogram normalized to organic carbon
cm = centimeter
Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30	LY-31	LY-31	LY-32	COA_01	COA_02	COA_03
Sample Identification			LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2	LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118
Sample Date			08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type			Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native	Recent	Native	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	1.08	1.15	--	--	--	--	--	--	--	--	--	--	--	--	1.08	1.36	1.57
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.60	4.92	5.87
Total Solids (TS)	%	NE	60.8	62.3	--	--	--	--	--	--	--	--	--	--	--	--	82.2	54.1	44.9
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.9	27.9	41.5
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.6	984	2,260
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Sand	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Coarse Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Medium Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Very Fine Silt	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Clay	%	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	3.15	6.44	6.17
Cadmium	mg/kg	0.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.14	0.85	0.58
Chromium	mg/kg	62	--	--	--	--	--	--	--	--	--	--	--	--	--	--	27.5	32.3	34.3
Copper	mg/kg	45	--	--	--	--	--	--	--	--	--	--	--	--	--	--	28.4	36.3	31.7
Lead	mg/kg	21	--	--	--	--	--	--	--	--	--	--	--	--	--	--	13.6	11.4	9.44
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.0149 J	0.111	0.0835
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.05 J	0.17 J	0.11
Zinc	mg/kg	93	--	--	--	--	--	--	--	--	--	--	--	--	--	--	122	82.8	77.8
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	128 J	257	291	--	--	--	--	--	--	--	--	--	--	--	16.7	118	17
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.65 J	22.6 J	12.83 J
2-Methylnaphthalene	mg/kg OC	38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.84 J	1.31 J	1.54
Acenaphthene	mg/kg OC	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	0.79 J	1.59
Acenaphthylene	mg/kg OC	66	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	2.56	0.92 J
Anthracene	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	4.58	1.9
Fluorene	mg/kg OC	23	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.69	1.99
Naphthalene	mg/kg OC	99	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	2.25	1.52
Phenanthrene	mg/kg OC	100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.65 J	10.74	4.91
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7 J	307.4 J	201.5 J
2-Methylnaphthalene	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	9.1 J	17.8 J	24.2
Acenaphthene	µg/kg	500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	10.7 J	24.9
Acenaphthylene	µg/kg	560	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	34.8	14.5 J
Anthracene	µg/kg	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	62.3	29.8
Fluorene	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	23	31.3
Naphthalene	µg/kg	2,100	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	30.6	23.9
Phenanthrene	µg/kg	1,500	--	--	--	--	--	--	--	--	--	--	--	--	--	--	7 J	146	77.1

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Sample Location[1]			LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30	LY-31	LY-31	LY-32	COA_01	COA_02	COA_03
Sample Identification			LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2	LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118
Sample Date			08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20
Sample Interval (dbm)		SMS and DMMP Screening Level[2]	0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type			Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native	Recent	Native	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.68	350.04	64.38 J
Benzo(a)anthracene	mg/kg OC	110	1.84 J	3.24	--	--	--	--	--	--	--	--	--	--	--	--	0.57 J	14.19	3.69
Benzo(a)pyrene	mg/kg OC	99	2.23 J	3.5	--	--	--	--	--	--	--	--	--	--	--	--	1.15 J	12.35	4.48
Benzofluoranthenes[6] (Total)	mg/kg OC	230	4.43 J	6.5	--	--	--	--	--	--	--	--	--	--	--	--	2.63 J	57.94	13.31
Benzo(g,h,i)perylene	mg/kg OC	31	1.78 J	3.3	--	--	--	--	--	--	--	--	--	--	--	--	1.39 J	5.96	2.62
Chrysene	mg/kg OC	110	3.25 J	4.58	--	--	--	--	--	--	--	--	--	--	--	--	2.45	64.19	10.19
Dibenzo(a,h)anthracene	mg/kg OC	12	0.79 J	0.92	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	2.49	1.14 J
Fluoranthene	mg/kg OC	160	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.05 J	108.82	11.59
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	1.69 J	2.03	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	6.88	2.45
Pyrene	mg/kg OC	1,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	2.44	77.21	14.9
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **																			
Sum of HPAHs[5]	µg/kg	12,000	--	--	--	--	--	--	--	--	--	--	--	--	--	--	126.1	4,760.5	992.9
Benzo(a)anthracene	µg/kg	1,300	19.9 J	37.3	--	11.2 J	28.7 J	136	3.80 J	--	--	9.31	1.57 J	9.01	4.98 U	--	6.2 J	193	57.9
Benzo(a)pyrene	µg/kg	1,600	24.1 J	40.3	--	11.4 J	29.2 J	204	7.37	--	--	11.8	3.41 J	6.83	4.98 U	--	12.4 J	168	70.4
Benzofluoranthenes[6] (Total)	µg/kg	3,200	47.8 J	74.7	--	13.45 J	79.5 J	333	14.43 J	--	--	10.46 J	7.37 J	7.2 J	4.98 U	--	28.4 J	788	209.0
Benzo(g,h,i)perylene	µg/kg	670	19.2 J	37.9	--	9.15 J	13.9	118	3.11 J	--	--	9.28	1.62 J	4.04 J	4.98 U	--	15 J	81	41.2
Chrysene	µg/kg	1,400	35.1 J	52.7	--	11.9 J	62.7 J	212	6.13	--	--	25	2.73 J	11.4	4.98 U	--	26.5	873	160
Dibenzo(a,h)anthracene	µg/kg	230	8.48 J	10.6	--	2.83 J	4.06 J	32.2	4.98 U	--	--	2.9	4.95	1.09 J	4.98 U	--	19.9 U	33.9	17.9 J
Fluoranthene	µg/kg	1,700	--	--	--	--	--	--	--	--	--	--	--	--	--	--	11.3 J	1,480	182
Indeno(1,2,3-c,d)pyrene	µg/kg	600	18.2 J	23.3	--	5.35	13.1	106	2.43 J	--	--	3.77	1.31 J	2.98 J	4.98 U	--	19.9 U	93.6	38.4
Pyrene	µg/kg	2,600	--	--	--	--	--	--	--	--	--	--	--	--	--	--	26.3	1,050	234
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	33.89 J	55.42	--	14.8 J	42.36 J	266.84	9.73	--	--	14.69	4.57 J	8.97	7.02Lmax	--	17.01 J	287.58	104.32
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.46 U	0.37 U	0.32 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.46 U	0.37 U	0.32 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.46 U	0.37 U	0.32 U
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.46 U	1.27 U
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--	--	--	--	--	--	NA	NA	NA
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--	--	--	--	--	--	4.59 U	3.59 J	2.22 J
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	0.72 J	1.27 U
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.39 J	1.17 J	1.25 J
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	2.01	1.27 U
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.93	1.27 U
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.46 U	1.27 U
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--	--	--	--	--	--	49.6 U	48.8 J	34.9 J
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	9.8 J	19.9 U
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--	--	--	--	--	--	15 J	15.9 J	19.6 J
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	27.4	19.9 U
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	26.3	19.9 U
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	19.9 U	19.9 U
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	3 J	2.2 J
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	19.9 U	19.9 U
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	51.3	33.5
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--	--	--	--	--	--	99.3 U	99.6 U	99.7 U
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	12.7 J	11.9 J

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Sample Location[1]			LY-26	LY-27	LY-27	LY-28	LY-28	LY-28	LY-28	LY-29	LY-29	LY-30	LY-30	LY-31	LY-31	LY-32	COA_01	COA_02	COA_03
Sample Identification			LY-SS-26_Dup-1 (LY-SS-26_0-10)	LY-SS-27_ 0-10	LY-SC-27_ 1-2	LY-28_ 0-10	Dup (LY-28_0-10)	LY-28_ 1-2	LY-28_ 2-3	LY-29_ 0-10	LY-29_ 1-2	LY-30_ 0-10	LY-30_ 1-2	LY-31_ 0-10	LY-31_ 1-2	LY-32_ 0-10	COA_01_G_ 20201120	COA_02_G_ 20201119	COA_03_G_ 20201118
Sample Date			08/31/21	08/31/21	09/01/21	01/26/23	01/26/23	01/27/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	01/27/23	01/26/23	11/20/20	11/19/20	11/18/20
Sample Interval (dbm)		SMS and DMMP Screening Level[2]	0 - 10 cm	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	1 -2 ft	2 - 3 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	1 -2 ft	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm
Sample Type			Surface	Surface	Core	Surface	Surface	Core	Core	Surface	Core	Surface	Core	Surface	Core	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Native	Recent	Native	Recent	Native	Recent	Native	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	***0.88 J***	***1.76***
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	0.46 U	0.37 U	0.32 U
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	1.84 U	1.46 U	1.27 U
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	***11.9 J***	***27.6***
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--	--	--	--	--	--	5 U	5 U	5 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	19.9 U	19.9 U
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--	--	--	--	--	--	***73.4 J***	199 U	199 U
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--	--	--	--	--	--	19.9 U	19.9 U	19.9 U
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	***1.13 J***	***4.24***	--	NA	NA	NA	NA	NA	NA	NA	--	NA	NA	NA	***1.06 J***	***1.09 J***	***0.48 J***
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	***12.2 J***	***48.8***	--	1.6 U	1.6 U	**24.4**	1.16 U	**8.5**	1.16 U	1.16 U	--	1.6 U	1.6 U	1.6 U	***11.5 J***	***14.8 J***	***7.6 J***
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	***2.17***	***4.87***	--	--	--	--	--	--	--	--	--	--	--	--	***2.55 J***	***4.39 J***	***4.19***
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
mg/kg OC = milligram per kilogram normalized to organic carbon
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
cm = centimeter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	COA-SS-1	COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-2	COA-SS-3	COA-SS-3	COA-SS-3
Sample Identification			COA_04_G_20201118	COA_05_G_20201119	COA-05-D_G_20201119	COA_06_G_20201120	COA-06-D_G_20201120	COA_07_G_20201118	COA_08_G_20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	**COA-SS-1-6.5-8.5-20201116**	COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	**COA-SS-2-7.5-9.5-20201118**	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118
Sample Date			11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	**11/16/20**	11/18/20	11/18/20	11/18/20	**11/18/20**	11/18/20	11/18/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	**6.5 - 8.5 ft**	1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	**7.5 - 9.5 ft**	1 - 3 ft	3 -5 ft	5 -7 ft
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	**Core**	Core	Core	Core	**Core**	Core	Core	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	**Native**	Recent	Native	Native	**Native**	Recent	Native	Native
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	<5	Absent	Absent	Absent	<5	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	1.38	1.56	1.63	0.97	1.09	0.93 J	0.13	0.35	0.14	**0.11**	0.20	0.21	0.09	**0.11**	1.12 J	0.07	0.07
Total Volatile Solids (TVS)	%	NE	5.39	5.04	5.26	3.41	3.44	3.48 J	1.05	2.50	1.29	**1.35**	2.34	1.68	1.97	**1.41**	1.61	1.11	1.07
Total Solids (TS)	%	NE	48.2	57.2	56.5	69.2	69.3	68.82 J	77.9	75.7	86.6	**87.0**	77.2	81.9	81.1	**86.3**	79.6	87.4	90.4
Total Ammonia	mg-N/kg	NE	34.8	27.7	28.0	11.8	12.8	8.76 J	1.8	8.8	2.3	**2.5**	6.7	3.4	3.0	**1.6**	5.0	3.6	3.4
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	1,690	1,380	1,270	257	277	114	2.9	158	1.19 U	**1.4**	20.9	1.17 U	1.26 U	1.14 U	1.6	1.14 U	1.18 U
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	--	2.03	--	--	--	--	--	20.1	16	**29**	5.6	7	2	**6.3**	--	10.6	21.2
Very Coarse Sand	%	NE	--	0.96	--	--	--	--	--	2.3	3.7	**4.6**	2.4	3	1.4	**2.6**	--	5.1	4.3
Coarse Sand	%	NE	--	1.96	--	--	--	--	--	3.1	4.5	**6.1**	2.7	4.3	2	**3.2**	--	6.7	4.6
Medium Sand	%	NE	--	3.9	--	--	--	--	--	5.6	6.2	**8.5**	4.7	5.7	2.7	**5.3**	--	10	7
Fine Sand	%	NE	--	20.9	--	--	--	--	--	7.2	11	**8.3**	6.7	8.9	6	**6.6**	--	9.9	8.3
Very Fine Sand	%	NE	--	25.9	--	--	--	--	--	6.8	8.5	**7**	6.9	6.2	4.5	**6.7**	--	8.7	8.2
Coarse Silt	%	NE	--	11.76	--	--	--	--	--	9.7	9.5	**6.7**	10.4	10	5.3	**8.4**	--	11.2	9.6
Medium Silt	%	NE	--	10.73	--	--	--	--	--	10.5	10.1	**6.6**	11.8	9.4	14.5	**14.9**	--	10	10.3
Fine Silt	%	NE	--	4.96	--	--	--	--	--	7.6	8	**6.7**	10	10.1	13.3	**10.7**	--	8.7	9.3
Very Fine Silt	%	NE	--	3.1	--	--	--	--	--	6.8	6.9	**5.3**	8.4	8.6	12.2	**9.8**	--	6.7	7.1
Clay	%	NE	--	13.8	--	--	--	--	--	20.2	15.7	**11.3**	30.5	26.8	36.1	**25.5**	--	12.5	10.2
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	6.26	7.5	7.24	6.56	5.65	5.98	3.2	4.38	4.02	**5.11**	3.96	6.05	6.37	**4.9**	3.78	5.02	1.14
Cadmium	mg/kg	0.8	0.57	0.54	0.55	0.39	0.39	0.41	0.14	0.28	0.12	**0.12**	0.11 J	0.05 J	0.08 J	**0.13**	0.25	0.09 J	0.11 U
Chromium	mg/kg	62	34.2	36.9	30.8	25.4	30.3	55.6	32	62	124	**99.7**	23.3	40.2	38.2	**73.5**	23.6	81.5	39.3
Copper	mg/kg	45	25.4	29.3	22.2	12.3	6.63	23.8	12.5	34.3	23.7	**23.9**	19.5	41.2	41.3	**37.4**	8.34	21.3	9.48
Lead	mg/kg	21	7.82	9.73	7.21	5.16	3.82	2.02	3.71	5.01	2.78	**3.02**	2.99	4.73	4.87	**3.95**	2.41	2.42	0.87
Mercury	mg/kg	0.41	0.0716	0.0531	0.46	0.0534	0.04	0.046	0.0181 J	0.157	0.0347	**0.0321**	0.0574	0.0377	0.0364	**0.0317**	0.019 J	0.0319	0.0307
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	0.11 J	0.08 J	0.08 J	0.06 J	0.05 J	0.05 J	0.03 J	0.1 J	0.07 J	**0.06 J**	0.06 J	0.05 J	0.07 J	**0.07 J**	0.05 J	0.06 J	0.21 U
Zinc	mg/kg	93	76.2	62	63.9	38.5	39.9	38.4	38.6	59.9	45.4	**47.4**	34.9	68.1	69.6	**60.1**	27.6	38.6	20.7
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	8.97	382	119	15.9	3.08 J	2.05 J	0.838 J	23.1	4.92	3.81 U	9.34	3.84 U	3.83 U	**0.502 J**	0.958 J	3.82 U	3.83 U
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	13.27 J	31.67 J	17.6 J	38.65 J	29.49 J	25.66 J	NA	NA	NA	NA	NA	NA	NA	NA	8.49 J	NA	NA
2-Methylnaphthalene	mg/kg OC	38	1.57	1.36	1.48	1.41 J	1.7 J	1.53 J	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Acenaphthene	mg/kg OC	16	0.78 J	1.15 J	1.41	1.76 J	0.83 J	1.49 J	NA	NA	NA	NA	NA	NA	NA	NA	0.5 J	NA	NA
Acenaphthylene	mg/kg OC	66	0.92 J	3.08	0.98 J	1.41 J	2.04	1.6 J	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Anthracene	mg/kg OC	220	2.2	7.69	2.85	5.34	6.21	4.15	NA	NA	NA	NA	NA	NA	NA	NA	1.41 J	NA	NA
Fluorene	mg/kg OC	23	1.6	2.65	1.96	3.02	1.99	1.86 J	NA	NA	NA	NA	NA	NA	NA	NA	0.68 J	NA	NA
Naphthalene	mg/kg OC	99	2.73	4.22	4.92	10.52	6.22	7	NA	NA	NA	NA	NA	NA	NA	NA	3.22	NA	NA
Phenanthrene	mg/kg OC	100	5.04	12.88	5.48	16.6	12.2	9.55	NA	NA	NA	NA	NA	NA	NA	NA	2.68	NA	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	183.1 J	494.1 J	311.1 J	374.9 J	321.4 J	238.6 J	7.7 J	65.7 J	6.2 J	**6 J**	18.7 J	4.7 J	4.8 J	19.9 U	95.1 J	20 U	19.9 U
2-Methylnaphthalene	µg/kg	670	21.6	21.2	24.2	13.7 J	18.5 J	14.2 J	19.9 U	8.3 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Acenaphthene	µg/kg	500	10.8 J	17.9 J	23	17.1 J	9 J	13.9 J	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	5.6 J	20 U	19.9 U
Acenaphthylene	µg/kg	560	12.7 J	48.1	15.9 J	13.7 J	22.2	14.9 J	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Anthracene	µg/kg	960	30.3	120	46.5	51.8	67.7	38.6	19.9 U	6.1 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	15.8 J	20 U	19.9 U
Fluorene	µg/kg	540	22.1	41.3	32	29.3	21.7	17.3 J	19.9 U	5 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	7.6 J	20 U	19.9 U
Naphthalene	µg/kg	2,100	37.7	65.8	80.2	102	67.8	65.1	7.7 J	34.5	19.9 U	19.9 U	6.4 J	19.9 U	19.9 U	19.9 U	36.1	20 U	19.9 U
Phenanthrene	µg/kg	1,500	69.5	201	89.3	161	133	88.8	19.9 U	20.1	6.2 J	**6 J**	12.3 J	4.7 J	4.8 J	19.9 U	30	20 U	19.9 U

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Sample Location[1]			COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	**COA-SS-1**	COA-SS-2	COA-SS-2	COA-SS-2	**COA-SS-2**	COA-SS-3	COA-SS-3	COA-SS-3
Sample Identification			COA_04_G_20201118	COA_05_G_20201119	COA_05-D_G_20201119	COA_06_G_20201120	COA-06-D_G_20201120	COA_07_G_20201118	COA_08_G_20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	**COA-SS-1-6.5-8.5-20201116**	COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	**COA-SS-2-7.5-9.5-20201118**	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118
Sample Date			11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	**11/16/20**	11/18/20	11/18/20	11/18/20	**11/18/20**	11/18/20	11/18/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	**6.5 - 8.5 ft**	1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	**7.5 - 9.5 ft**	1 - 3 ft	3 -5 ft	5 -7 ft
Sample Type		**SMS and DMMP**	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	**Core**	Core	Core	Core	**Core**	Core	Core	Core
Stratigraphic Unit		**Screening**	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	**Native**	Recent	Native	Native	**Native**	Recent	Native	Native
Tidal Zone		**Level[2]**	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	61.52 J	302.23	70.31 J	100.52 J	338.83	160.58	NA	NA	NA	NA	NA	NA	NA	NA	28.66 J	NA	NA
Benzo(a)anthracene	mg/kg OC	110	4.51	23.46	5.04	8.3	15.6	6.94	NA	NA	NA	NA	NA	NA	NA	NA	2.11	NA	NA
Benzo(a)pyrene	mg/kg OC	99	5.23	23.53	5.09	8.76	35.87	9.46	NA	NA	NA	NA	NA	NA	NA	NA	2.24	NA	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	15.72	52.31	12.39	18.04	90.73	64.52	NA	NA	NA	NA	NA	NA	NA	NA	6.8	NA	NA
Benzo(g,h,i)perylene	mg/kg OC	31	2.85	10.58	2.9	3.39	14.86	8.45	NA	NA	NA	NA	NA	NA	NA	NA	1.21 J	NA	NA
Chrysene	mg/kg OC	110	10.36	41.79	8.96	9.9	70.73	25.38	NA	NA	NA	NA	NA	NA	NA	NA	5.84	NA	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	1.32 J	4.86	1.2 J	1.41 J	7.08	3.63	NA	NA	NA	NA	NA	NA	NA	NA	0.56 J	NA	NA
Fluoranthene	mg/kg OC	160	7.25	67.95	13.37	19.48	41.28	13.23	NA	NA	NA	NA	NA	NA	NA	NA	3.75	NA	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	2.84	11.73	2.69	3.81	16.51	9.19	NA	NA	NA	NA	NA	NA	NA	NA	1.06 J	NA	NA
Pyrene	mg/kg OC	1,000	11.45	66.03	18.65	27.42	46.15	19.78	NA	NA	NA	NA	NA	NA	NA	NA	5.09	NA	NA
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **																			
Sum of HPAHs[5]	µg/kg	12,000	831.0	4,714.8	1,126.1 J	961.4 J	3,693.2	1,493.4	13.4 J	266.7 J	8.2 J	9.3 J	171.9 J	39.7 U	39.7 U	6.6 J	321 J	39.9 U	39.8 U
Benzo(a)anthracene	µg/kg	1,300	62.3	366	82.1	80.5	170	64.5	19.9 U	11.5 J	19.9 U	19.9 U	5.4 J	19.9 U	19.9 U	19.9 U	23.6	20 U	19.9 U
Benzo(a)pyrene	µg/kg	1,600	72.2	367	83	85	391	88	19.9 U	16 J	19.9 U	19.9 U	9.7 J	19.9 U	19.9 U	19.9 U	25.1	20 U	19.9 U
Benzofluoranthenes[6] (Total)	µg/kg	3,200	217.0	816	202.0	175.0	989	600.0	39.8 U	42	39.8 U	39.8 U	31.3 J	39.7 U	39.7 U	39.9 U	76.2	39.9 U	39.8 U
Benzo(g,h,i)perylene	µg/kg	670	39.3	165	47.2	32.9	162	78.6	19.9 U	13.6 J	19.9 U	9.3 J	6.2 J	19.9 U	19.9 U	19.9 U	13.5 J	20 U	19.9 U
Chrysene	µg/kg	1,400	143	652	146	96	771	236	19.9 U	23.3	19.9 U	19.9 U	10.8 J	19.9 U	19.9 U	19.9 U	65.4	20 U	19.9 U
Dibenzo(a,h)anthracene	µg/kg	230	18.2 J	75.8	19.5 J	13.7 J	77.2	33.8	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	6.3 J	20 U	19.9 U
Fluoranthene	µg/kg	1,700	100	1,060	218	189	450	123	4.6 J	34.2	19.9 U	19.9 U	14.8 J	19.9 U	19.9 U	19.9 U	42	20 U	19.9 U
Indeno(1,2,3-c,d)pyrene	µg/kg	600	39.2	183	43.8	37	180	85.5	19.9 U	10.1 J	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	11.9 J	20 U	19.9 U
Pyrene	µg/kg	2,600	158	1,030	304	266	503	184	8.8 J	116	8.2 J	19.9 U	93.7	19.9 U	19.9 U	6.6 J	57	20 U	19.9 U
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	107.30	517.60	119.20	116.58	540.33	168.74	30.05Lmax	23.39 J	30.05Lmax	30.05Lmax	14.13 J	30.04Lmax	30.04Lmax	30.06Lmax	37.55	30.19Lmax	30.05Lmax
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	0.36 U	0.32 U	0.31 U	0.52 U	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	0.36 U	0.32 U	0.31 U	0.52 U	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	0.36 U	0.32 U	0.1 J	0.11 J	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
Hexachlorobenzene	mg/kg OC	0.38	1.44 U	1.28 U	1.22 U	2.05 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.78 U	NA	NA
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	NA	NA	NA	NA	NA	NA	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	NA	5 U	5 U
Hexachlorobenzene	µg/kg	22	NA	NA	NA	NA	NA	NA	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	NA	19.9 U	19.9 U
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	2.59 J	2.09 J	3.06 U	5.14 U	10.83	5.35 U	NA	NA	NA	NA	NA	NA	NA	NA	4.41 J	NA	NA
Butyl benzyl Phthalate	mg/kg OC	4.9	1.44 U	1.28 U	1.23 U	2.06 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Dibutyl Phthalate	mg/kg OC	220	1.33 J	1.1 J	0.96 J	1.47 J	1.81 J	1.88 J	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Diethyl Phthalate	mg/kg OC	61	1.44 U	1.28 U	1.23 U	2.45	1.61 J	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	2.82	NA	NA
Dimethyl Phthalate	mg/kg OC	53	0.6 J	1.28 U	0.52 J	2.06 U	16.79	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Di-N-Octyl Phthalate	mg/kg OC	58	1.44 U	1.28 U	1.23 U	2.06 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	35.7 J	32.6 J	49.9 U	49.9 U	118	49.8 U	49.8 U	378	49.8 U	49.8 U	49.6 U	49.7 U	49.6 U	49.8 U	49.4 J	49.9 U	219
Butyl benzyl Phthalate	µg/kg	63	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Dibutyl Phthalate	µg/kg	1,400	18.4 J	17.1 J	15.6 J	14.3 J	19.7 J	17.5 J	14.8 J	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Diethyl Phthalate	µg/kg	200	19.9 U	19.9 U	20 U	23.8	17.6 J	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	25.9	19.9 U	26.8	19.9 U	31.6	33.7	26
Dimethyl Phthalate	µg/kg	71	8.3 J	19.9 U	8.5 J	20 U	183	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Di-N-Octyl Phthalate	µg/kg	6,200	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	19.9 U	19.9 U	3.6 J	2.2 J	3.2 J	2.2 J	19.9 U	19.9 U	19.9 U	99.5 U	19.8 U	19.9 U	99.3 U	19.9 U	20 U	20 U	99.6 U
2-methylphenol (o-Cresol)	µg/kg	63	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
4-methylphenol (p-Cresol)	µg/kg	670	16.3 J	81.3	46	31.5	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Pentachlorophenol	µg/kg	360	99.7 U	99.6 U	99.8 U	99.8 U	99.6 U	99.5 U	99.6 U	99.5 U	99.6 U	99.5 U	99.2 U	99.4 U	99.3 U	99.7 U	99.8 U	99.8 U	99.6 U
Phenol	µg/kg	420	11.3 J	10 J	15 J	10.8 J	8.7 J	19.9 U	19.9 U	19.9 U	19.9 U	8.9 J	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U

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Sample Location[1]			COA_04	COA_05	COA_05	COA_06	COA_06	COA_07	COA_08	COA-SS-1	COA-SS-1	**COA-SS-1**	COA-SS-2	COA-SS-2	COA-SS-2	**COA-SS-2**	COA-SS-3	COA-SS-3	COA-SS-3
Sample Identification			COA_04_G_20201118	COA_05_G_20201119	COA-05-D_G_20201119	COA_06_G_20201120	COA-06-D_G_20201120	COA_07_G_20201118	COA_08_G_20201119	COA-SS-1-1-3-20201116	COA-SS-1-3-5-20201116	**COA-SS-1-6.5-8.5-20201116**	COA-SS-2-1.5-3.5-20201118	COA-SS-2-3.5-5.5-20201118	COA-SS-2-5.5-7.5-20201118	**COA-SS-2-7.5-9.5-20201118**	COA-SS-3-1-3-20201118	COA-SS-3-3-5-20201118	COA-SS-3-5-7-20201118
Sample Date			11/18/20	11/19/20	11/19/20	11/20/20	11/20/20	11/18/20	11/19/20	11/16/20	11/16/20	**11/16/20**	11/18/20	11/18/20	11/18/20	**11/18/20**	11/18/20	11/18/20	11/18/20
Sample Interval (dbm)			0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	1 - 3 ft	3 -5 ft	**6.5 - 8.5 ft**	1.5 - 3.5 ft	3.5 - 5.5 ft	5.5 - 7.5 ft	**7.5 - 9.5 ft**	1 - 3 ft	3 -5 ft	5 -7 ft
Sample Type		**SMS and DMMP Screening Level[2]**	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Core	Core	**Core**	Core	Core	Core	**Core**	Core	Core	Core
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Native	**Native**	Recent	Native	Native	**Native**	Recent	Native	Native
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal	**Subtidal**	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	**1.02 J**	**1.41**	**1.48**	**1.48 J**	**1.94**	**1.6 J**	NA	NA	NA	NA	NA	NA	NA	NA	**0.62 J**	NA	NA
Hexachlorobutadiene	mg/kg OC	3.9	0.36 U	0.32 U	0.31 U	0.52 U	0.46 U	0.54 U	NA	NA	NA	NA	NA	NA	NA	NA	0.45 U	NA	NA
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	1.44 U	1.28 U	1.23 U	2.06 U	1.83 U	2.14 U	NA	NA	NA	NA	NA	NA	NA	NA	1.79 U	NA	NA
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	**14.1 J**	**22**	**24.1**	**14.4 J**	**21.1**	**14.9 J**	19.9 U	**5.1 J**	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	**6.9 J**	20 U	19.9 U
Hexachlorobutadiene	µg/kg	11	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	5 U	19.9 U	5 U	5 U	19.9 U	19.9 U	5 U	5 U	5 U
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Benzoic Acid	µg/kg	650	199 U	199 U	200 U	200 U	199 U	199 U	199 U	199 U	199 U	199 U	198 U	199 U	199 U	199 U	200 U	200 U	199 U
Benzyl Alcohol	µg/kg	57	19.9 U	19.9 U	20 U	20 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.9 U	19.8 U	19.9 U	19.9 U	19.9 U	20 U	20 U	19.9 U
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	**0.52 J**	**1.11 J**	**0.43 J**	**0.22 J**	**0.41 J**	**1.49 J**	NA	NA	NA	NA	NA	NA	NA	NA	0.14 U	NA	NA
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total PCBs Aroclors	µg/kg	3.5	**7.2 J**	**17.2**	**7 J**	**2.1 J**	**4.5 J**	13.9 U	1.6 U	2.1 U	1.6 U	1.6 U	**1.8 J**	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U	1.6 U
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)																			
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	**3.54 J**	**4.41**	**1.84 JL10**	**1.75 J**	**3.44**	**1.81 J**	**1.19 JL10**	**1.97 J**	**1.06 JL13**	**0.98 JL15**	**1.19 J**	**1.03 JL15**	**1.04 JL15**	**1.14 JL13**	**1.26 JL12**	**0.96 JL15**	**1.03 JL13**
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
mg/kg OC = milligram per kilogram normalized to organic carbon
Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
cm = centimeter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre	PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post
Sample Identification			COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730	COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	POST_20241002DUP
Sample Date			11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24
Sample Interval (dbm)			7 - 9 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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm
Sample Type			Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening																			
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals																			
Total Organic Carbon (TOC)	%	NE	**0.08**	*1.84*	*1.55*	*1.67*	*1.52*	*0.95*	*2.44*	*1.64*	*0.96*	*0.89*	*2.00*	*1.63*	*0.72*	*1.22*	*1.56*	**1.60**	**1.40**
Total Volatile Solids (TVS)	%	NE	**1.18**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	**89.5**	*53.0*	*42.6*	*52.4*	*49.7*	*56.1*	*56.7*	*55.2*	*57.3*	*72.7*	*55.0*	*42.1*	*77.1*	*62.3*	*54.3*	**47.7**	**47.8**
Total Ammonia	mg-N/kg	NE	**3.0**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	1.05 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Grain Size																			
Gravel	%	NE	**15.2**	*0.3 U*	*0.3 U*	*0.3*	*3.1*	*1*	--	*7.8*	*16.4*	*0.4*	*0.6*	*0.4*	*1.8*	*1*	*0.3 U*	**5.3**	--
Very Coarse Sand	%	NE	**4.3**						--										--
Coarse Sand	%	NE	**4.1**						--										--
Medium Sand	%	NE	**5.4**	40.4	19.9	22.4	38.4	52	--	48.4	27	87.9	47.9	20.1	87	57.9	49.1	**33.6**	--
Fine Sand	%	NE	**10.2**						--										--
Very Fine Sand	%	NE	**9.6**						--										--
Coarse Silt	%	NE	**10.5**						--										--
Medium Silt	%	NE	**11.8**	47.8	65.9	67.8	46.2	34	--	34.1	46.4	7.7	41.2	65.6	7.2	33.5	42.9	**46.2**	--
Fine Silt	%	NE	**9.6**						--										--
Very Fine Silt	%	NE	**8.3**						--										--
Clay	%	NE	**11**	*11.7*	*14.1*	*9.7*	*12.2*	*13*	--	*9.8*	*10*	*4.3*	*10.4*	*14.1*	*4.1*	*8*	*8.2*	**14.8**	--
Metals																			
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	**2.82**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	**0.07 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	**79.4**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	**26.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	**2.81**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	**0.0307**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	**0.09 J**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	**43.5**	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Organometallic Compounds																			
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	3.8 U	**7.04**	**8.96**	**52.9**	*2.51 J*	*1.92 UJ*	*4.4 J*	*13.8*	*18.7*	*3.28 J*	*14.6*	*11.4*	*18.1*	*19.1*	*23*	*21.2 J*	*4.0 J*
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N																			
Sum of LPAHs[4]	mg/kg OC	370	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
2-Methylnaphthalene	mg/kg OC	38	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Acenaphthene	mg/kg OC	16	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Acenaphthylene	mg/kg OC	66	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Anthracene	mg/kg OC	220	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Fluorene	mg/kg OC	23	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Naphthalene	mg/kg OC	99	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Phenanthrene	mg/kg OC	100	NA	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	*NA*	NA	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W																			
Sum of LPAHs[4]	µg/kg	5,200	**6 J**	*221.38 J*	*94.5 J*	*219.9 J*	*335.6 J*	*207.2 J*	*151.9 J*	*1145.8*	*80.55 J*	*132.9 J*	*574.1*	*63.6 J*	*36.5 J*	*262.5 J*	*234.5 J*	**124.9 J**	**133.6 J**
2-Methylnaphthalene	µg/kg	670	20 U	*21.9*	*16.6*	*26.2*	*22.4*	*21.6*	*18.4*	*33.4*	*13 J*	*13.7 J*	*38.7*	*17.2*	*7.47 U*	*18.9*	*22.8*	**15.7**	**11.1**
Acenaphthene	µg/kg	500	20 U	*10.2 J*	*7.5 U*	*12.8 J*	*13.5 J*	*7.98 J*	*14.4 J*	*41.8*	*7.49 U*	*7.48 U*	*44*	*7.49 U*	*7.47 U*	*11.7 J*	*11.7 J*	**6.7**	**5.9**
Acenaphthylene	µg/kg	560	20 U	*9.28 J*	*7.5 U*	*11.2 J*	*13.3 J*	*7.83 J*	*7.5 UJ*	*69.4*	*7.49 U*	*7.48 U*	*25.1*	*7.49 U*	*7.47 U*	*11.8 J*	*12.1 J*	**6.2 J**	**8.9**
Anthracene	µg/kg	960	20 U	*28.5*	*21.2*	*38.1*	*93.8*	*44.2 J*	*13.2 J*	*184*	*17.3*	*13.6 J*	*119*	*10.7 J*	*7.47 U*	*48.8*	*45.7*	**20**	**27.4 J**
Fluorene	µg/kg	540	20 U	*12.6 J*	*8.44 J*	*16.5*	*20.1*	*13.3 J*	*12 J*	*65.3*	*8.95 J*	*8.11 J*	*42.7*	*7.49 U*	*7.47 U*	*16.3*	*20.2*	**11.4**	**12.7**
Naphthalene	µg/kg	2,100	20 U	*64.6*	*14.4 J*	*34.3*	*63.9*	*48.5*	*73.8*	*85.3*	*21.9*	*66*	*76.3*	*23.8*	*25.8*	*69.9*	*61.6*	**39.8 J**	**21.2 J**
Phenanthrene	µg/kg	1,500	**6 J**	*96.2*	*50.5*	*107*	*131*	*85.4 J*	*38.5 J*	*700*	*32.4*	*45.2 J*	*267*	*29.1*	*10.7 J*	*104*	*83.2*	**40.8**	**57.5 J**

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Sample Location[1]			COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre	PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post
Sample Identification			COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730	COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	POST_20241002DUP
Sample Date			11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24
Sample Interval (dbm)			7 - 9 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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm
Sample Type		SMS and DMMP Screening Level[2]	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N																			
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	mg/kg OC	99	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	mg/kg OC	160	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	mg/kg OC	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **																			
Sum of HPAHs[5]	µg/kg	12,000	40 U	1,078.8 J	610.46 J	1,459.50	2,509.3	742.9 J	227.75 J	26,363.7	497.5	536.1 J	3,908.2	376.9 J	50.4 J	1,426.6	2,305.6	660.9 J	1,094.3 J
Benzo(a)anthracene	µg/kg	1,300	20 U	56.4	55.1	86.3	313	59.2 J	13.8 J	805	31.2	32.6	307	24.7	7.47 U	89.3	161	55.2	59.6 J
Benzo(a)pyrene	µg/kg	1,600	20 U	68.5	65.9	106	258	62.3 J	15.9 J	762	46.7	34.8	341	29.7	7.47 U	129	129	56.2	48.6
Benzofluoranthenes[6] (Total)	µg/kg	3,200	40 U	186	136	280	598	122 J	33.2 J	2,850	110	77.5	807	70	22.4 U	317	438	140 J	154 J
Benzo(g,h,i)perylene	µg/kg	670	20 U	39	29.9	54	77.3	39.5 J	19.6 J	292	26.2	22.8	131	16.6	7.47 U	63	52	26.3	25.3
Chrysene	µg/kg	1,400	20 U	138	75.2	191	424	159 J	22.7 J	2,320	54.2	71.8 J	524	46.1	9.6 J	195	366	69.6	115 J
Dibenzo(a,h)anthracene	µg/kg	230	20 U	11.2 J	8.16 J	15.5	30.3	13.5 J	7.5 UJ	79.7	7.49 U	7.48 U	46.2	7.49 U	7.47 U	19.6	17	6.5 J	6.6
Fluoranthene	µg/kg	1,700	20 U	286	97.6	320	350	129 J	42.9 J	10,700	67.3	148 J	751	73.1	18	290	605	87.4 J	344 J
Indeno(1,2,3-c,d)pyrene	µg/kg	600	20 U	34.7	27.6	48.7	85.7	30.4 J	8.55 J	335	23.9	16.6	140	13.7 J	7.47 U	60.7	51.6	20.7 J	22.2
Pyrene	µg/kg	2,600	20 U	259	115	358	373	128 J	71.1 J	8,220	138	132 J	861	103	22.8	263	486	199 J	319 J
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)																			
Total cPAHs TEQ[7] (KM)	µg/kg	21	30.2Lmax	98.71	89.34 J	150.96	364.94	86.4 J	21.91 J	1,192.17	64.29	48.91	476.26	41.46	7.95 JL5	179.61	199.42	79.14	73.99
Chlorinated Hydrocarbons (OC Normalized)																			
1,2,4-Trichlorobenzene	mg/kg OC	0.81	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)																			
1,2,4-Trichlorobenzene	µg/kg	31	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	19.9 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)																			
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)																			
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	50 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)																			
2,4-Dimethylphenol	µg/kg	29	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	99.9 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

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Sample Location[1]			COA-SS-3	Pre-1	Pre-2	Pre-3	PP-1-Pre	PP-2-Pre	PP-2-Pre	PP-3-Pre	PP-4-Pre	PP-5-Pre	PP-6-Pre	PP-7-Pre	PP-8-Pre	PP-9-Pre	PP-10-Pre	PP-1-Post	PP-1-Post
Sample Identification			COA-SS-3-7-9-20201118	COA_NS-01-PRE-20240730	COA_NS-02-PRE-20240730	COA_NS-03-PRE-20240730	COA_PP-01-PRE_20240730	COA_PP-02-PRE_20240730	COA_PP-02-PRE_20240730DUP	COA_PP-03-PRE_20240730	COA_PP-04-PRE_20240730	COA_PP-05-PRE_20240730	COA_PP-06-PRE_20240730	COA_PP-07-PRE_20240730	COA_PP-08-PRE_20240730	COA_PP-09-PRE_20240730	COA_PP-10-PRE_20240730	COA_PP-01-POST_20241002	POST_20241002DUP
Sample Date			11/18/20	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	07/30/24	10/02/24	10/02/24
Sample Interval (dbm)			7 - 9 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 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0 - 10 cm	0-10 cm	0-10 cm
Sample Type		SMS and DMMP Screening Level[2]	Core	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Native	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)																			
Dibenzofuran	mg/kg OC	15	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	mg/kg OC	3.9	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	NA	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables (Dry Weight)																			
Dibenzofuran	µg/kg	540	20 U	*12.5 J*	*7.95 J*	*16.3 J*	*17.6*	*11.8 J*	*14.9 J*	*34.9*	*9.51 J*	*7.48 U*	*35.2*	*7.79 J*	*7.47 U*	*17.2*	*15 J*	**8.3**	**9.7**
Hexachlorobutadiene	µg/kg	11	5 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	200 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	20 U	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Pesticides																			
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)																			
Total PCBs Aroclors	mg/kg OC	12	NA	*1.33 J*	*0.85 J*	*1.32 J*	*0.84 J*	*0.93*	*0.42 J*	*1.4 J*	*1.84 J*	*5.55 J*	*0.1 U*	*4.87 J*	*1.22*	*3.2 J*	*1.25 J*	**0.98 J**	**0.46**
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)															*NA*				
Total PCBs Aroclors	µg/kg	3.5	**1.3**	*24.5 J*	*13.1 J*	*22.1 J*	*12.8 J*	*8.8*	*10.2 J*	*22.9 J*	*17.7 J*	*49.4 J*	*2 U*	*79.4 J*	*8.8*	*39.1 J*	*19.5 J*	**15.6 J**	**6.4**
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)															*NA*				
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Dioxins and Furans																			
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	**0.96 JL15**	*1.35L11*	*1.33L11*	*2.82*	*2.10 JL9*	*0.39 JL13*	*0.55 JL11*	*33.03*	*1.21L10*	*0.31 JL14*	*3.77L10*	*1.88L9*	*0.25 JL14*	*1.34L11*	*4.83*	**1.63 JL11**	**0.57 JL11**
Bioassay																			
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
J = The analyte was detected and the detected concentration is considered an estimate.
n/a = not applicable
µg/kg = microgram per kilogram
mg/kg = milligram per kilogram
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
µg/L = microgram per liter
mg/kg OC = milligram per kilogram normalized to organic carbon
NE = not established
cm = centimeter
mg/L = milligram per liter
ng/kg = nanogram per kilogram
dbm = depth below mudline
mg-N/kg = milligrams of nitrogen per kilogram
U = The analyte was not detected at a concentration greater than the value identified.
mg/kg OC = milligram per kilogram normalized to organic carbon
cm = centimeter
Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 2

Summary of Sediment Analytical Results for the Protection of Benthic Organisms

Anacortes Port Log Yard
Anacortes, Washington

Sample Location[1]		SMS and DMMP Screening Level[2]	PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post	PP-10-Post
Sample Identification			COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002	COA_PP-10-POST_20241002
Sample Date			10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Field Screening											
Sheen	n/a	NE	--	--	--	--	--	--	--	--	--
Visual Wood Content[3]	%	10	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent	Absent
Conventionals											
Total Organic Carbon (TOC)	%	NE	**0.90**	**1.70**	**1.20**	**1.50**	**1.90**	**1.60**	**0.60**	**1.20**	**1.10**
Total Volatile Solids (TVS)	%	NE	--	--	--	--	--	--	--	--	--
Total Solids (TS)	%	NE	**54.3**	**55.0**	**58.0**	**71.8**	**60.7**	**42.5**	**79.3**	**62.8**	**58.7**
Total Ammonia	mg-N/kg	NE	--	--	--	--	--	--	--	--	--
Porewater Ammonia	mg-N/L	NE	--	--	--	--	--	--	--	--	--
Total Sulfide	mg/kg	NE	--	--	--	--	--	--	--	--	--
Porewater Sulfide	mg/L	NE	--	--	--	--	--	--	--	--	--
Grain Size											
Gravel	%	NE	**1.9**	**8.3**	**20.3**	**1.4**	**1**	**0.3**	**1.4**	**0.7**	**4.2**
Very Coarse Sand	%	NE									
Coarse Sand	%	NE									
Medium Sand	%	NE	**54.6**	**47.7**	**27.1**	**84.3**	**57.8**	**25.3**	**88.1**	**61.7**	**64.2**
Fine Sand	%	NE									
Very Fine Sand	%	NE									
Coarse Silt	%	NE									
Medium Silt	%	NE									
Fine Silt	%	NE	**30.3**	**29.6**	**40.8**	**7.7**	**30.9**	**60.4**	**5.4**	**28**	**20.4**
Very Fine Silt	%	NE									
Clay	%	NE	**13.2**	**14.3**	**11.7**	**6.6**	**10.3**	**14.1**	**5.2**	**9.5**	**11.2**
Metals											
Antimony	mg/kg	150	--	--	--	--	--	--	--	--	--
Arsenic	mg/kg	11	--	--	--	--	--	--	--	--	--
Cadmium	mg/kg	0.8	--	--	--	--	--	--	--	--	--
Chromium	mg/kg	62	--	--	--	--	--	--	--	--	--
Copper	mg/kg	45	--	--	--	--	--	--	--	--	--
Lead	mg/kg	21	--	--	--	--	--	--	--	--	--
Mercury	mg/kg	0.41	--	--	--	--	--	--	--	--	--
Selenium	mg/kg	3.0	--	--	--	--	--	--	--	--	--
Silver	mg/kg	0.3	--	--	--	--	--	--	--	--	--
Zinc	mg/kg	93	--	--	--	--	--	--	--	--	--
Organometallic Compounds											
Tributyltin Ion (Interstitial Water)	µg/L	0.15	--	--	--	--	--	--	--	--	--
Tributyltin Ion (Bulk Sediment)	µg/kg	73	1.9 UJ	**11.7 J**	**8.0 J**	**47.3 J**	**31.8 J**	**8.9 J**	1.9 UJ	**7.4 J**	**20.2 J**
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; OC N											
Sum of LPAHs[4]	mg/kg OC	370	NA	NA	NA	NA	NA	NA	NA	NA	NA
2-Methylnaphthalene	mg/kg OC	38	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthene	mg/kg OC	16	NA	NA	NA	NA	NA	NA	NA	NA	NA
Acenaphthylene	mg/kg OC	66	NA	NA	NA	NA	NA	NA	NA	NA	NA
Anthracene	mg/kg OC	220	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluorene	mg/kg OC	23	NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	mg/kg OC	99	NA	NA	NA	NA	NA	NA	NA	NA	NA
Phenanthrene	mg/kg OC	100	NA	NA	NA	NA	NA	NA	NA	NA	NA
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs; Dry W											
Sum of LPAHs[4]	µg/kg	5,200	**72.1 J**	**1,586.8 J**	**63.5 J**	**250.3 J**	**1304.3 J**	**217.1 J**	**58.1**	**141.1 J**	**115.3 J**
2-Methylnaphthalene	µg/kg	670	**9.2**	**33.9**	**9.9**	**9.5**	**113**	**23.3**	**7.3**	**11.3**	**8.6**
Acenaphthene	µg/kg	500	**4.3 J**	**43.3**	**3.2 J**	**13.5**	**40**	**17.2**	**10.3**	**8**	**6.7**
Acenaphthylene	µg/kg	560	**3.1 J**	**100 J**	**4.3 J**	**5.5 J**	**62.7 J**	**6.8 J**	2.5 U	**8.9 J**	**4.2 J**
Anthracene	µg/kg	960	**11.6 J**	**160**	**12.7**	**46.3 J**	**123**	**40.4**	**7.9**	**29.5**	**22**
Fluorene	µg/kg	540	**6.8**	**94.3**	**7.1**	**16.4**	**88.2**	**26.8**	**9.3**	**11.2**	**11.2**
Naphthalene	µg/kg	2,100	**22.7**	**59.2**	**12.7**	**51.6**	**78.4**	**27.9**	**8.2**	**37.6**	**15**
Phenanthrene	µg/kg	1,500	**23.6 J**	**1,130**	**23.5**	**117 J**	**912**	**98**	**22.4**	**45.9**	**56.2**

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Sample Location[1]			PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post	PP-10-Post
Sample Identification			COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002	COA_PP-10-POST_20241002
Sample Date			10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type		SMS and DMMP	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit		Screening	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone		Level[2]	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; OC N											
Sum of HPAHs[5]	mg/kg OC	960	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)anthracene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(a)pyrene	mg/kg OC	99	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzofluoranthenes[6] (Total)	mg/kg OC	230	NA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(g,h,i)perylene	mg/kg OC	31	NA	NA	NA	NA	NA	NA	NA	NA	NA
Chrysene	mg/kg OC	110	NA	NA	NA	NA	NA	NA	NA	NA	NA
Dibenzo(a,h)anthracene	mg/kg OC	12	NA	NA	NA	NA	NA	NA	NA	NA	NA
Fluoranthene	mg/kg OC	160	NA	NA	NA	NA	NA	NA	NA	NA	NA
Indeno(1,2,3-c,d)pyrene	mg/kg OC	34	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyrene	mg/kg OC	1,000	NA	NA	NA	NA	NA	NA	NA	NA	NA
**High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs; Dry **											
Sum of HPAHs[5]	µg/kg	12,000	**2,27.1 J**	**35,687 J**	**442.1 J**	**999.1 J**	**5,573 J**	**855.3 J**	**125.1 J**	**891.1 J**	**636.6 J**
Benzo(a)anthracene	µg/kg	1,300	**16.4 J**	**1,030**	**31.9**	**114**	**434**	**73.5**	**5.2**	**60.9**	**59.4**
Benzo(a)pyrene	µg/kg	1,600	**18.7**	**933**	**28.9**	**85.4**	**261**	**62**	**9.7**	**73.7**	**49.3**
Benzofluoranthenes[6] (Total)	µg/kg	3,200	**41.3 J**	**4,200**	**86.8 J**	**188 J**	**703 J**	**165 J**	**33.3 J**	**239 J**	**119 J**
Benzo(g,h,i)perylene	µg/kg	670	**12.6**	**407 J**	**13.3**	**41.2**	**102**	**27.4**	**3.9 J**	**28.5**	**20.7**
Chrysene	µg/kg	1,400	**23 J**	**2,670**	**66.8**	**119**	**846**	**109**	**8.6**	**138**	**68.1**
Dibenzo(a,h)anthracene	µg/kg	230	**2.7 J**	**103 J**	**3.3 J**	**13.4 J**	**35 J**	**7.5 J**	2.5 U	**6.5 J**	**4.1 J**
Fluoranthene	µg/kg	1,700	**42.6 J**	**14,500**	**64.1**	**202 J**	**1490**	**156**	**26.9**	**138**	**136**
Indeno(1,2,3-c,d)pyrene	µg/kg	600	**9.4 J**	**444 J**	**11 J**	**36.1 J**	**102 J**	**24.9 J**	**3.3 J**	**26.5 J**	**18 J**
Pyrene	µg/kg	2,600	**60.4 J**	**11,400**	**136 J**	**200 J**	**1,600 J**	**230 J**	**34.2 J**	**180 J**	**162 J**
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)											
Total cPAHs TEQ[7] (KM)	µg/kg	21	**25.91**	**1537.40**	**42.87**	**121.74**	**396.86**	**90.18**	**14.05**	**108.37**	**70.03**
Chlorinated Hydrocarbons (OC Normalized)											
1,2,4-Trichlorobenzene	mg/kg OC	0.81	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	mg/kg OC	2.3	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	mg/kg OC	3.1	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	mg/kg OC	0.38	--	--	--	--	--	--	--	--	--
Chlorinated Hydrocarbons (Dry Weight)											
1,2,4-Trichlorobenzene	µg/kg	31	--	--	--	--	--	--	--	--	--
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	35	--	--	--	--	--	--	--	--	--
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	110	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	µg/kg	22	--	--	--	--	--	--	--	--	--
Phthalates (OC Normalized)											
Bis(2-Ethylhexyl) Phthalate	mg/kg OC	47	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	mg/kg OC	4.9	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	mg/kg OC	220	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	mg/kg OC	61	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	mg/kg OC	53	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	mg/kg OC	58	--	--	--	--	--	--	--	--	--
Phthalates (Dry Weight)											
Bis(2-Ethylhexyl) Phthalate	µg/kg	1,300	--	--	--	--	--	--	--	--	--
Butyl benzyl Phthalate	µg/kg	63	--	--	--	--	--	--	--	--	--
Dibutyl Phthalate	µg/kg	1,400	--	--	--	--	--	--	--	--	--
Diethyl Phthalate	µg/kg	200	--	--	--	--	--	--	--	--	--
Dimethyl Phthalate	µg/kg	71	--	--	--	--	--	--	--	--	--
Di-N-Octyl Phthalate	µg/kg	6,200	--	--	--	--	--	--	--	--	--
Phenols (Dry Weight)											
2,4-Dimethylphenol	µg/kg	29	--	--	--	--	--	--	--	--	--
2-methylphenol (o-Cresol)	µg/kg	63	--	--	--	--	--	--	--	--	--
4-methylphenol (p-Cresol)	µg/kg	670	--	--	--	--	--	--	--	--	--
Pentachlorophenol	µg/kg	360	--	--	--	--	--	--	--	--	--
Phenol	µg/kg	420	--	--	--	--	--	--	--	--	--

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Sample Location[1]		SMS and DMMP Screening Level[2]	PP-2-Post	PP-3-Post	PP-4-Post	PP-5-Post	PP-6-Post	PP-7-Post	PP-8-Post	PP-9-Post	PP-10-Post
Sample Identification			COA_PP-02-POST_20241002	COA_PP-03-POST_20241002	COA_PP-04-POST_20241002	COA_PP-05-POST_20241002	COA_PP-06-POST_20241002	COA_PP-07-POST_20241002	COA_PP-08-POST_20241002	COA_PP-09-POST_20241002	COA_PP-10-POST_20241002
Sample Date			10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24	10/02/24
Sample Interval (dbm)			0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm	0-10 cm
Sample Type			Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface	Surface
Stratigraphic Unit			Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent	Recent
Tidal Zone			Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal	Subtidal
Miscellaneous Extractables (OC Normalized)											
Dibenzofuran	mg/kg OC	15	NA	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobutadiene	mg/kg OC	3.9	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	mg/kg OC	11	--	--	--	--	--	--	--	--	--
Miscellaneous Extractables (Dry Weight)											
Dibenzofuran	µg/kg	540	**5.7**	**63.6 J**	**6**	**9.9**	**33.5**	**18.4**	**14.9**	**9.7**	**7.6**
Hexachlorobutadiene	µg/kg	11	--	--	--	--	--	--	--	--	--
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	28	--	--	--	--	--	--	--	--	--
Benzoic Acid	µg/kg	650	--	--	--	--	--	--	--	--	--
Benzyl Alcohol	µg/kg	57	--	--	--	--	--	--	--	--	--
Pesticides											
4,4'-DDD	µg/kg	16	--	--	--	--	--	--	--	--	--
4,4'-DDE	µg/kg	9	--	--	--	--	--	--	--	--	--
4,4'-DDT	µg/kg	12	--	--	--	--	--	--	--	--	--
Total DDT (4,4 isomers)	µg/kg	NE	--	--	--	--	--	--	--	--	--
Aldrin	µg/kg	9.5	--	--	--	--	--	--	--	--	--
Total Chlordane[8]	µg/kg	2.8	--	--	--	--	--	--	--	--	--
Dieldrin	µg/kg	1.9	--	--	--	--	--	--	--	--	--
Heptachlor	µg/kg	1.5	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; OC Normalized)											
Total PCBs Aroclors	mg/kg OC	12	0.22 UJ	**2.44 J**	**2.24 J**	**1.17 J**	**2.88 J**	**1.93 J**	0.3 U	**1.07 J**	**0.65**
Total PCBs Congeners	mg/kg OC	12	--	--	--	--	--	--	--	--	--
Polychlorinated Biphenyls (PCBs; Dry Weight)											
Total PCBs Aroclors	µg/kg	3.5	2.0 UJ	**41.5 J**	**26.9 J**	**17.5 J**	**54.8 J**	**30.8 J**	2 U	**12.8 J**	**7.1**
Total PCBs Congeners	µg/kg	3.5	--	--	--	--	--	--	--	--	--
Dioxin-Like Polychlorinated Biphenyls (PCBs; Dry Weight)											
Total Dioxin-like PCB Congeners TEQ[9] (KM)	ng/kg	0.2	--	--	--	--	--	--	--	--	--
Dioxins and Furans											
Total Dioxin and Furan TEQ[10] (KM)	ng/kg	4	**517.93**	**186.70**	**0.66 J**	**0.48 JL12**	**5.15**	**2.57**	**0.72 J**	**1.80**	**1.32L9**
Bioassay											
10-Day Amphipod Mortality Test (Acute Toxicity)	n/a	See Table 3	--	--	--	--	--	--	--	--	--
Larval Development Test (Acute Toxicity)	n/a	See Table 4	--	--	--	--	--	--	--	--	--
Microtox® Porewater Test	n/a	See Table 5	--	--	--	--	--	--	--	--	--
20-Day Juvenile Infaunal Growth Test (Chronic Toxicity)	n/a	See Table 6	--	--	--	--	--	--	--	--	--
Benthic Abundance of Major Taxa	n/a	See Table 7	--	--	--	--	--	--	--	--	--

Notes:

[1] Sample locations shown in Figure 3.

[2] Lowest numberical SMS or DMMP screening level from Table 2. The organic carbon normalized screening levels are applicable to sediment with a total organic carbon (TOC) concentration ranging from 0.5 to 3.5 percent. Results for sediment samples with TOC concentrations outside of the 0.5 to 3.5 percent range are screened against the dry weight screening levels (EPA, 1988).

[3] Visual wood content values of <1 indicate that wood debris was not identified in the sample.

[4] Total LPAH represents the sum of the detected concentrations of the following LPAH compounds: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported. The result for 2-Methylnaphthalene is not included in the LPAH sum.

[5] Total HPAH represents the sum of the detected concentrations of the following HPAH compounds: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes. When all compounds are undetected, only the single highest individual chemical quantitation limit is reported.

[6] Total benzofluoranthenes represents the sum of concentrations of the b, j, and k isomers.

[7] Total cPAH Toxicity Equivalency Quotients (TEQs) were calculated using Toxicity Equivalency Factors (TEFs) from MTCA Table 708-2 (WAC 173-340-900).

[8] Sum of cis-chlordane, trans- chlordane, cis-nonachlor, trans- nonachlor, oxychlordane.

[9] Total PCB congener TEQs were calculated using the 2005 World Health Organization (WHO) TEF values for humans and mammals (Van den Berg et al., 2006).

[10] Total dioxin/furan TEQs were calculated using the United States Environmental Protection Agency (USEPA) TEF values for human health (EPA, 2003).

--= not analyzed
µg/kg = microgram per kilogram
µg/L = microgram per liter
cm = centimeter
dbm = depth below mudline
mg/kg OC = milligram per kilogram normalized to organic carbon
J = The analyte was detected and the detected concentration is considered an estimate.
mg/kg = milligram per kilogram
mg/kg OC = milligram per kilogram normalized to organic carbon
mg/L = milligram per liter
mg-N/kg = milligrams of nitrogen per kilogram
cm = centimeter
n/a = not applicable
NA denotes that the corresponding result is not appropriate based on the TOC concentration in the sample (see Note 2).
NE = not established
ng/kg = nanogram per kilogram
U = The analyte was not detected at a concentration greater than the value identified.

Bold font type indicates the analyte was detected at the reported concentration.
Yellow shading indicates exceedance of the PCUL.
Blue shading indicates that the practical quantitation limit (PQL) or the organic carbon normalized value calculated from the PQL exceeds the preliminary cleanup level.
Grey italicized text indicates that sediment represented by this sample was either removed as a result of the City's Wastewater Treatment Plant Outfall Dredging Project or is superseded by more recent co-located sediment sample result.

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Table 3

Sediment Bioassay Results: 10-Day Amphipod Acute Toxicity Bioassay[1]

Anacortes Port Log Yard

Anacortes, Washington

Sample Identification[2]	Mean Mortality (%)	Statistically More than Reference (Yes/No)	Mortality Comparison to Reference M_T-M_R	Fails SQS[3] (Yes/No)	Fails CSL[4] (Yes/No)
2007 Sediment Investigation (SAIC 2008)					
Control	8	--	--	--	--
FB-REF-01	11	--	--	--	--
FB-A4-20	23	Yes	12	No	No
2008 Sediment Investigation (GeoEngineers 2008)					
Control	2	--	--	--	--
Reference CR-1	15	--	--	--	--
S-1	100	Yes	85	**Yes**	**Yes**
S-2	8	No	7	No	No
2009 Sediment Investigation (GeoEngineers 2010)					
Control	1	--	--	--	--
Reference CR-3	4	--	--	--	--
S-3	2	No	-2	No	No
S-4	4	No	0	No	No
S-5	15	No	11	No	No
S-6	4	No	0	No	No
S-7	2	No	-2	No	No

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Notes:

[1] Sediment Management Standards (SMS) comparison for *Eohaustorius estuarius* .

[2] Sample locations are shown on Figure 3.

[3] Sediment Quality Standard (SQS) criteria: statistical significance and M_T-M_R >25%.

[4] Cleanup Screening Level (CSL) criteria: statistical significance and M_T-M_R >30%.

-- = Not available or not applicable

M_R = reference sediment mortality

M_T = test sediment mortality

Yellow shading indicates exceedance of SQS or CSL screening criteria.

Bioassay testing performed by Newfields Northwest LLC of Port Gamble, Washington.

Table 4

Sediment Bioassay Results: Larval Development Bioassay[1]

Anacortes Port Log Yard
Anacortes, Washington

Sample Identification[2]	Mean Normal Survival (%)	Statistically Less than Reference and >20% Difference (Yes/No)	Normal Survival Comparison to Reference $(N_T/N_C)/(N_R/N_C)$	Fails SQS[3] (Yes/No)	Fails CSL[4] (Yes/No)
2007 Sediment Investigation (SAIC 2008)					
Control	84.6	--	--	--	--
FB-REF-01	85	--	--	--	--
FB-A4-20	88.8	No	1.045	No	No
2008 Sediment Investigation (GeoEngineers 2008)					
Control	89	--	--	--	--
Reference CR-1	87.3	--	--	--	--
S-1	85	No	0.97	No	No
S-2	97.1	No	1.11	No	No
2009 Sediment Investigation (GeoEngineers 2010)					
Control	98.7	--	--	--	--
Reference CR-3	85.2	--	--	--	--
S-3	79.1	No	0.93	No	No
S-4	78.7	No	0.92	No	No
S-5	79.1	No	0.93	No	No
S-6	65.3	No	0.77	**Yes**	No
S-7	87.6	No	1.03	No	No

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Notes:

[1] Sediment Management Standards (SMS) comparison for *Dendraster excentricus* .

[2] Sample locations are shown on Figure 4.

[2] Sediment Quality Standard (SQS) criteria: statistical significance criteria and $N_{CT} < 0.85 * N_{CR}$.

[3] Cleanup Screening Level (SCL) criteria: statistical significance criteria and $N_{CT} < 0.70 * N_{CR}$.

-- = Not available or not applicable

N_C = negative control normal larvae survival

N_R = reference sediment normal larvae survival

N_T = test sediment normal larvae survival

Yellow shading indicates exceedance of SQS or CSL screening criteria.

Bioassay testing performed by Newfields Northwest LLC of Port Gamble, Washington.

Table 5

Sediment Bioassay Results: Microtox® Porewater Test[1]

Anacortes Port Log Yard
Anacortes, Washington

Sample Identification[2]	5-Minute Reading		15-Minute Reading		Fails SQS[3,4] (Yes/No)
	Mean % Output	Statistically Less than Reference and >20% Difference (Yes/No)	Mean % Output	Statistically Less than Reference and >20% Difference (Yes/No)	
2008 Sediment Investigation (GeoEngineers 2008)					
Control	90 ± 1	--	80 ± 3	--	--
Reference CR-1	102 ± 2	--	102 ± 2	--	--
S-1	0 ± 0	Yes	0 ± 0	Yes	**Yes**
S-2	35 ± 6	Yes	32 ± 4	Yes	**Yes**
2009 Sediment Investigation (GeoEngineers 2010)					
Control	101 ± 1	--	98 ± 2	--	--
Reference CR-3	102 ± 1	--	102 ± 1	--	--
S-3	74 ± 3	Yes	71 ± 2	Yes	**Yes**
S-4	37 ± 3	Yes	34 ± 3	Yes	**Yes**
S-5	24 ± 3	Yes	16 ± 2	Yes	**Yes**
Control	99 ± 4	--	98 ± 4	--	--
Reference CR-3	103 ± 2	--	100 ± 1	--	--
S-6	46 ± 2	Yes	45 ± 5	Yes	**Yes**
S-7	34 ± 4	Yes	20 ± 9	Yes	**Yes**

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Notes:

[1] Sediment Management Standards (SMS) Comparison for Microtox® Porewater Test.

[2] Sample locations are shown on Figure 3.

[3] Sediment Quality Standard (SQS) criteria: > 20% difference and statistically significant difference ($p<0.05$) relative to the reference.

[4] No Cleanup Screening Level (CSL) failure criteria for Microtox® under SMS rule.

-- = Not available or not applicable

Yellow shading indicates exceedance of SQS or CSL screening criteria.

Bioassay testing performed by Newfields Northwest LLC of Port Gamble, Washington. Newfields subcontracted to Nautilus Environmental for the Microtox® porewater test.

Table 6

Sediment Bioassay Results: 20-Day Juvenile Infaunal Growth Test[1]

Anacortes Port Log Yard
Anacortes, Washington

Sample Identification[2]	MIG[3]	Mean MIG[4]	Reference Sediment	MIG Relative to Reference MIG_T/MIG_R	Statistically Less than Reference (p=0.05) (Yes/No)	Fails SQS[5] (Yes/No)	Fails CSL[6] (Yes/No)
2007 Sediment Investigation (SAIC 2008)							
Control	0.570 0.664 0.488 0.498 0.615	0.567 ± 0.1	--	--	--	--	--
FB-REF-01	0.602 0.565 0.590 0.514 0.625	0.579 ± 0.0	--	--	--	--	--
FB-A4-20	0.475 0.453 0.597 0.671 0.559	0.551 ± 0.1	FB-REF-01	0.952	No	No	No

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Notes:

[1] Sediment Management Standards (SMS) comparison for *N. arenaceodentata.*

[2] Sample locations are shown on Figure 3.

[3] Mean individual growth per replicate (mg/individual/day).

[4] Mean individual growth ± standard deviation for sample (mg/individual/day).

[5] Sediment Cleanup Objective (SCO) criteria: statistical significance and MIG_T/MIG_R <0.70.

[6] Sediment Cleanup Level (CSL) criteria: statistical significance and MIG_T/MIG_R <0.50.

-- = Not available or not applicable

MIG_R = reference mean individual growth

MIG_T = treatment mean individual growth

Yellow shading indicates exceedance of SQS or CSL screening criteria.

Bioassay testing performed by Newfields Northwest LLC of Port Gamble, Washington.

Table 7

Benthic Abundance of Major Taxa

Anacortes Port Log Yard
Anacortes, Washington

Sample Identification[1]	Replicate	Abundance[2]		
		Crustacea	Mollusca	Polychaeta
2010 Sediment Investigation (Newfields 2010)				
LHO-REF	1	5	18	111
	2	16	17	65
	3	3	1	96
	4	13	3	101
	5	5	4	19
	Mean	8.4	8.6	78.4
	Standard Deviation	5.7	8.2	37.4
S-2	1	16	2	31
	2	4	0	14
	3	0	0	15
	4	1	1	24
	5	0	2	1
	Mean	4.2	1	17
	Standard Deviation	6.8	1	11.3
	S-2 Proportion of Reference	0.50	0.12	0.22
	Probability Normal Distribution	0.021	0.348	0.287
	Probability Equal Variance	0.94	0	0.044
	Test Type	Mann-Whitney	T-Test Unequal Variation	T-Test Unequal Variation
	One-Tailed Probability	0.1	0.05	0.05
	Significance (P < 0.05)	No	Yes	Yes
	One-Tailed Test Result	Treatment >= Comparison	Treatment < Comparison	Treatment < Comparison
	Fails SQS[3] (Yes/No)	No	**Yes**	**Yes**
	Fails CSL[4] (Yes/No)	No	**Yes**	**Yes**

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Notes:

[1] Sample locations are shown on Figure 3.

[2] The abundances of crustacean, molluscan, and polychaete taxa at Station S2 were compared to those at the reference station to determine compliance with

[3] Sediment Cleanup Objective (SCO) criteria: test sediment has less than 50 percent of the reference sediment mean abundance.

[4] Sediment Cleanup Level (CSL) criteria: major taxa have abundances less than 50 percent of the reference sediment and are statistically different from the reference station.

Yellow shading indicates exceedance of SQS or CSL screening criteria.

Benthic abundance testing performed by Newfields Northwest LLC of Port Gamble, Washington.

Table 8

Proposed Sediment Sample Locations, Objectives, and Laboratory Analyses

Anacortes Port Log Yard
Anacortes, Washington

Proposed Sample Station Information						Proposed Sample Intervals							Laboratory Analysis for Site COCs[4]								Laboratory Analysis for DMMP Paramters[5]								Objectives and Rationale
Sampling Station Identification[1]	Sample Area	Sample Coordinates[2] Northing	Sample Coordinates[2] Easting	Mudline Elevation (ft MLLW)	Estimated Thickness of Contamination (ft)	Sample Identification	Media	Collection Method	Target Interval (ft MLLW) Top	Target Interval (ft MLLW) Bottom	Target Interval[3] (ft BML) Top	Target Interval[3] (ft BML) Bottom	TS/TVS/TOC	Total Sulfide	Total Ammonia	Site Metals	TBT	Site VOCs	PCB Congeners	Dioxin/Furans	Grain Size/TS/TVS/TOC	DMMP Metals	TBT	DMMP SVOCs	DMMP Pesticides	PCB Arocklrs	Dioxins/Furans	Bioassay	
Environmental Subsurface Sediment and Surface Water Investigation (Figure 5)																													
PRDI-01	Former Log Haul Out	559676.5	1210647.7	2.0	3.8	PRDI-01-C_ 3.8 - 4.8	Sediment	Sonic	-1.8	-2.8	3.8	4.8	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs and provide data for dredge depth verification.
						PRDI-01-C_ 4.8 - 5.8			-2.8	-3.8	4.8	5.8	A	A	A	A	A	A	A	A									
						PRDI-01-C_ 5.8 - 6.8			-3.8	-4.8	5.8	6.8	A	A	A	A	A	A	A	A									
						PRDI-01-C_ 6.8 - 7.8			-4.8	-5.8	6.8	7.8	A	A	A	A	A	A	A	A									
PRDI-02	Former Log Haul Out	559846.7	1210653.8	-0.7	4.6	PRDI-02-C_ 4.6 - 5.6	Sediment	Sonic	-5.3	-6.3	4.6	5.6	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs and provide data for dredge depth verification.
						PRDI-02-C_ 5.6 - 6.6			-6.3	-7.3	5.6	6.6	A	A	A	A	A	A	A	A									
						PRDI-02-C_ 6.6 - 7.6			-7.3	-8.3	6.6	7.6	A	A	A	A	A	A	A	A									
						PRDI-02-C_ 7.6 - 8.6			-8.3	-9.3	7.6	8.6	A	A	A	A	A	A	A	A									
PRDI-03	Former Log Haul Out	560009.8	1210663.8	-3.5	3.9	PRDI-03-C_ 3.9 - 4.9	Sediment	Sonic	-7.5	-8.5	3.9	4.9	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs and provide data for dredge depth verification.
						PRDI-03-C_ 4.9 - 5.9			-8.5	-9.5	4.9	5.9	A	A	A	A	A	A	A	A									
						PRDI-03-C_ 5.9 - 6.9			-9.5	-10.5	5.9	6.9	A	A	A	A	A	A	A	A									
						PRDI-03-C_ 6.9 - 7.9			-10.5	-11.5	6.9	7.9	A	A	A	A	A	A	A	A									
PRDI-04	Pier 61/ Wyman's Ramp Operational Area	559873.7	1210786.3	-3.5	6.0	PRDI-04-C_ 6.0 - 7.0	Sediment	Sonic	-9.5	-10.5	6.0	7.0	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs, provide data for dredge depth verification, and characterize for subsurface DMMU for open-water suitability determination.
						PRDI-04-C_ 7.0 - 8.0			-10.5	-11.5	7.0	8.0	A	A	A	A	A	A	A	A									
						PRDI-04-C_ 8.0 - 9.0			-11.5	-12.5	8.0	9.0	A	A	A	A	A	A	A	A	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	A	
						PRDI-04-C_ 9.0 - 9.5			-12.5	-13.0	9.0	9.5	A	A	A	A	A	A	A	A									
						PRDI-04-C_ 9.5 - 10.5			-13.0	-14.0	9.5	10.5	A	X	X	A	A	A	A	A	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	A	Characterize Z-Layer based on subsurface DMMU characterization based on the composite subsurface DMMU sample results for antidegradation evaluation.
						PRDI-04-C_ 10.5 - 11.5			-14.0	-15.0	10.5	11.5	A	A	A	A	A	A	A	A									
						PRDI-04-C_ 11.5 - 12.5			-15.0	-16.0	11.5	12.5	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		
PRDI-05	Pier 61/ Wyman's Ramp Operational Area	5600007.1	1210792.3	-7.8	2.6	PRDI-05-C_ 2.6 - 3.6	Sediment	Sonic	-10.4	-11.4	2.6	3.6	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs, provide data for dredge depth verification, and characterize for subsurface DMMU for open-water suitability determination.
						PRDI-05-C_ 3.6 - 4.6			-11.4	-12.4	3.6	4.6	A	A	A	A	A	A	A	A									
						PRDI-05-C_ 4.6 - 5.2			-12.4	-13.0	4.6	5.2	A	A	A	A	A	A	A	A	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	A	
						PRDI-05-C_ 5.2 - 6.2			-13.0	-14.0	5.2	6.2	A	X	X	A	A	A	A	A									
						PRDI-05-C_ 6.2 - 6.7			-14.0	-15.0	6.2	6.7	A	A	A	A	A	A	A	A	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	A	Characterize Z-Layer based on subsurface DMMU characterization based on the composite subsurface DMMU sample results for antidegradation evaluation.
						PRDI-05-C_ 6.7 - 7.7			-15.0	-16.0	6.7	7.7	A	A	A	A	A	A	A	A									
PRDI-06	Pier 61/ Wyman's Ramp Operational Area	559870.0	1210917.2	-5.2	4.0	PRDI-06-C_ 4.0 - 5.0	Sediment	Sonic	-9.2	-10.2	4.0	5.0	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs, provide data for dredge depth verification, and characterize for subsurface DMMU for open-water suitability determination.
						PRDI-06-C_ 5.0 - 6.0			-10.2	-11.2	5.0	6.0	A	A	A	A	A	A	A	A									
						PRDI-06-C_ 6.0 - 7.0			-11.2	-12.2	6.0	7.0	A	A	A	A	A	A	A	A									
						PRDI-06-C_ 7.0 - 7.8			-12.2	-13.0	7.0	7.8	A	A	A	A	A	A	A	A	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	A	
						PRDI-06-C_ 7.8 - 8.8			-13.0	-14.0	7.8	8.8	A	X	X	A	A	A	A	A									
						PRDI-06-C_ 8.8 - 9.8			-14.0	-15.0	8.8	9.8	A	A	A	A	A	A	A	A	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	A	Characterize Z-Layer based on subsurface DMMU characterization based on the composite subsurface DMMU sample results for antidegradation evaluation.
						PRDI-06-C_ 9.8 - 10.8			-15.0	-16.0	9.8	10.8	A	A	A	A	A	A	A	A									
PRDI-07	Pier 61/ Wyman's Ramp Operational Area	559999.4	1210924.0	-6.7	3.9	PRDI-07-C_ 3.9 - 4.9	Sediment	Sonic	-10.5	-11.5	3.9	4.9	X	X	X	X	X	X	X	X									Confirm the estimated base elevation of Site COCs, provide data for dredge depth verification, and characterize for subsurface DMMU for open-water suitability determination.
						PRDI-07-C_ 4.9 - 5.9			-11.5	-12.5	4.9	5.9	A	A	A	A	A	A	A	A									
						PRDI-07-C_ 5.9 - 6.4			-12.5	-13.0	5.9	6.4	A	A	A	A	A	A	A	A	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	C[6]	A	
						PRDI-07-C_ 6.4 - 7.4			-13.0	-14.0	6.4	7.4	A	X	X	A	A	A	A	A									
						PRDI-07-C_ 7.4 - 8.4			-14.0	-15.0	7.4	8.4	A	A	A	A	A	A	A	A	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	Z[7]	A	Characterize Z-Layer based on subsurface DMMU characterization based on the composite subsurface DMMU sample results for antidegradation evaluation.
						PRDI-07-C_ 8.4 - 9.4			-15.0	-16.0	8.4	9.4	A	A	A	A	A	A	A	A	A	A	A	A	A	A	A		

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Notes:

[1] Approximate sample station locations are shown on Figures 5.

[2] Coordinates are presented in North America Datum of 1983 (NAD83), Washington State Plane North.

[4] Subsurface sediment samples below the base of the anticipated contaminated sediment layer will be initially analyzed for Site COCs identified as part of the RI (see Section 1.5.2 of the PRDI Work Plan). Archive samples (step-down samples) collected and archived for follow up analysis if one or more contaminates exceeding the screening level (Table 1) are identified.

[5] Subsurface samples below the base of the contaminated layer based on Site COC verification sample analytical results will be composited and analyzed for DMMP parameters to evaluate open-water suitability determination. Z-layer samples will be analyzed for DMMP parameters to evaluate antidegradation if one or more COCs are detected in the composite DMMU sample exceeding the screening level (Table 1).

[6] Sample will be archived pending the results of the PRDI to determine the contaminated sediment contact layer. Archived sediment below the contaminated sediment layer as determined by the PRDI sample results will be composited by the laboratory to represent the DMMU layer for open-water suitability determination.

[7] Sample will be archived pending the results of the DMMU composite sample analysis. Archived composite Z-Layer sample will be analyzed if one or more DMMP Marine Guideline Values (Table 1) are exceeded.

A = Archive sample for potential analysis

C = Composite sample for follow up analysis

COC = Contaminant of Concern

DMMP = Dredged Material Management Program

ft = feet

MLLW = Mean Lower Low Water

PCBs - Polychlorinated Biphenyls

PRDI = Pre-Remedial Design Investigation

SVOC = Semi-Volatile Organic Compound

TBT = Tributyltin

TOC = Total Organic Carbon

X = Sample for initial analysis

Z = Z-layer sample for potential follow up analysis

BML = Below Mudline

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Table 9

Analytical Methods, Sample Size, Containers, Preservation, and Holding Times

Anacortes Port Log Yard
Anacortes, Washington

Parameter	Preparation Method	Analytical Method	Minimum Sample Size (dry weight)	Container Size and Type	Sample Preservation Technique	Holding Time for Indicated Preservation Technique[1]
Particle Size	PSEP 1986	PSEP 1986/ASTM D-6913 (sand fractions) and ASTM D-7928 (silt/clay fractions)	100-200 g	16-oz HDPE or Glass	4 ± 2°C	6 months
Total Solids (TS)	PSEP 1986	SM 2540G	125 g	8-oz Glass or HDPE	4 ± 2°C	14 days
					-18 ± 2°C	6 months
Total Volatile Solids (TVS)	PSEP 1986	SM 2540G			4 ± 2°C	14 days
					-18 ± 2°C	6 months
Total Organic Carbon (TOC)	PSEP 1986	SM 5310B/EPA 9060A			4 ± 2°C	14 days
					-18 ± 2°C	6 months
Total Sulfides	PESP 1986	PSEP 1986/ SM 4500-S2	50 g	4-oz Glass	4 ± 2°C with 5mL of Normal Zinc Acetate per 30 g sediment	7 days
Total Ammonia	Plumb 1981	Plumb 1981/ SM-4500-NH3	25 g	4-oz Glass	4 ± 2°C	7 days
Total Metals (Sb, As, Cd, Cr, Cu, Pb, Se, Ag and Zn)	EPA 3050B/3051A	EPA 6010D/6020B	50 g	4-oz Glass	4 ± 2°C	6 months
					-18 ± 2°C	2 years
Mercury	EPA 7471	EPA 7471			≤6°C	28 days
					-18 ± 2°C	1 year
Tributyltin Ion in Bulk Sediment	Krone 1989	Krone 1989	50 g	4-oz Glass	-18 ± 2°C	6 months
SVOCs (including PAHs)/ Pesticides/PCB Aroclors	EPA 3550-mod[2,3]/ 3540C[4,5]	EPA 8270E-SIM/8151A/ 8081B/8082A	150 g	(2) 8-oz WM-Glass or 16 oz Glass	4 ± 2°C	14 days until extraction
					4 ± 2°C	40 days after extraction
					-18 ± 2°C	1 year until extraction
PCB Congeners	EPA 1668C	EPA 1668C	100 g	8-oz WM-Glass	Freeze -18°C	1 year until extraction
Dioxins and Furans	EPA 8290A/1613B	EPA 8290A/1613B	50 g	4-oz Amber Glass	4 ± 2°C	14 days until extraction
					-18 ± 2°C	1 year until extraction
Archive	NA	NA	1 L	Min. 16 oz glass	-18 ± 2°C	Variable

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Notes:

[1] Due to the duration of the sediment core collection field effort and the complexity of completing the sample compositing in the laboratory, the DMMP agencies will allow holding time exceedances for analytical methods with holding times of 7 or 14 days except for analysis of total sulfides. Total sulfides will be collected discretely as described in the Sampling and Analysis Plan and analyzed within the 7-day holding time.

[2] EPA Method 3550 is modified to add matrix spikes before the dehydration step (Ecology 2025).

[3] 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. (Ecology 2025).

[4] 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 total organic carbon levels elevate detection limits above ecological criteria levels. See PSEP organics chapter, Appendix B, Guidance for Selected Ion Monitoring (1997b).

[5] All polychlorinated biphenyl extracts should be subjected to sulfuric acid/permanganate cleanup as specified by EPA SW-846 Method 3665A.

[2] Please refer to Table 7-2 in the DMMP User Manual (USACE, 2021).

ASTM = ASTM International

EPA = United States Environmental Protection Agency

g = gram

HDPE = High-density polyethylene

L = liter

NA = not applicable

oz =ounce

PAHs = Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

PSEP = Puget Sound Estuary Program

SVOC = Semi-Volatile Organic Compound

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Table 10

Estimated In-Situ Dredge Volume and Proposed Dredged Material Characterization

Anacortes Port Log Yard
Anacortes, Washington

Project Area[1]	Dredged Material Ranking[2]	Sediment Classification	Proposed Dredged Prisms and Volumes						Maximum Recommended Volume Based on Dredged Material Ranking		Proposed DMMU Characterization Approach	
			DMMU Identification	DMMU Type	Baseline Dredge Volume[3] (BCY)	Uncertainty Factor[4] (BCY)	1-Foot Over-Dredge Allowance (BCY)	Estimated In-Situ Dredge Volume (BCY)	In-Situ Volume Per DMMU (BCY)	In-Situ Volume Per Composite Sample (BCY)	Minimum Number of Sample Cores for Composite Analysis	In-Situ Volume Represented (BCY)
Navigational Dredge Prism	High	Heterogeneous	DMMU-1	Subsurface	3,200	640	2,290	6,130	12,000	4,000	4	12,000

Notes:

[1] Navigational Depth Deredge Prism shown in plan view in Figure 5 and in cross-sectrion in Figures 7 and 8.

[2] Dredged material rank based on DMMP User Guidance (USACE 2025).

[3] Based on the proposed dredge prism design shown in Figure 5.

[4] The uncertainty factor is assumed to be approximately 20 percent of the baseline volume estimate to account for any inherent errors in the estimation process (as recommended in DMMP User Manual [USACE 2025]).

BCY = Bank (In-Situ) Cubic Yards

DMMU = Dredged Material Management Unit

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Table 11

Quality Control Procedures and Acceptance Criteria for Conventional Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Analyte	Initial Calibration	Continuing Calibration	Calibration Blanks	Laboratory Control Samples	Matrix Spikes	Laboratory Duplicates	Method Blank
Grain Size	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20% RSD	Not applicable
Total Solids (TS)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20% RSD	Analyte concentration ≤PQL
Total Volatile Solids (TVS)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20% RSD	Analyte concentration ≤PQL
Total Organic Carbon (TOC)	Correlation coefficient ≥ 0.995	90-110% recovery	Analyte concentration ≤ PQL	80-120% recovery	75-125% recovery	20% RSD	Analyte concentration ≤ PQL
Total Sulfides	Correlation coefficient ≥ 0.990	85 -115% recovery	Not applicable	65 -135% recovery	65 -135% recovery	20% RSD	Analyte concentration ≤ PQL
Total Ammonia	Correlation coefficient ≥0.995	90 -110% recovery	Analyte concentration ≤ PQL	80 -120% recovery	75 -125% recovery	20% RSD	Analyte concentration ≤ PQL

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Notes:

[1] The control limits provided above are suggested limits only. They are based on EPA control limits for metals analyses, and an attempt has been made to take into consideration the expected analytical accuracy using PSEP methodology. The corrective action indicated for metals in Table 12 will be applied to the conventional analytes using professional judgment.

[2] As applicable, the QA/QC procedures indicated in this table will be completed at the same frequency as for metals analyses (see Table 12).

[3] QA/QC procedures for DMMP conventionals are presented in Table 17.

PQL = Practical Quantification Limit

RSD - Relative Standard Deviation

DMMP = Dredged Material Management Program

PSEP = Puget Sound Estruary Program

QA/QC = Quality Assurance/Quality Control

EPA = United States Environmental Protection Agency

Table 12

Quality Control Procedures and Acceptance Criteria for Metals Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Daily.	Correlation coefficient ≥0.995.	Laboratory to optimize and recalibrate the instrument and reanalyze any affected samples.
Initial Calibration Verification	Immediately after initial calibration.	90-110% recovery for ICP-AES, ICP-MS and GFAA (80-120% for Mercury), or method based.	Laboratory to resolve discrepancy prior to sample analysis.
Continuing Calibration Verification	After every 10 samples or every 2 hours, whichever is more frequent, and after the last sample.	90-110% recovery for ICP-AES and GFAA, 85-115% for ICP-MS (80-120% for mercury).	Laboratory to recalibrate and reanalyze affected samples.
Initial and Continuing Calibration Blanks	Immediately after initial calibration, then 10% of samples or every 2 hours, whichever is more frequent, and after the last sample.	Analyte concentration ≤ PQL.	Laboratory to recalibrate and reanalyze affected samples
ICP Interelement Interference Check Samples	At the beginning and end of each analytical sequence or twice per 8- hour shift, whichever is more frequent.	80-120% of the true value.	Laboratory to correct problem, recalibrate, and reanalyze affected samples.
Method Quality Assurance/Quality Control			
Holding Times	All samples.	See Table 9.	Laboratory to qualify results if holding times are exceeded. Data validator will use professional judgment to qualify results as estimated or reject data.
Method Detection Limits (MDL)	Update method detection limit studies annually.	See reference method(s) in Table 9.	Revise detection limits.
Method Blanks	With every sample batch or every 20 samples, whichever is more frequent.	Analyte concentration ≤ PQL. Control limits are not applicable if sample concentrations are < MDL	Laboratory to re-digest and reanalyze samples.
Analytical (Laboratory) Duplicates or Matrix Spike Duplicates	One duplicate analysis with every sample batch or every 20 samples, whichever is more frequent; Use analytical replicates when samples are expected to contain target analytes. Use matrix spike replicates when samples are not expected to contain target analytes.	Analyte and matrix specific. Use intra-laboratory control chart limits if sufficient data are available to generate control charts; otherwise use analytical method default criteria.	Laboratory to re-digest and reanalyze samples if analytical problems are suspected, or to qualify the data if sample homogeneity problems are suspected and the project manager is consulted.
Matrix Spikes	With every sample batch or every 20 samples, whichever is more frequent.	75-125% recovery applied when the sample concentration is ≤4 times the spiked concentration for a particular analyte.	Laboratory may be able to correct or minimize problem, or qualify and accept data.
Certified or Standard Reference Material	Project specific requirement or at project manager's discretion. See Table 17 for DMMP requirements.	Compound specific, recovery should be within accepted control or advisory limits.	Laboratory to re-extract and reanalyze samples if analytical problems suspected, or to qualify the data after consultation.
Field Quality Assurance/Quality Control			
Field Duplicates	One per every ten sediment samples	Project, matrix, and compound specific	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion	Analyte concentration ≤ PQL	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

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Notes:

[1] Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

[2] Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

[3] Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

DMMP = Dredged Material Management Program

GFAA = Graphite Furnace Atomic Absorption

ICP-AES - Inductively Coupled Plasma/Atomic Emission Spectrometry

ICP-MS = Inductively Coupled Plasma/Mass Spectrometry

MDL = Method Detection Limit

PQL = Practical Quantification Limit

Table 13

Quality Control Procedures and Acceptance Criteria for Organic Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Before sample analysis and when continuing calibration does not meet method requirements. See reference method(s) in Table 9.	See reference method(s) in Table 9.	Laboratory to recalibrate and reanalyze affect samples.
Continuing Calibration	Method-specific. See reference method(s) in Table 9.	Method–specific. See reference method(s) in Table 9.	Laboratory to recalibrate if correlation coefficient or response factor does not meet requirements.
Method Quality Assurance/Quality Control			
Holding Times	All samples.	See reference method(s) in Table 9.	Laboratory to qualify results if holding times are exceeded. Data validator will use professional judgment to qualify results as estimated or reject data.
Method Detection Limits (MDL)	Update method detection limit studies annually.	See reference method(s) in Table 9.	Revise detection limits.
Method Blanks	One per sample batch or every 20 samples, whichever is more frequent, or when there is a change in reagents.	Analyte concentration ≤ PQL. Control limits are not applicable if sample concentrations are < MDL.	Laboratory to eliminate or greatly reduce laboratory contamination due to glassware, or reagents, or analytical system. Re-digest and reanalyze affected samples.
Analytical Laboratory Duplicates and Matrix Spike Duplicates	One duplicate analysis with every sample batch or every 20 samples, whichever is more frequent. Use analytical replicates when samples are expected to contain target analytes. Use matrix spike duplicates when samples are not expected to contain target analytes.	Compound and matrix specific. Use intra-laboratory control chart results if sufficient data are available to generate control charts. Otherwise use analytical method default criteria.	Laboratory to re-digest and reanalyze samples if analytical problems are suspected, or to qualify the data if sample homogeneity problems are suspected and the project manager is consulted.
Matrix Spikes	One per sample batch or every 20 samples, whichever is more frequent. Spiked with the same analytes at the same concentration as the laboratory control sample.	Compound and matrix specific, recovery should not exceed method or performance - based intra- laboratory control chart limits.	Laboratory to re-digest and reanalyze samples if analytical problems suspected. Matrix interferences should be assessed and explained in case narrative accompanying the data package.
Surrogate Spikes	Added to every organics sample as specified in analytical protocol.	Compound specific, recovery should not exceed the control limits specified in the method or performance-based intra-laboratory control limits.	Follow corrective actions specified in analytical method.
Laboratory Control Samples	One per analytical batch or every 20 samples, whichever is more frequent.	Compound specific, recovery should not exceed performance- based intra-laboratory control limits.	Laboratory to correct problem to verify the analysis can be performed in a clean matrix with acceptable precision and recovery; then re-extract and reanalyze affected samples.
Certified or Standard Reference Material	Project specific requirement or at project manager's discretion. See Table 17 for DMMP requirements.	Compound specific, recovery should be within accepted control or advisory limits.	Laboratory to re-extract and reanalyze samples if analytical problems suspected, or to qualify the data after consultation.
Field Quality Assurance/Quality Control			
Field Duplicates	One per every ten sediment samples.	Project, matrix, and compound specific.	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion.	Analyte concentration ≤ PQL.	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

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Notes:

[1] Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

[2] Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

[3] Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

DMMP = Dredged Material Management Program

MDL = Method Detection Limit

PQL = Practical Quantification Limit

Table 14

Quality Control Procedures and Acceptance Criteria for PCDD/PCDF Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Acceptance Criteria	Laboratory Corrective Action
Ongoing Precision and Recovery	One per sample batch or every 20 samples, whichever is more frequent.	Recovery within limits presented in Table 15.	1. Check calculation. 2. Re-extract and reanalyze batch.
Stable-isotope labeled compounds	Spiked into each sample for every target analyte	Recovery within limits presented in Table 15.	1. Check calculations. 2. Qualify all associated results as estimated. 3. Alternatively, use of secondary ions that meet appropriate theoretical criteria is allowed if interferences are suspect. This alternative must be agency approved.
		Ion abundance ratios must be within the criteria specified by the method.	
Sample target analyte ion abundance ratios	All detected analytes for all samples.	Ion abundance ratios must be within the criteria specified by the method.	1. Reanalyze specific samples. 2. Reject all affected results outside the criteria. 3. Alternatively, use of secondary ions that meet appropriate theoretical criteria is allowed if interferences are suspect. This alternative must be agency approved.
Method blank	One per sample batch or every 20 samples, whichever is more frequent.	Detection ≤ minimum level as specified by the method.	1. If the method blank results are greater than the reporting limit, halt analysis, find the source of contamination, and reanalyze batch. 2. Report project samples as non- detected for results ≤ to the reported method blank values.
GC/MS Tune	At the beginning of each 12 hour shift; must start and end each analytical sequence	>10,000 resolving power at m/z304.9825. Exact mass of 380.9760 within 5 ppm of theoretical values.	1. Re-analyze affected samples. 2. Reject all data not meeting method 1613B requirements.
Initial Calibration	Initially and when continuing calibration fails	Five point curve for all analytes. RSD must meet Table 15 requirements for all target compounds and labeled compounds. Signal to noise ratio (S/N)>10. Ion abundance (IA) ratios within method specified limits.	
Window Defining/Column Performance Mix	Before every initial and continuing calibration	Valley < 25% for all peaks near 2,3,7,8-TCDD/F peaks.	
Continuing Calibration	Must start and end each analytical sequence.	%Difference must use the limits for target compounds & labeled compounds as specified by the method. S/N>10. IA ratios within method specified limits.	
Confirmation of 2,3,7,8-TCDF	For all primary column detections of 2,3,7,8-TCDF.	Confirmation presence of 2,3,7,8-TCDF in accordance with method 1613B requirements.	Failure to verify presence of 2,3,7,8-TCDF by second column confirmation or use of an alternative primary column that meets resolution criteria requires qualification of associated 2,3,7,8-TCDF results as non-detected at the associated value
Sample data not achieving target reporting limits or method performance in presence of possibly interfering compounds	Not applicable	Not applicable	Rather than simply diluting an extract to reduce interferences, the lab should perform additional cleanup techniques identified in the method to insure minimal matrix effects and background interference. Thereafter, the lab can dilute the extract. If reanalysis is required, the laboratory shall report both initial and re-analysis results.
Sediment Reference Material	One per analytical project.	Results must be within 20% of the 95% confidence interval.	1. Extraction and analysis should be evaluated by the lab and re-analysis performed of the entire sample batch once performance criteria can be met. 2. If analysis accompanies several batches with acceptable RM results, then the laboratory can narrate possible reason for RM outliers.

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Notes:

[1] Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

[2] Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

[3] Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

ppm = Part Per Million
IA = Ion abundance
MDL = method detection limit
PCDD = Polychlorinated dibenzodioxins
PCDF = Polychlorinated dibenzofurans
PQL = practical quantification limit
RM = Reference Material
S/N = Signal to Noise Ratio
TCDD = Tetrachlorodibenzodioxin
TCDF = Tetrachlorodibenzofuran

Table 15

Quality Control Acceptance Criteria for PCDD/PCDF

Anacortes Port Log Yard

Anacortes, Washington

Compound	Test Concentration (ng/ml)[1]	IPR[2]		OPR[3] (%)	I-CAL %	CAL/VER[4] (%) (Coeff. of Variation)	Labeled Compound % Recovery in Sample	
		RSD (%)	Recovery				Warning Limit	Control Limit
Native Compound								
2,3,7,8-TCDD	10	28	83-129	70-130	20	78-129	-	-
2,3,7,8-TCDF	10	20	87-137	75-130	20	84-120	-	-
1,2,3,7,8-PeCDD	50	15	76-132	70-130	20	78-130	-	-
1,2,3,7,8-PeCDF	50	15	86-124	80-130	20	82-120	-	-
2,3,4,7,8-PeCDF	50	17	72-150	70-130	20	82-122	-	-
1,2,3,4,7,8-HxCDD	50	19	78-152	70-130	20	78-128	-	-
1,2,3,6,7,8-HxCDD	50	15	84-124	76-130	20	78-128	-	-
1,2,3,7,8,9-HXCDD	50	22	74-142	70-130	35	82-122	-	-
1,2,3,4,7,8-HxCDF	50	17	82-108	72-130	20	90-112	-	-
1,2,3,6,7,8-HxCDF	50	13	92-120	84-130	20	88-114	-	-
1,2,3,7,8,9-HxCDF	50	13	84-122	78-130	20	90-112	-	-
2,3,4,6,7,8-HxCDF	50	15	74-158	70-130	20	88-114	-	-
1,2,3,4,6,7,8-HpCDD	50	15	76-130	70-130	20	86-116	-	-
1,2,3,4,6,7,8-HpCDF	50	13	90-112	82-122	20	90-110	-	-
1,2,3,4,7,8,9-HpCDF	50	16	86-126	78-130	20	86-116	-	-
OCDD	100	19	86-126	78-130	20	79-126	-	-
OCDF	100	27	74-146	70-130	35	70-130	-	-
Labeled Compounds								
13C12-2,3,7,8-TCDD	100	37	28-134	25-130	35	82-121	40-120	25-130
13C12-2,3,7,8-TCDF	100	35	31-113	25-130	35	71-130	40-120	24-130
13C12-1,2,3,7,8-PeCDD	100	39	27-184	25-150	35	70-130	40-120	25-130
13C12-1,2,3,7,8-PeCDF	100	34	27-156	25-130	35	76-130	40-120	24-130
13C12-2,3,4,7,8-PeCDF	100	38	16-279	25-130	35	77-130	40-120	21-130
13C12-1,2,3,4,7,8-HxCDD	100	41	29-147	25-130	35	85-117	40-120	32-130
13C12-1,2,3,6,7,8-HxCDD	100	38	34-122	25-130	35	85-118	40-120	28-130
13C12-1,2,3,4,7,8-HxCDF	100	43	27-152	25-130	35	76-130	40-120	26-130
13C12-1,2,3,6,7,8-HxCDF	100	35	30-122	25-130	35	70-130	40-120	26-123
13C12-1,2,3,7,8,9-HxCDF	100	40	24-157	25-130	35	74-130	40-120	29-130
13C12-2,3,4,6,7,8-HxCDF	100	37	29-136	25-130	35	73-130	40-120	28-130
13C12-1,2,3,4,6,7,8-HpCDD	100	35	34-129	25-130	35	72-130	40-120	23-130
13C12-1,2,3,4,6,7,8-HpCDF	100	41	32-110	25-130	35	78-129	40-120	28-130
13C12-1,2,3,4,7,8,9-HpCDF	100	40	28-141	25-130	35	77-129	40-120	26-130
13C12-OCDD	200	48	20-138	25-130	35	70-130	25-120	17-130
Cleanup Standard								
37Cl4-2,3,7,8-TCDD	10	36	39-154	31-130	35	79-127	40-120	35-130

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Notes:

[1] Quality control acceptance criteria for IPR, OPR and samples based on a 20 µL extract final volume.

[2] Initial Precision and Recovery (IPR) demonstration

[3] Ongoing Precision and Recovery (OPR) test run with every batch of samples.

[4] Calibration Verification (CAL/VER) test run at least every 12 hours.

µL = microliter

I-Cal = Interinal Calibration

ng/ml = nanogram per mililiter

RSD = Relative Standard Diviation

Table 16

Quality Control Acceptance Criteria for PCB Congeners

Anacortes Port Log Yard
Anacortes, Washington

Compound	Test Concentration[1,2,3] (ng/ml)	Calibration Verification (%)	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Surrogate Standard (% Recovery in Sample)
			RSD (%)	Recovery (%)		
Native Compound						
PCB-1	50	72-125	25	70-130	60-135	-
PCB-3	50	72-125	25	70-130	60-135	-
PCB-4	50	72-125	25	70-130	60-135	-
PCB-15	50	72-125	25	70-130	60-135	-
PCB-19	50	72-125	25	70-130	60-135	-
PCB-37	50	72-125	25	70-130	60-135	-
PCB-54	50	72-125	25	70-130	60-135	-
PCB-77	50	72-125	25	70-130	60-135	-
PCB-81	50	72-125	25	70-130	60-135	-
PCB-104	50	72-125	25	70-130	60-135	-
PCB-105	50	72-125	25	70-130	60-135	-
PCB-114	50	72-125	25	70-130	60-135	-
PCB-118	50	72-125	25	70-130	60-135	-
PCB-123	50	72-125	25	70-130	60-135	-
PCB-126	50	72-125	25	70-130	60-135	-
PCB-155	50	72-125	25	70-130	60-135	-
PCB-156	50	72-125	25	70-130	60-135	-
PCB-157	50	72-125	25	70-130	60-135	-
PCB-167	50	72-125	25	70-130	60-135	-
PCB-169	50	72-125	25	70-130	60-135	-
PCB-188	50	72-125	25	70-130	60-135	-
PCB-189	50	72-125	25	70-130	60-135	-
PCB-202	50	72-125	25	70-130	60-135	-
PCB-205	50	72-125	25	70-130	60-135	-
PCB-206	50	72-125	25	70-130	60-135	-
PCB-208	50	72-125	25	70-130	60-135	-
PCB-209	50	72-125	25	70-130	60-135	-
Surrogate Compounds						
13C-PCB-1	100	50-145	70	20-135	15-145	5-145
13C-PCB-3	100	50-145	70	20-135	15-145	5-145
13C-PCB-4	100	50-145	70	20-135	15-145	5-145
13C-PCB-15	100	50-145	70	20-135	15-145	5-145
13C-PCB-19	100	50-145	70	20-135	15-145	5-145
13C-PCB-28	100	50-145	70	20-135	15-145	5-145
13C-PCB-37	100	50-145	70	20-135	15-145	5-145
13C-PCB-54	100	50-145	70	20-135	15-145	5-145
13C-PCB-77	100	50-145	50	45-135	40-145	10-145
13C-PCB-81	100	50-145	50	45-135	40-145	10-145
13C-PCB-104	100	50-145	50	45-135	40-145	10-145
13C-PCB-105	100	50-145	50	45-135	40-145	10-145
13C-PCB-111	100	50-145	50	45-135	40-145	10-145
13C-PCB-114	100	50-145	50	45-135	40-145	10-145
13C-PCB-118	100	50-145	50	45-135	40-145	10-145
13C-PCB-123	100	50-145	50	45-135	40-145	10-145
13C-PCB-126	100	50-145	50	45-135	40-145	10-145
13C-PCB-155	100	50-145	50	45-135	40-145	10-145
13C-PCB-156	100	50-145	50	45-135	40-145	10-145
13C-PCB-157	100	50-145	50	45-135	40-145	10-145
13C-PCB-167	100	50-145	50	45-135	40-145	10-145
13C-PCB-169	100	50-145	50	45-135	40-145	10-145
13C-PCB-178	100	50-145	50	45-135	40-145	10-145
13C-PCB-188	100	50-145	50	45-135	40-145	10-145
13C-PCB-189	100	50-145	50	45-135	40-145	10-145
13C-PCB-202	100	50-145	50	45-135	40-145	10-145
13C-PCB-205	100	50-145	50	45-135	40-145	10-145
13C-PCB-206	100	50-145	50	45-135	40-145	10-145
13C-PCB-208	100	50-145	50	45-135	40-145	10-145
13C-PCB-209	100	50-145	50	45-135	40-145	10-145
Cleanup Surrogate Compounds						
13C-PCB-28	100	65-135	70	20-135	15-145	5-145
13C-PCB-111	100	75-125	50	45-135	40-145	10-145
13C-PCB-178	100	75-125	50	45-135	40-145	10-145

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Notes:

[1] Concentration of Congeners and Surrogates in Calibration Verification Standard #3 (CS3)

[2] Concentration of Congeners and Surrogates in final extract of IPR and OPR

[3] Concentration of Surrogates in all final extracts

-- indicates that the measurement quality objective is not applicable for the laboratory method.

ng/ml = nanogram per milliliter

PCBs = Polychlorinated biphenyls

RSD = Relative Standard Deviation

Table 17

Laboratory Quality Assurance/Quality Control Requirements for DMMP Conventionals and COCs

Anacortes Port Log Yard
Anacortes, Washington

Analysis Type	Method Blanks[1]	Replicates[1]	Triplicates[1]	CRM/RM	MS/MSD[1]	Surrogates[2]
Grain Size			X			
Total Solids (TS)			X			
Total Volatile Solids (TVS)			X			
Total Organic Carbon (TOC)	X		X	X		
Total Sulfides	X		X			
Total Ammonia	X		X			
Metals	X	X		X	X	
SVOCs[3,4]	X[5]	X[6]		X	X	X
PCBs[3,4]	X[5]	X[6]		X[7]	X	X
Pesticides[3,4]	X[5]	X[6]		X	X	X
Tributyltin	X	X[6]		X	X	X
Dioxins and Furans	See Table 14					

Notes:

[1] Frequency of Analysis (FOA) = 5 percent or one per batch, whichever is more frequent.

[2] Surrogate spikes required for every sample, including matrix spiked samples, blanks, and reference materials.

[3] Initial calibrations required before any samples are analyzed, after each major disruption of equipment, and when ongoing calibration fails to meet criteria.

[4] Ongoing calibration required at the beginning of each work shift, every 10–12 samples or every 12 hours (whichever is more frequent), and at the end of each shift.

[5] FOA = one per extraction batch.

[6] Matrix spike duplicates may be used.

[7] The Puget Sound Sediment Reference Material must be used.

COC = Contaminant of Concern

CRM = Certified Reference Material

MS/MSD = matrix spike/matrix spike duplicate

PCBs = polychlorinated biphenyls

QA/QC = quality assurance/quality control

RM = Reference Material

SVOCs = semi-volatile organic compounds

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Table 18

Target Reporting Limits

Anacortes Port Log Yard
Anacortes, Washington

Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
Conventionals				
Total Organic Carbon (TOC)	%	n/a	EPA 9060A	0.02
Total Volatile Solids (TVS)	%	n/a	PSEP	0.04
Total Solids (TS)	%	n/a	PSEP	0.04
Total Ammonia	mg-N/kg	n/a	SM 4500NH3	0.40
Total Sulfide	mg/kg	n/a	SM 4500S2	1.00
Grain Size				
Gravel	%	n/a	PSEP	0.01
Very Coarse Sand	%	n/a	PSEP	0.01
Coarse Sand	%	n/a	PSEP	0.01
Medium Sand	%	n/a	PSEP	0.01
Fine Sand	%	n/a	PSEP	0.01
Very Fine Sand	%	n/a	PSEP	0.01
Coarse Silt	%	n/a	PSEP	0.01
Medium Silt	%	n/a	PSEP	0.01
Fine Silt	%	n/a	PSEP	0.01
Very Fine Silt	%	n/a	PSEP	0.01
Clay	%	n/a	PSEP	0.01
Metals				
Antimony	mg/kg	7440-36-0	EPA 6020B	0.20
Arsenic	mg/kg	7440-38-2	EPA 6020B	0.20
Cadmium	mg/kg	7440-43-9	EPA 6020B	0.10
Copper	mg/kg	7440-50-8	EPA 6020B	0.50
Lead	mg/kg	7439-92-1	EPA 6020B	0.10
Mercury	mg/kg	7439-97-6	EPA 7471B	0.025
Selenium	mg/kg	7782-49-2	EPA 6020B	1.0
Silver	mg/kg	7440-22-4	EPA 6020B	0.20
Zinc	mg/kg	7440-66-6	EPA 6020B	6.0
Organometallic Compounds				
Tributyltin Ion (Bulk Sediment)	µg/kg	56-35-9	EPA 8270E/SIM	3.9
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)				
2-Methylnaphthalene	µg/kg	91-57-6	EPA 8270E/SIM	20.0
Acenaphthene	µg/kg	83-32-9	EPA 8270E/SIM	20.0
Acenaphthylene	µg/kg	208-96-8	EPA 8270E/SIM	20.0
Anthracene	µg/kg	120-12-7	EPA 8270E/SIM	20.0
Fluorene	µg/kg	86-73-7	EPA 8270E/SIM	20.0
Naphthalene	µg/kg	91-20-3	EPA 8270E/SIM	20.0
Phenanthrene	µg/kg	85-01-8	EPA 8270E/SIM	20.0
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)				
Benzo(a)anthracene	µg/kg	56-55-3	EPA 8270E/SIM	20.0
Benzo(a)pyrene	µg/kg	50-32-8	EPA 8270E/SIM	20.0
Benzofluoranthenes[6] (Total)	µg/kg	n/a	EPA 8270E/SIM	40.0
Benzo(g,h,i)perylene	µg/kg	191-24-2	EPA 8270E/SIM	20.0
Chrysene	µg/kg	218-01-9	EPA 8270E/SIM	20.0
Dibenzo(a,h)anthracene	µg/kg	53-70-3	EPA 8270E/SIM	5.0
Fluoranthene	µg/kg	206-44-0	EPA 8270E/SIM	20.0
Indeno(1,2,3-c,d)pyrene	µg/kg	193-39-5	EPA 8270E/SIM	20.0
Pyrene	µg/kg	129-00-0	EPA 8270E/SIM	20.0
Chlorinated Hydrocarbons				
1,2,4-Trichlorobenzene	µg/kg	120-82-1	EPA 8270E/SIM	5.0
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	95-50-1	EPA 8270E/SIM	5.0
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	106-46-7	EPA 8270E/SIM	5.0
Hexachlorobenzene	µg/kg	118-74-1	EPA 8081B	0.5
Phthalates				
Bis(2-Ethylhexyl) Phthalate	µg/kg	117-81-7	EPA 8270E/SIM	50.0
Butyl benzyl Phthalate	µg/kg	85-68-7	EPA 8270E/SIM	5.0
Dibutyl Phthalate	µg/kg	84-74-2	EPA 8270E/SIM	20.0
Diethyl Phthalate	µg/kg	84-66-2	EPA 8270E/SIM	20.0
Dimethyl Phthalate	µg/kg	131-11-3	EPA 8270E/SIM	5.0
Di-N-Octyl Phthalate	µg/kg	117-84-0	EPA 8270E/SIM	20.0
Phenols				
2,4-Dimethylphenol	µg/kg	105-67-9	EPA 8270E/SIM	20.0
2-methylphenol (o-Cresol)	µg/kg	95-48-7	EPA 8270E/SIM	5.0
4-methylphenol (p-Cresol)	µg/kg	106-44-5	EPA 8270E/SIM	5.0
Pentachlorophenol	µg/kg	87-86-5	EPA 8270E/SIM	20.0
Phenol	µg/kg	108-95-2	EPA 8270E/SIM	5.0

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Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
Miscellaneous Extractables				
Dibenzofuran	µg/kg	132-64-9	EPA 8270E/SIM	20.0
Hexachlorobutadiene	µg/kg	87-68-3	EPA 8081B	0.5
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	86-30-6	EPA 8270E/SIM	5.0
Benzoic Acid	µg/kg	65-85-0	EPA 8270E/SIM	100
Benzyl Alcohol	µg/kg	100-51-6	EPA 8270E/SIM	20.0
Pesticides				
4,4'-DDD	µg/kg	72-54-8	EPA 8081B	1.0
4,4'-DDE	µg/kg	72-55-9	EPA 8081B	1.0
4,4'-DDT	µg/kg	50-29-3	EPA 8081B	1.0
Aldrin	µg/kg	309-00-2	EPA 8081B	0.5
cis-Chlordane	µg/kg	5103-71-9	EPA 8081B	0.5
trans-Chlordane	µg/kg	5103-74-2	EPA 8081B	0.5
cis-Nonachlor	µg/kg	5103-73-1	EPA 8081B	1.0
trans-Nonachlor	µg/kg	39765-80-5	EPA 8081B	1.0
Oxychlordane	µg/kg	27304-13-8	EPA 8081B	1.0
Dieldrin	µg/kg	60-57-1	EPA 8081B	1.0
Heptachlor	µg/kg	76-44-8	EPA 8081B	0.5
Polychlorinated Biphenyls (PCBs)				
Aroclor 1016	µg/kg	12674-11-2	EPA 8082A	4.0
Aroclor 1221	µg/kg	11104-28-2	EPA 8082A	4.0
Aroclor 1232	µg/kg	11141-16-5	EPA 8082A	4.0
Aroclor 1242	µg/kg	53469-21-9	EPA 8082A	4.0
Aroclor 1248	µg/kg	12672-29-6	EPA 8082A	4.0
Aroclor 1254	µg/kg	52663-62-4	EPA 8082A	4.0
Aroclor 1260	µg/kg	11096-82-5	EPA 8082A	4.0
Aroclor 1262	µg/kg	37324-23-5	EPA 8082A	4.0
Aroclor 1268	µg/kg	11100-14-4	EPA 8082A	4.0
Polychlorinated Biphenyl (PCB) Congeners				
PCB-1	µg/kg	2051-60-7	EPA 1668C	0.4
PCB-2	µg/kg	2051-61-8	EPA 1668C	0.4
PCB-3	µg/kg	2051-62-9	EPA 1668C	0.4
PCB-4/PCB-10	µg/kg	13029-08-8	EPA 1668C	0.4
PCB-5/PCB-8	µg/kg	16605-91-7	EPA 1668C	0.4
PCB-6	µg/kg	25569-80-6	EPA 1668C	0.4
PCB-7/PCB-9	µg/kg	33284-50-3	EPA 1668C	0.4
PCB-11	µg/kg	2050-67-1	EPA 1668C	0.4
PCB-12/PCB-13	µg/kg	2974-92-7	EPA 1668C	0.4
PCB-14	µg/kg	34883-41-5	EPA 1668C	0.4
PCB-15	µg/kg	2050-68-2	EPA 1668C	0.4
PCB-16/PCB-32	µg/kg	38444-78-9	EPA 1668C	0.4
PCB-17	µg/kg	37680-66-3	EPA 1668C	0.4
PCB-18	µg/kg	37680-65-2	EPA 1668C	0.4
PCB-19	µg/kg	38444-73-4	EPA 1668C	0.4
PCB-20/PCB-21/PCB-33	µg/kg	38444-84-7	EPA 1668C	0.4
PCB-22	µg/kg	38444-85-8	EPA 1668C	0.4
PCB-23	µg/kg	55720-44-0	EPA 1668C	0.4
PCB-24/PCB-27	µg/kg	55702-45-9	EPA 1668C	0.4
PCB-25	µg/kg	55712-37-3	EPA 1668C	0.4
PCB-26	µg/kg	38444-81-4	EPA 1668C	0.4
PCB-28	µg/kg	7012-37-5	EPA 1668C	0.4
PCB-29	µg/kg	15862-07-4	EPA 1668C	0.4
PCB-30	µg/kg	35693-92-6	EPA 1668C	0.4
PCB-31	µg/kg	16606-02-3	EPA 1668C	0.4
PCB-34	µg/kg	37680-68-5	EPA 1668C	0.4
PCB-35	µg/kg	37680-69-6	EPA 1668C	0.4
PCB-36	µg/kg	38444-87-0	EPA 1668C	0.4
PCB-37	µg/kg	38444-90-5	EPA 1668C	0.4
PCB-38	µg/kg	53555-66-1	EPA 1668C	0.4
PCB-39	µg/kg	38444-88-1	EPA 1668C	0.4
PCB-40	µg/kg	38444-93-8	EPA 1668C	0.4
PCB-41/64/71/72	µg/kg	52663-59-9	EPA 1668C	0.4
PCB-42/59	µg/kg	36559-22-5	EPA 1668C	0.4
PCB-43/49	µg/kg	70362-46-8	EPA 1668C	0.4
PCB-44	µg/kg	41464-39-5	EPA 1668C	0.4
PCB-45	µg/kg	70362-45-7	EPA 1668C	0.4
PCB-46	µg/kg	41464-47-5	EPA 1668C	0.4
PCB-47	µg/kg	2437-79-8	EPA 1668C	0.4
PCB-48/75	µg/kg	70362-47-9	EPA 1668C	0.4
PCB-50	µg/kg	62796-65-0	EPA 1668C	0.4
PCB-51	µg/kg	68194-04-7	EPA 1668C	0.4
PCB-52/69	µg/kg	35693-99-3	EPA 1668C	0.4
PCB-53	µg/kg	41464-41-9	EPA 1668C	0.4
PCB-54	µg/kg	15968-05-5	EPA 1668C	0.4
PCB-55	µg/kg	74338-24-2	EPA 1668C	0.4
PCB-56/60	µg/kg	41464-43-1	EPA 1668C	0.4

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Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
PCB-57	µg/kg	70424-67-8	EPA 1668C	0.4
PCB-58	µg/kg	41464-49-7	EPA 1668C	0.4
PCB-61/70	µg/kg	33284-53-6	EPA 1668C	0.4
PCB-62	µg/kg	54230-22-7	EPA 1668C	0.4
PCB-63	µg/kg	74472-34-7	EPA 1668C	0.4
PCB-65	µg/kg	33284-54-7	EPA 1668C	0.4
PCB-67	µg/kg	73575-53-8	EPA 1668C	0.4
PCB-68	µg/kg	73575-52-7	EPA 1668C	0.4
PCB-73	µg/kg	74338-23-1	EPA 1668C	0.4
PCB-74	µg/kg	32690-93-0	EPA 1668C	0.4
PCB-76/66	µg/kg	70362-48-0	EPA 1668C	0.4
PCB-77	µg/kg	32598-13-3	EPA 1668C	0.4
PCB-78	µg/kg	70362-49-1	EPA 1668C	0.4
PCB-79	µg/kg	41464-48-6	EPA 1668C	0.4
PCB-80	µg/kg	33284-52-5	EPA 1668C	0.4
PCB-81	µg/kg	70362-50-4	EPA 1668C	0.4
PCB-82	µg/kg	52663-62-4	EPA 1668C	0.4
PCB-83	µg/kg	60145-20-2	EPA 1668C	0.4
PCB-84/92	µg/kg	52663-60-2	EPA 1668C	0.4
PCB-85/116	µg/kg	65510-45-4	EPA 1668C	0.4
PCB-86	µg/kg	55312-69-1	EPA 1668C	0.4
PCB-87/117/125	µg/kg	38380-02-8	EPA 1668C	0.4
PCB-88/91	µg/kg	55215-17-3	EPA 1668C	0.4
PCB-89	µg/kg	73575-57-2	EPA 1668C	0.4
PCB-90/101	µg/kg	68194-07-0	EPA 1668C	0.4
PCB-93	µg/kg	73575-56-1	EPA 1668C	0.4
PCB-94	µg/kg	73575-55-0	EPA 1668C	0.4
PCB-95/98/102	µg/kg	38379-99-6	EPA 1668C	0.4
PCB-96	µg/kg	73575-54-9	EPA 1668C	0.4
PCB-97	µg/kg	41464-51-1	EPA 1668C	0.4
PCB-99	µg/kg	38380-01-7	EPA 1668C	0.4
PCB-100	µg/kg	39485-83-1	EPA 1668C	0.4
PCB-103	µg/kg	60145-21-3	EPA 1668C	0.4
PCB-104	µg/kg	56558-16-8	EPA 1668C	0.4
PCB-105	µg/kg	32598-14-4	EPA 1668C	0.4
PCB-106/118	µg/kg	70424-69-0	EPA 1668C	0.4
PCB-107/109	µg/kg	70424-68-9	EPA 1668C	0.4
PCB-108/112	µg/kg	70362-41-3	EPA 1668C	0.4
PCB-110	µg/kg	38380-03-9	EPA 1668C	0.4
PCB-111/115	µg/kg	39635-32-0	EPA 1668C	0.4
PCB-113	µg/kg	68194-10-5	EPA 1668C	0.4
PCB-114	µg/kg	74472-37-0	EPA 1668C	0.4
PCB-119	µg/kg	56558-17-9	EPA 1668C	0.4
PCB-120	µg/kg	68194-12-7	EPA 1668C	0.4
PCB-121	µg/kg	56558-18-0	EPA 1668C	0.4
PCB-122	µg/kg	76842-07-4	EPA 1668C	0.4
PCB-123	µg/kg	65510-44-3	EPA 1668C	0.4
PCB-124	µg/kg	70424-70-3	EPA 1668C	0.4
PCB-126	µg/kg	57465-28-8	EPA 1668C	0.4
PCB-127	µg/kg	39635-33-1	EPA 1668C	0.4
PCB-128/162	µg/kg	38380-07-3	EPA 1668C	0.4
PCB-129	µg/kg	55215-18-4	EPA 1668C	0.4
PCB-130	µg/kg	52663-66-8	EPA 1668C	0.4
PCB-131/133	µg/kg	61798-70-7	EPA 1668C	0.4
PCB-132/161	µg/kg	38380-05-1	EPA 1668C	0.4
PCB-134/143	µg/kg	52704-70-8	EPA 1668C	0.4
PCB-135	µg/kg	52744-13-5	EPA 1668C	0.4
PCB-136	µg/kg	38411-22-2	EPA 1668C	0.4
PCB-137	µg/kg	35694-06-5	EPA 1668C	0.4
PCB-138/163/164	µg/kg	35065-28-2	EPA 1668C	0.4
PCB-139/149	µg/kg	56030-56-9	EPA 1668C	0.4
PCB-140	µg/kg	59291-64-4	EPA 1668C	0.4
PCB-141	µg/kg	52712-04-6	EPA 1668C	0.4
PCB-142	µg/kg	41411-61-4	EPA 1668C	0.4
PCB-144	µg/kg	68194-14-9	EPA 1668C	0.4
PCB-145	µg/kg	74472-40-5	EPA 1668C	0.4
PCB-146/165	µg/kg	51908-16-8	EPA 1668C	0.4
PCB-147	µg/kg	68194-13-8	EPA 1668C	0.4
PCB-148	µg/kg	74472-41-6	EPA 1668C	0.4
PCB-150	µg/kg	68194-08-1	EPA 1668C	0.4
PCB-151	µg/kg	52663-63-5	EPA 1668C	0.4
PCB-152	µg/kg	68194-09-2	EPA 1668C	0.4
PCB-153	µg/kg	35065-27-1	EPA 1668C	0.4
PCB-154	µg/kg	60145-22-4	EPA 1668C	0.4

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Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
PCB-155	µg/kg	33979-03-2	EPA 1668C	0.4
PCB-156	µg/kg	38380-08-4	EPA 1668C	0.4
PCB-157	µg/kg	69782-90-7	EPA 1668C	0.4
PCB-158/160	µg/kg	74472-42-7	EPA 1668C	0.4
PCB-159	µg/kg	39635-35-3	EPA 1668C	0.4
PCB-166	µg/kg	41411-63-6	EPA 1668C	0.4
PCB-167	µg/kg	52663-72-6	EPA 1668C	0.4
PCB-168	µg/kg	59291-65-5	EPA 1668C	0.4
PCB-169	µg/kg	32774-16-6	EPA 1668C	0.4
PCB-170	µg/kg	35065-30-6	EPA 1668C	0.4
PCB-171	µg/kg	52663-71-5	EPA 1668C	0.4
PCB-172	µg/kg	52663-74-8	EPA 1668C	0.4
PCB-173	µg/kg	68194-16-1	EPA 1668C	0.4
PCB-174	µg/kg	38411-25-5	EPA 1668C	0.4
PCB-175	µg/kg	40186-70-7	EPA 1668C	0.4
PCB-176	µg/kg	52663-65-7	EPA 1668C	0.4
PCB-177	µg/kg	52663-70-4	EPA 1668C	0.4
PCB-178	µg/kg	52663-67-9	EPA 1668C	0.4
PCB-179	µg/kg	52663-64-6	EPA 1668C	0.4
PCB-180	µg/kg	35065-29-3	EPA 1668C	0.4
PCB-181	µg/kg	74472-47-2	EPA 1668C	0.4
PCB-182/187	µg/kg	60145-23-5	EPA 1668C	0.4
PCB-183	µg/kg	52663-69-1	EPA 1668C	0.4
PCB-184	µg/kg	74472-48-3	EPA 1668C	0.4
PCB-185	µg/kg	52712-05-7	EPA 1668C	0.4
PCB-186	µg/kg	74472-49-4	EPA 1668C	0.4
PCB-188	µg/kg	74487-85-7	EPA 1668C	0.4
PCB-189	µg/kg	39635-31-9	EPA 1668C	0.4
PCB-190	µg/kg	41411-64-7	EPA 1668C	0.4
PCB-191	µg/kg	74472-50-7	EPA 1668C	0.4
PCB-192	µg/kg	74472-51-8	EPA 1668C	0.4
PCB-193	µg/kg	69782-91-8	EPA 1668C	0.4
PCB-194	µg/kg	35694-08-7	EPA 1668C	0.4
PCB-195	µg/kg	52663-78-2	EPA 1668C	0.4
PCB-196/203	µg/kg	42740-50-1	EPA 1668C	0.4
PCB-197	µg/kg	33091-17-7	EPA 1668C	0.4
PCB-198	µg/kg	68194-17-2	EPA 1668C	0.4
PCB-199	µg/kg	52663-75-9	EPA 1668C	0.4
PCB-200	µg/kg	52663-73-7	EPA 1668C	0.4
PCB-201	µg/kg	40186-71-8	EPA 1668C	0.4
PCB-202	µg/kg	2136-99-4	EPA 1668C	0.4
PCB-204	µg/kg	74472-52-9	EPA 1668C	0.4
PCB-205	µg/kg	74472-53-0	EPA 1668C	0.4
PCB-206	µg/kg	40186-72-9	EPA 1668C	0.4
PCB-207	µg/kg	52663-79-3	EPA 1668C	0.4
PCB-208	µg/kg	52663-77-1	EPA 1668C	0.4
PCB-209	µg/kg	2051-24-3	EPA 1668C	0.4
Dioxins and Furans				
2,3,7,8-TCDD	ng/kg	9014-42-0	EPA 1613B	1.0
1,2,3,7,8-PeCDD	ng/kg	40321-76-4	EPA 1613B	1.0
1,2,3,4,7,8-HxCDD	ng/kg	39227-28-6	EPA 1613B	1.0
1,2,3,6,7,8-HxCDD	ng/kg	57653-85-7	EPA 1613B	1.0
1,2,3,7,8,9-HxCDD	ng/kg	19408-74-3	EPA 1613B	1.0
1,2,3,4,6,7,8-HxCDD	ng/kg	39227-28-6	EPA 1613B	2.5
OCDD	ng/kg	3268-87-9	EPA 1613B	10.0
2,3,7,8-TCDF	ng/kg	51207-31-9	EPA 1613B	1.0
1,2,3,7,8-PeCDF	ng/kg	57117-41-6	EPA 1613B	1.0
2,3,4,7,8-HxCDF	ng/kg	70648-26-9	EPA 1613B	1.0
1,2,3,4,7,8-HxCDF	ng/kg	70648-26-9	EPA 1613B	1.0
1,2,3,6,7,8-HxCDF	ng/kg	57117-44-9	EPA 1613B	1.0
1,2,3,7,8,9-HxCDF	ng/kg	72918-21-9	EPA 1613B	1.0
2,3,4,6,7,8-HxCDF	ng/kg	60851-34-5	EPA 1613B	1.0
1,2,3,4,5,6,8-HpCDF	ng/kg	67562-39-4	EPA 1613B	1.0
1,2,3,4,7,8,9-HPCDF	ng/kg	55673-89-7	EPA 1613B	1.0
OCDF	ng/kg	39001-02-0	EPA 1613B	2.5

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Notes:

[1] Chemical abstract service registry number.

[2] Practical Quantitation Limit (PQL) values from Analytical Resources LLC (ARL) of Tukwila, Washington.

% = Percent

µg/kg = Micrograms per kilogram

mg/kg = Milligram per kilogram

mg-N/kg = Milligram nitrogen per kilogram

n/a = not available

ng/kg = Nanogram per kilogram

Table 19

Toxicity Equivalency Factors

Anacortes Port Log Yard
Anacortes, Washington

Analyte Group	CAS Number[1]	TEF[2]
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)		
Benzo[a]pyrene	50-32-8	1.0
Benzo[a]anthracene	56-55-3	0.1
Benzo[b]fluoranthene	205-99-2	0.1
Benzo[k]fluoranthene	207-08-9	0.1
Chrysene	218-01-9	0.01
Dibenz[a,h]anthracene	53-70-3	0.1
Indeno[1,2,3-cd]pyrene	193-39-5	0.1
Dioxin Congeners		
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	1.0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	40321-76-4	1.0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	39227-28-6	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD)	57653-85-7	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)	19408-74-3	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)	35822-46-9	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (1,2,3,4,6,7,8,9-OCDD)	3268-87-9	0.0003
Furan Congeners		
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	51207-31-9	0.1
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	57117-41-6	0.03
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8- PeCDF)	57117-31-4	0.3
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	70648-26-9	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8- HxCDF)	57117-44-9	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9- HxCDF)	72918-21-9	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)	60851-34-5	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	67562-39-4	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)	55673-89-7	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (1,2,3,4,6,7,8,9-OCDF)	39001-02-0	0.0003
Dioxin-Like Polychlorinated Biphenyls (PCBs)		
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	32598-13-3	0.0001
3,4,4',5- Tetrachlorobiphenyl (PCB 81)	70362-50-4	0.0003
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	32598-14-4	0.00003
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	74472-37-0	0.00003
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	31508-00-6	0.00003
2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	65510-44-3	0.00003
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	57465-28-8	0.1
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	38380-08-4	0.00003
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	69782-90-7	0.00003
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	52663-72-6	0.00003
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	32774-16-6	0.03
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	39635-31-9	0.00003

Notes:

[1] Chemical abstract service registry number.

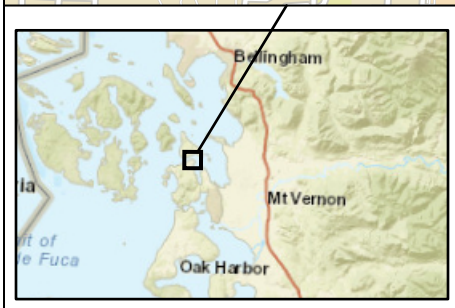
[2] Toxicity equivalency factors (TEFs) referenced from Tables 6-1 through 6-3 of Ecology's Sediment Cleanup Users Manual (SCUM; Ecology 2025).

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Figures

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N

0 100

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: ESRI Streets Map, 2023

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

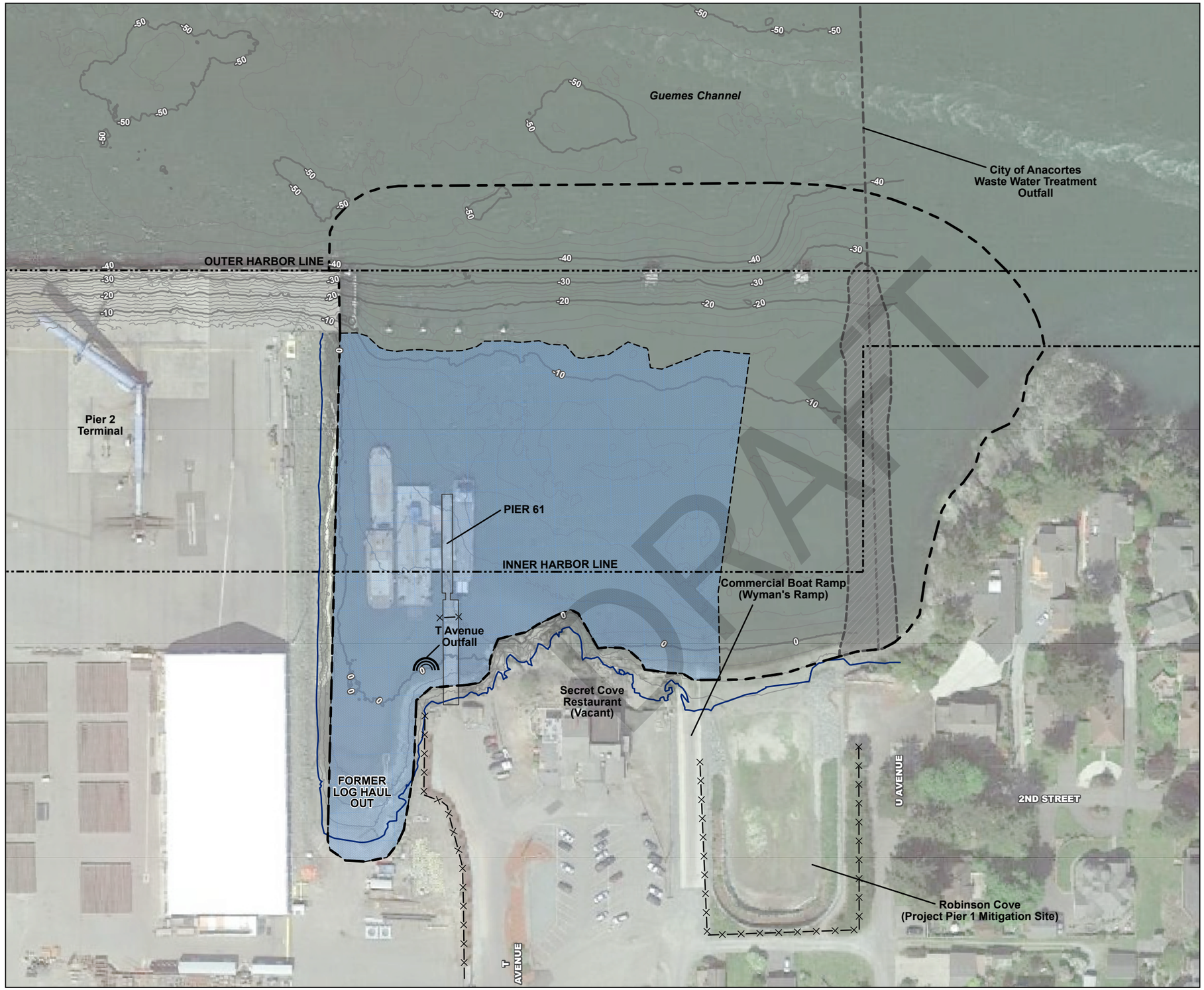
Vicinity Map

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 1

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Legend

- Anacortes Port Log Yard Site
- Mean Higher High Water (MHHW)
- Fence
- Harbor Line
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Proposed Interim Action Area
- Outfall

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

*Remedial actions were completed in conjunction with the City of Anacortes Waste Water Treatment Outfall Dredging Project to remove previously identified contaminated sediment for permitted upland landfill disposal.

SMA = Sediment Management Area

N

0 100

Feet

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

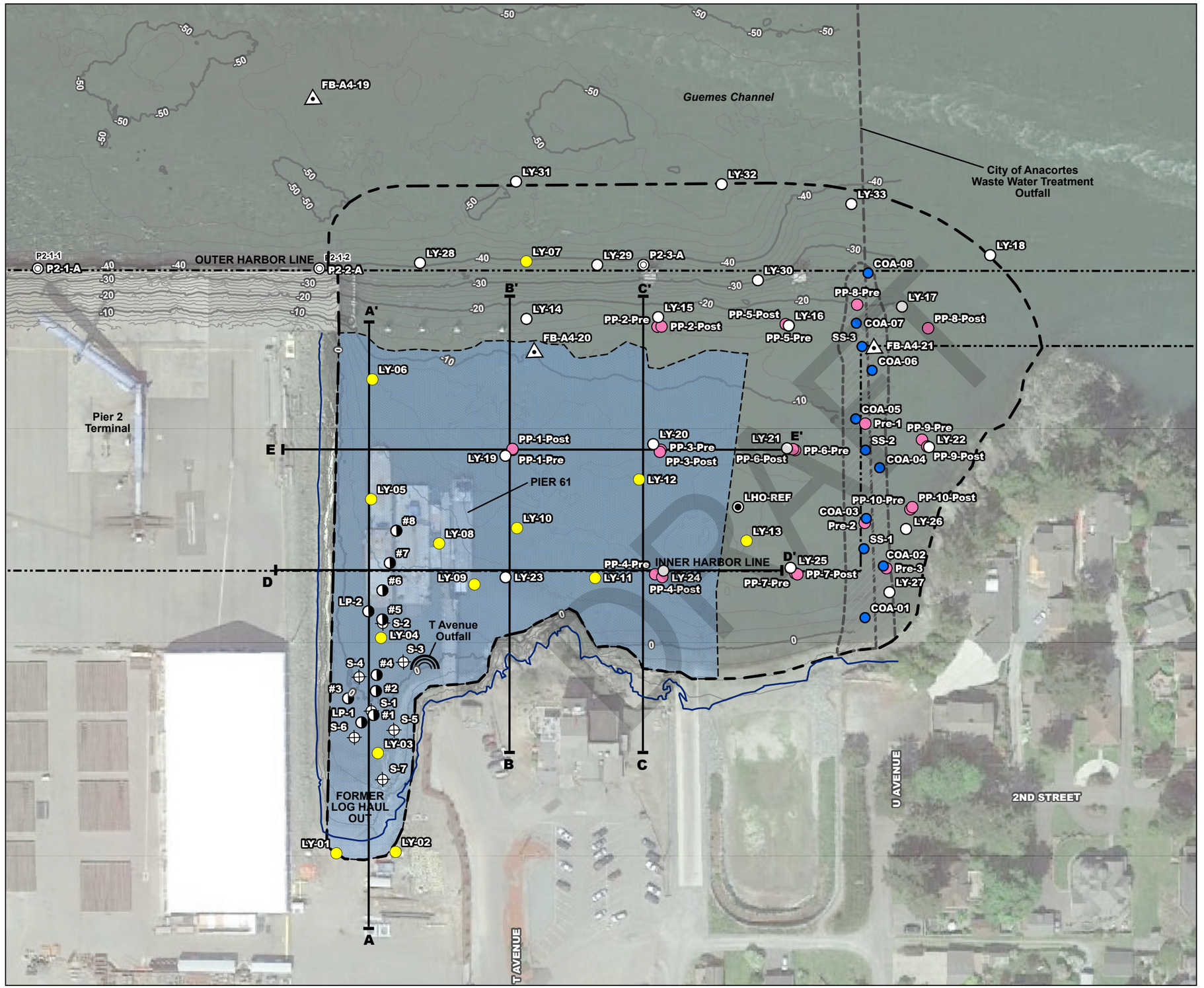
Current Property Layout and Proposed Interim Action Area

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 2

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Legend

- Anacortes Log Yard Site
- Mean Higher High Water (MHHW)
- Harbor Line
- City of Anacortes Outfall
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area
- Proposed Interim Action Area
- Cross Section (See Figures 7 through 11)
- Pre- and Post-Construction Characterization (Geosyntec 2025)
- Supplemental Sediment Investigation (GeoEngineers 2021-23)
- Nearshore Sediment Characterization Study (DOF 2020)
- RI/FS Investigation (GeoEngineers 2016)
- Dredged Material Characterization Study (GeoEngineers 2012)
- Supplemental Sediment Characterization Study (GeoEngineers 2012)
- Sediment Characterization Study (GeoEngineers 2010)
- Fidalgo Bay Sediment Investigation (SAIC 2008)
- Pier 2 Log Haul Out Facility Due Diligence Study (Floyd|Snyder 2004)

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

N

0 100

Feet

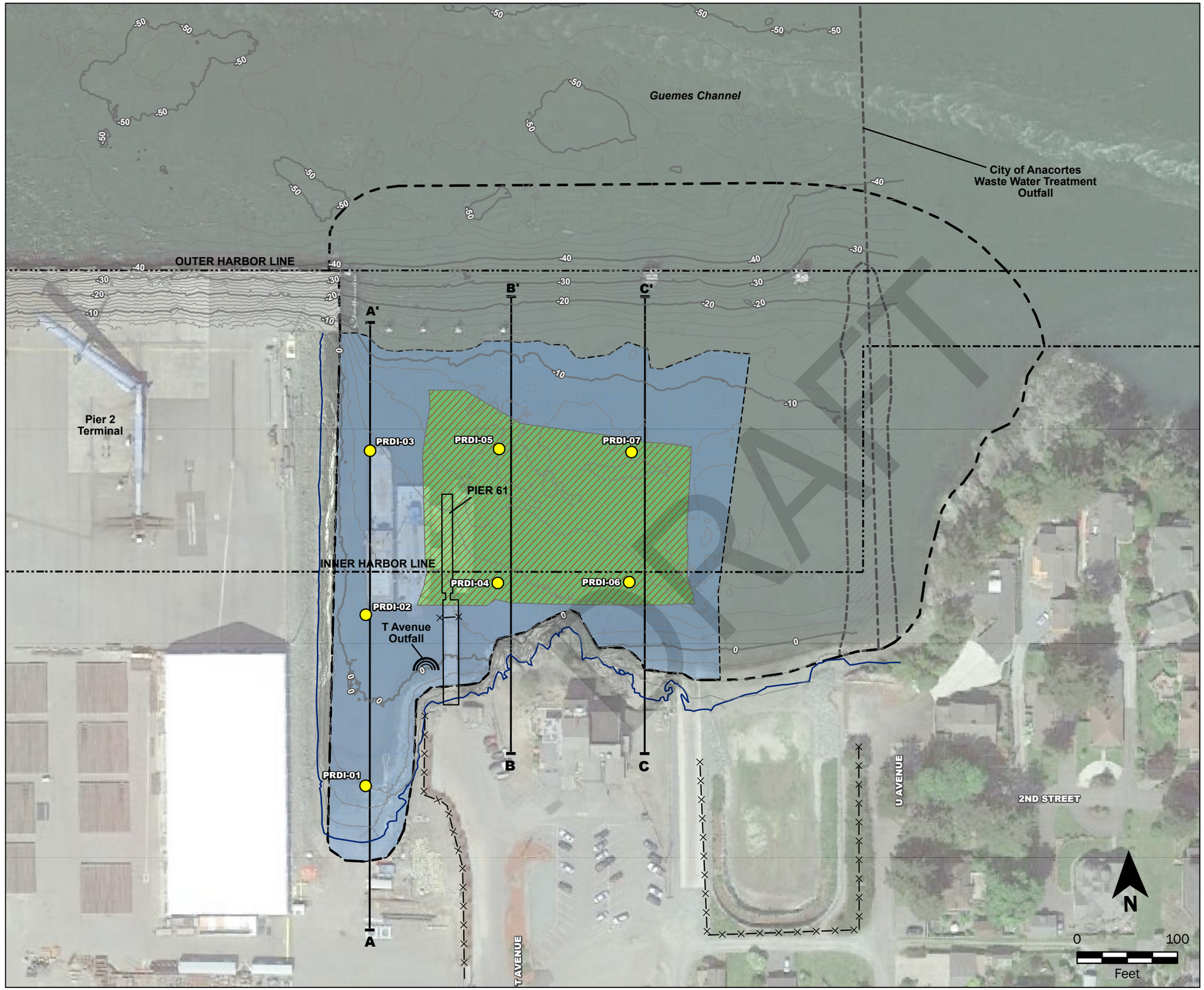
Sediment Investigation Sampling Locations

Anacortes Port Log Yard
Anacortes, Washington

GeoEngineers

Figure 3

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Legend

- Anacortes Port Log Yard Site
- Sample Location - With Sediment Data
- Sample Location - No Sediment Data
- Mean Higher High Water (MHHW)
- Fence
- Outfall
- Harbor Line
- Proposed Pre-Remedial Dredge Sampling Location
- Navigational Depth Dredge Prism (Subsurface DMMU)
- City of Anacortes Waste Water Treatment Outfall Project Dredge Area*
- Interim Action Dredged Prism

Bathymetric Contours

- Index Contour (10 ft)
- Contour (2 ft)
- Cross Section (See Figures 5 through 7)

ft = Feet
DMMU = Dredged Material Management Unit

Notes:

1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.

Data Source: Bing Aerial Imagery, accessed 2023. Bathymetry from David Evans and Associates Inc. (DEA) survey dated June 26, 2014.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Proposed Interim Action and DMMU Sampling Locations

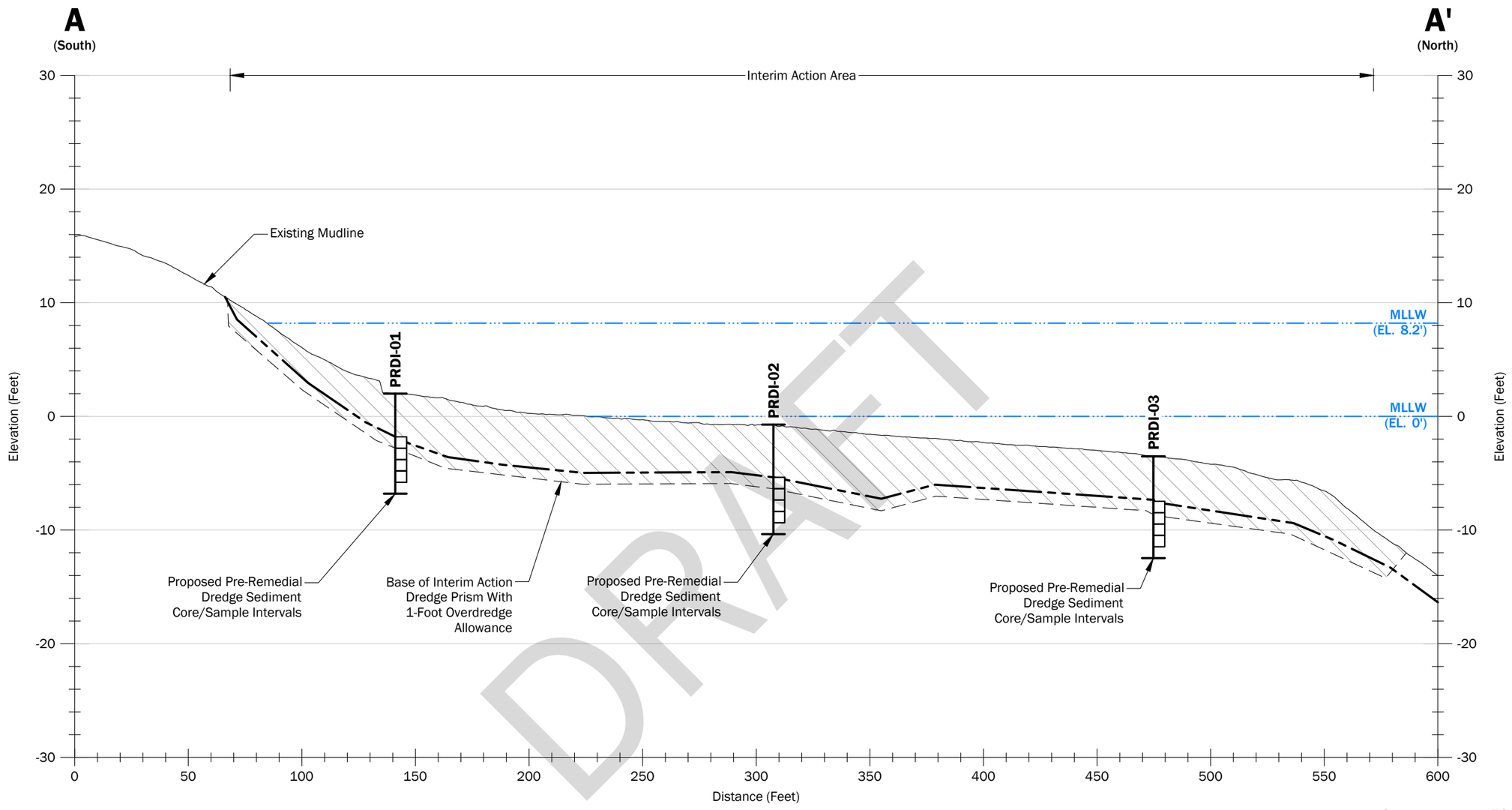
Anacortes Port Log Yard
Anacortes, Washington

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Figure 4

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0 50
Horizontal Feet

0 10
Vertical Feet
Vertical Exaggeration = 5X

Legend

Abbreviations

EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water

Interim Action Dredge Prism

Sediment Core

Existing Mudline
Inferred Recent/Native Contact
Verification Sediment Sample
DMMP Characterization Sample

Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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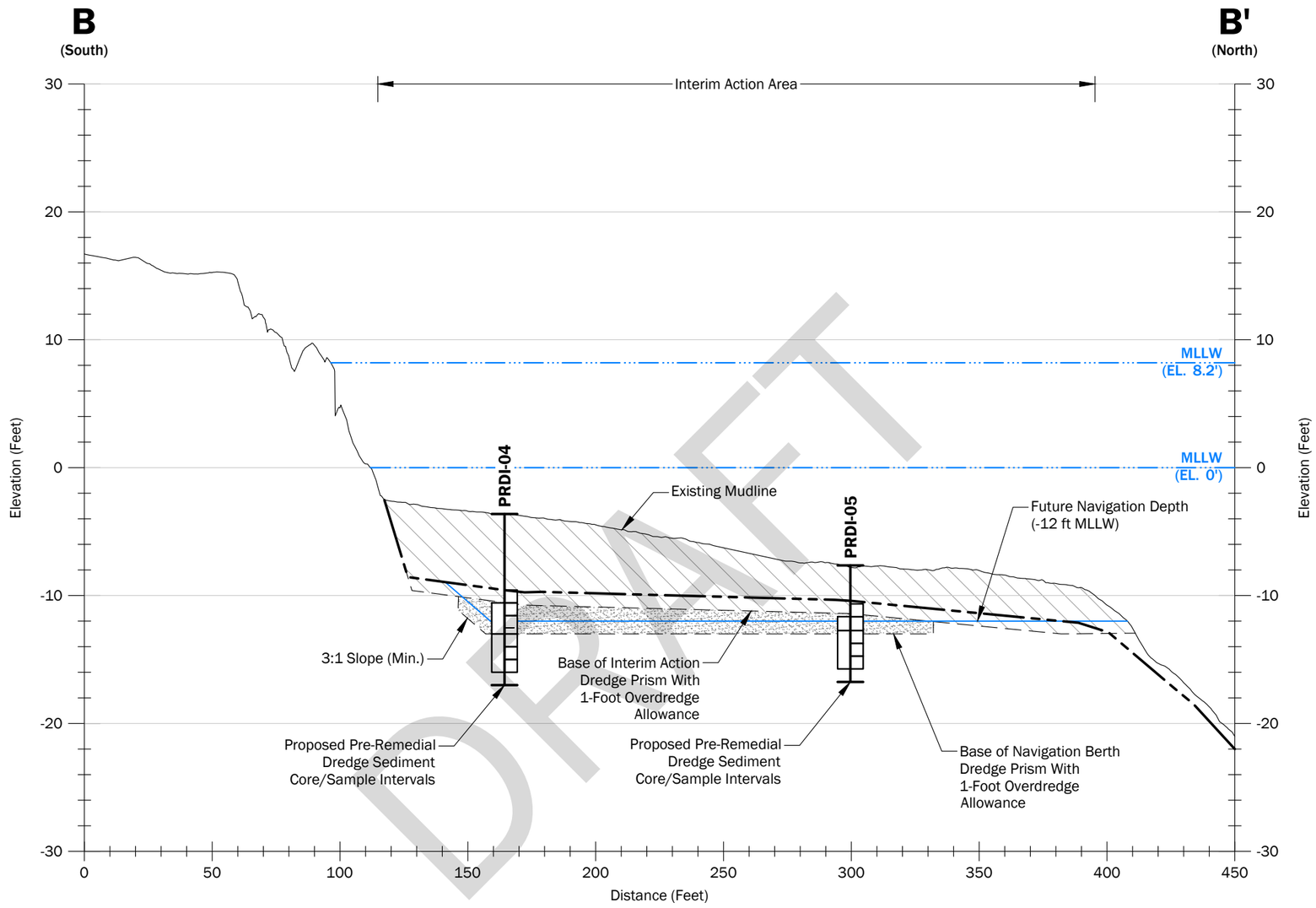
Interim Action/Navigation Dredge
Cross-Section A-A'

Anacortes Port Log Yard
Anacortes, Washington

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Figure 5

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0 50
Horizontal Feet

0 10
Vertical Feet
Vertical Exaggeration = 5X

Legend

Abbreviations

EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water

Interim Action Dredge Prism

Navigation Depth Dredge Prism

Sediment Core

Existing Mudline

Inferred Recent/Native Contact

Verification Sediment Sample

DMMP Characterization Sample

Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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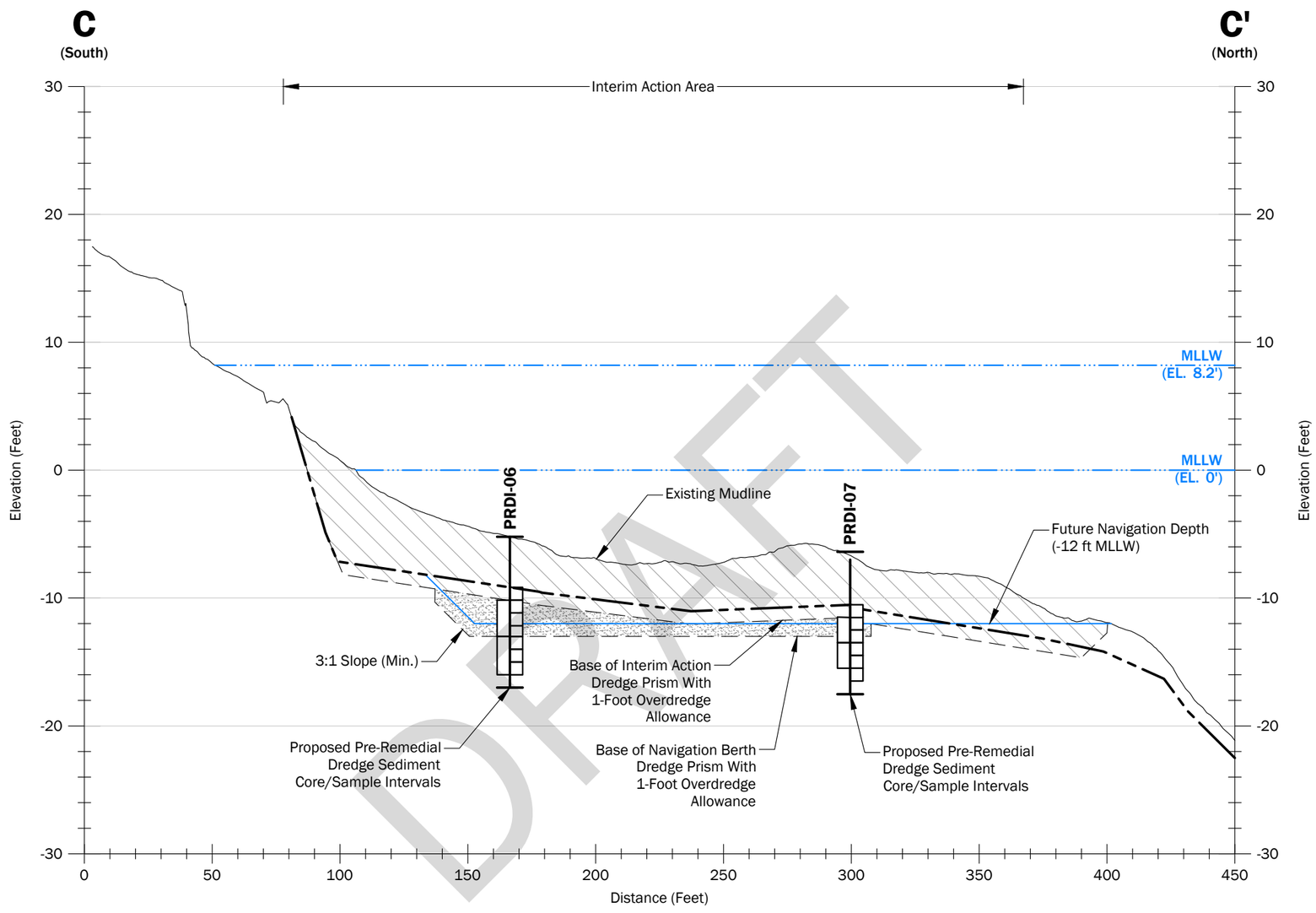
Interim Action/Navigation Dredge Cross-Section B-B'

Anacortes Port Log Yard
Anacortes, Washington

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Figure 6

P:\5\5147016\CAD\15\Interim Action\11 Section B - IA.dwg 6 Section B - IA Date Exported:8/31/2026 12:31 PM - by Sung-Chul Sonny Yi



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0 50
Horizontal Feet

0 10
Vertical Feet
Vertical Exaggeration = 5X

Legend

Abbreviations

EL	Elevation
ft	Feet
MHHW	Mean Higher High Water
MLLW	Mean Lower Low Water

Interim Action Dredge Prism

Navigation Depth Dredge Prism

Sediment Core

Existing Mudline

Inferred Recent/Native Contact

Verification Sediment Sample

DMMP Characterization Sample

Note(s):

1. The subsurface conditions shown are based on interpolation between widely spaced explorations and should be considered approximate; actual subsurface conditions may vary from those shown.

Datum: Mean Lower Low Water (MLLW)

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Interim Action/Navigation Dredge
Cross-Section C-C'

Anacortes Port Log Yard
Anacortes, Washington

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Figure 7

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Appendices

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Appendix A

Pre-Remedial Design Investigation Health and Safety Plan

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Pre-Remedial Design Investigation
Site Health & Safety Plan

Anacortes Port Log Yard
Anacortes, Washington
Facility Site No. 21898438
Cleanup Site No. 3604
Ecology Agreed Order No. DE 10630

October 5, 2026

DRAFT

2101 4th Avenue, Suite 950
Seattle, Washington 98101
206.278.2674

GeoEngineers

Pre-Remedial Design Investigation
Health and Safety Plan

Anacortes Port Log Yard
Anacortes, Washington

File No. 5147-016-15
October 5, 2026

Approved By:

Signature: _____ Date: October 5, 2026

Robert S. Trahan, LG, Associate Environmental Geologist, GeoEngineers

Signature: _____ Date: October 5, 2026

Jeff Pratt, Project Scientist, GeoEngineers

Signature: _____ Date: October 5, 2026

Chad Kean, Health and Safety Manager, GeoEngineers

JP:PC:RST:leh

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Health and Safety Specialist (HSS) 1

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Health and Safety Authorized Consultant (HSC) 1
Project Manager (PM) 1
Site Safety Officer/HAZWOPER (SSO) 2
Field Employees 3
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Appendices

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Appendix I. Personal Protective Equipment Program
Appendix J. Emergency/Hospital Contact Information and Directions

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Employee Acknowledgment
Anacortes Port Log Yard
GEI File No. 5147-016-15

I hereby verify that a copy of the Health and Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on site. I agree to comply with all required specified safety regulations and procedures.

Print Name	Signature	Date

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Subcontractor Acknowledgment
Anacortes Port Log Yard
GEI File No. 5147-016-15

I verify that a copy of the Health and Safety Plan has been provided by GeoEngineers, Inc. to inform us of the potential hazards, and procedures and protocols that will be used.

Print Name	Signature	Firm	Date

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1.0 Introduction

This Health and Safety Plan (HASP) has been prepared for use at the Anacortes Port Log Yard Site (Site) during field investigation activities to collect environmental data to evaluate cleanup action alternatives to address Site contamination resulting from historical land use. **This Health and Safety Plan (HASP) is to be used in conjunction with current standards and policies outlined in the GeoEngineers Inc. (GeoEngineers) Health and Safety Programs.** Together, the written GeoEngineers' safety programs and this HASP constitute the site safety plan for this subject site. This HASP is required by the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation (29 CFR 1910.120) when preforming mandatory or voluntary clean-up operations and initial investigations conducted to determine the presence or absence of hazardous substances unless the employer can demonstrate that the work does not involve employee exposure to safety and health hazards from hazardous substances at the site. This HASP is to be used by GeoEngineers personnel. A copy of this HASP must be available on site.

GENERAL PROJECT INFORMATION

PROJECT NAME	Anacortes Port Log Yard
PROJECT NUMBER	5147-016-15
TYPE OF PROJECT	Sediment Investigation
START/COMPLETION	Summer/Fall 2026
SUBCONTRACTORS	Holocene Drilling Gravity Environmental Consulting LLC Analytical Resources LLC
CLIENT	Port of Anacortes

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Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, the Subcontractor Acknowledgment shall be signed, and a copy of this record retained by GeoEngineers. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

2.0 Background

Detailed information regarding background information, including Site location, physical description, use history, summary of previous environmental investigations and identification of preliminary hazardous substances are presented in GeoEngineers' Interim Action Work Plan dated October 5, 2026, and are summarized below.

2.5 PROBLEM DEFINITION

Following the closure of log handling operations in 2004, the Port of Anacortes (Port) began working with Ecology to characterize sediment conditions at the Site due to evidence of degraded habitat resulting from wood debris. Initial investigations identified up to 75 percent wood waste by volume in shallow intertidal

sediment. In addition to wood waste, the initial investigations identified levels of organic carbon and volatile solids above recommended levels. Sediment investigations completed between 2008 and 2010 found that sediment samples exceeded Ecology's Sediment Cleanup Objective (SCO) and Cleanup Screening Level (CSL) criteria for benthic invertebrate community health.

Based on the results of the initial and follow-up investigations, the Port entered into Agreed Order No. DE 10630 (Agreed Order) with Ecology on November 3, 2014, pursuant to the Model Toxics Control Act (MTCA). Pursuant to the Agreed Order, an Interim Action to expedite cleanup in a portion of the Site is planned. The Interim Action will focus on implementing a partial cleanup of the Site to address sediment contamination within the current and planned future operational area and within areas containing elevated levels of wood waste resulting from historical log haul out operations (i.e., Former Log Haul Out).

2.6 LOCATION AND DESCRIPTION

The Site comprises the intertidal and subtidal marine areas within an embayment along Guemes Channel at the northern terminus of T Avenue in the nearshore area northwest of 718 4th Street. The Site is bounded to the west by Pier 2, which is an earth fill structure and pile-supported wharf along the northernmost portion of the facility. The shoreline south and east of the Site includes a mixture of riprap, remnant structures, rock outcroppings, and beaches comprised of sand and gravel. A wooden dock (Pier 61) used for commercial transient vessels extends into the marine area from the southern shoreline. Public access to the Port's Pier 2 facility, including the beach area south of the Site between Pier 2 and Pier 61 (referred to as the former log handling area), is currently restricted by fencing and signage.

2.7 HISTORICAL LAND USE

Historically, the Site and surrounding area was used for lumber and wood milling and ship building operations from the early 1900s to 1965. In 1965, the Port purchased the Site and adjacent uplands (the "Property"). Between 1965 and 2004, the Port leased the Property to multiple tenants for log handling and loading operations. Log handling operations ceased after 2004 and the Site has remained largely unchanged since that time.

Currently, Pier 61 used for commercial transient vessels extending into the Site marine area from the southern shoreline. Additionally, a commercial launch (Wyman's Ramp), pocket beach (Robinson Cove) and former full-service restaurant (Secret Cove) are situated along the shoreline south of the Site. The northern part of the Pier 2 Terminal facility is a deep-water moorage terminal used for berthing and product loading and offloading, including petroleum coke and prilled sulfur. Other portions of the Pier 2 Terminal facility are leased to various tenants for equipment laydown and storage.

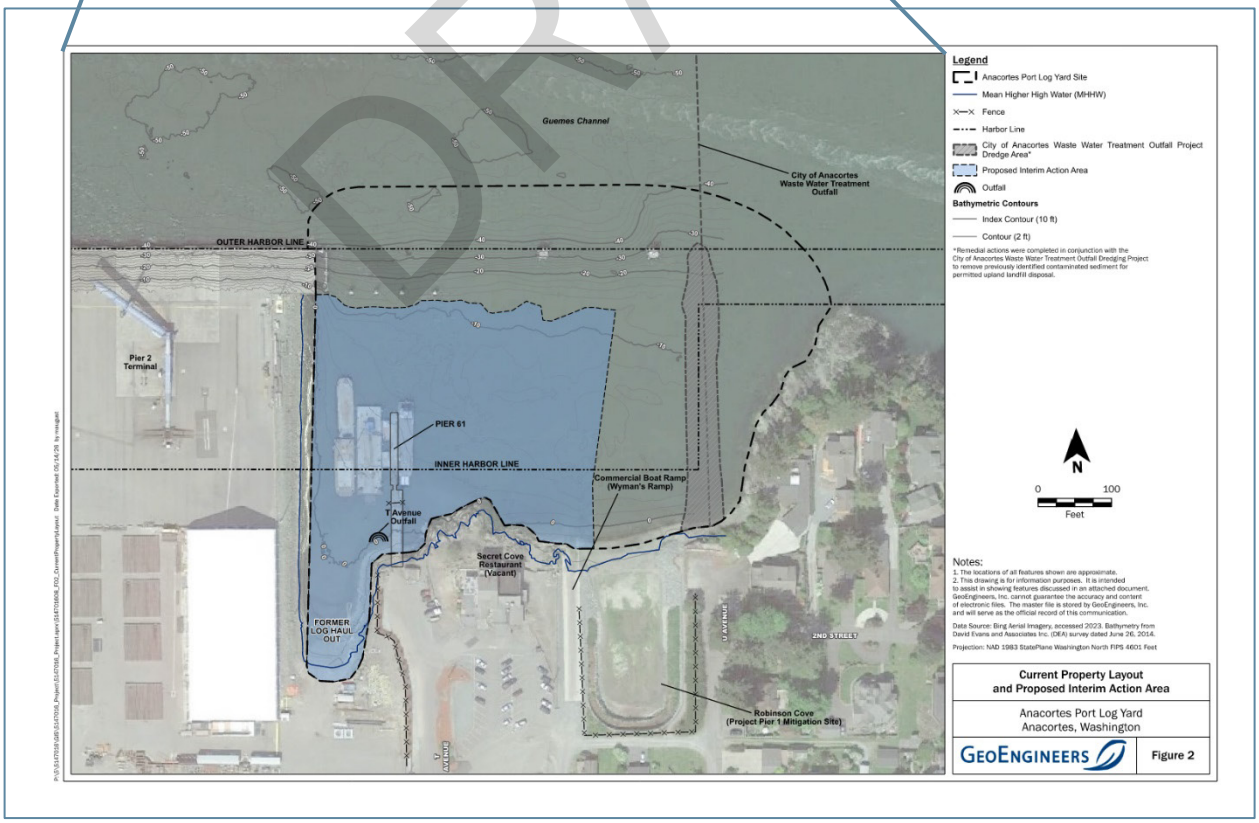
2.8 PROJECT DESCRIPTION

In accordance with the Interim Action Work Plan, field investigation activities are proposed to support project permitting, verify the contact between the sediment contamination and underlying clean native material, inform disposal options for the proposed dredged materials, and determine environmental protections that will be required to complete the Interim Action in a manner consistent with the suitability determination and cleanup requirements for Site.

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2.9 SITE MAP





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3.0 Work Plan

The field investigation to support remedial design and permitting for the planned Interim Action include the following:

- Document the extent and location of existing habitat features along the nearshore, intertidal and subtidal zones of the Site to assess the impact of the proposed Interim Action on existing habitats including forage fish spawning and eelgrass habitats.
- Determine the thickness of accumulated sediment above the toe of the armored revetment slope east and west of the Former Log Haul Out area and along Pier 2.
- Confirm the elevation of the contact between the recently deposited contaminated sediments and underlying clean native layer within the Interim Action area to support dredge design, refine dredge volume estimates for contract bidding purposes and compliance with the cleanup requirements.
- Characterize the clean native dredge material underlying the contaminated sediment layer within the Port's future operational area for the purpose of determining open-water disposal suitability and/or beneficial reuse.

Anticipated field activities and GeoEngineers personnel are summarized below.

ANTICIPATED FIELD ACTIVITIES

FIELD ACTIVITIES (CHECK ALL ANTICIPATED FIELD ACTIVITIES TO BE COMPLETED)	
☒ Site Reconnaissance	☐ Product Sample collection
☒ Surveying	☐ Recovery of Free Product
☐ Soil Sampling	☐ Remedial Excavation
☐ Groundwater Sampling	☐ Monitoring Well Installation
☒ Sediment Sampling	☐ Groundwater Depth and Free Product Measurement
☐ Vapor Sampling	☒ Other: Over-Water Work
☐ Test Pit Exploration	☒ Other: Sample Transport and Delivery
☐ Direct Push Exploration	☒ Other: Barge Based Sonic Drilling
☐ Hollow-Stem Auger Exploration	☐ Other: Click here to enter text.
☐ Construction Monitoring	☐ Other: Click here to enter text.
☐ UST Site Check/Site Assessment	☐ Other: Click here to enter text.
☐ UST Removal Observation	☐ Other: Click here to enter text.

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GEOENGINEERS FIELD PERSONNEL QUALIFICATIONS AND READINESS STATUS

NAME OF EMPLOYEE ON SITE	LEVEL OF HAZWOPER TRAINING (24-HR/40-HR)	DATE OF LAST 8-HR REFRESHER TRAINING	LAST FIRST AID/ CPR TRAINING DATE	SITE SPECIFIC TRAINING OR LICENSE REQUIREMENT	HAZWOPER MEDICAL SURVEILLANCE REQUIRED?
Nathan Solomon	40-Hr	March-2025	Oct-2025	n/a	n/a
Micheal Yaseguri	40-Hr	February-2026	February-2025	n/a	n/a
Max Henry Nelson	40-Hr	March-2026	May-2024	n/a	n/a
Olivia M. Holgate	40-Hr	March-2026	August-2026	n/a	n/a

GEOENGINEERS FIELD PERSONNEL REQUIRING RESPIRATOR USE ON THIS PROJECT

NAME OF EMPLOYEE REQUIRING A RESPIRATOR	RESPIRATOR FIT TEST DATE	MEDICAL EVALUATION DATE	RESPIRATOR CLEARANCE DATE	DATE OF ANNUAL REFRESHER TRAINING	APPROVED RESPIRATOR TYPE

Site safety meetings ("tailgate meeting") must be completed at the beginning of each day of site activity and/or at a minimum, weekly for similar activities performed during consecutive days. The site safety meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities. Personnel attending the Site Safety Meeting shall complete the **Site Safety Meeting Record** (Appendix A).

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4.0 Chain of Command

The chain of the command for the Site investigation has been established to provide the **hierarchical structure** in which field personnel reports potential issues or concerns if working conditions change that may affect on-site and off-site health and safety. The project chain of command and functional responsibility for key individuals are presented below.

PROJECT CHAIN OF COMMAND AND CONTACT INFORMATION

CHAIN OF COMMAND	TITLE	NAME	TELEPHONE NUMBERS
1	Current Owner	Jenkins Dossen	360.661.2163 (c) 360.299.1814 (O)
2	Associate In Charge	Robert Trahan	206.240.2300 (c) 206.239.3253 (o)
3	Health and Safety Program Manager	Chad Kean	425.515.5340 (c) 425.284.7256 (o)

CHAIN OF COMMAND	TITLE	NAME	TELEPHONE NUMBERS
4	Project Manager	Jeff Pratt	425.248.3944 (c) 503.603.6683 (o)
5	Client Assigned Site Supervisor/Contractor	n/a	n/a
6	Site Safety Officer	Nathan Solomon	206.437.6819 (c)
7	Field Engineer/Geologist	Nathan Solomon	206.437.6819 (c)
8	Gravity Environmental Consulting Holocene Drilling Analytical Resources LLC	Shawn Hinz Brian Gose Sue Dunahue	425.281.1471 (c) 253.848.6500 (o) 206.695.6200 (o)

The **Functional Responsibility** of individual roles within GeoEngineers health and safety program are described in Appendix B.

5.0 Hazard Analysis

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed taking into account the known and potential hazards at the site and surrounding areas, as well as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work. Updates will be made as necessary to this HASP if new or previous unidentified hazards are encountered. Procedures for reporting incidents involving work-related injuries, illnesses, property damage, or near-miss events and guidelines for investigating and implementing corrective measures to prevent reoccurrence is presented in GeoEngineers **Incident Reporting and Investigation Program** (Appendix C).

Known and/or anticipated hazards are discussed in the following sections.

5.1 JOB HAZARD ANALYSIS

The following presents potential job hazards and mitigation procedures/steps should be followed prior to leaving to the job site, while enroute to the job site and following arrival to the job site to reduce/eliminate these hazards. Prior to departure:

- Use only vehicles appropriate for the work needs and the driving conditions expected.
- Inspect the work vehicle, including:
  - Check for tire cuts, fluid leaks, flat tires, body damage, windshield cracks, and other damage.
  - Check lights, wipers, fluid levels, and seat belts.
  - Check for vehicle warning indicators.
  - Check for current vehicle registration and insurance.
  - Ensure the vehicle has fuel to get to and from your destinations.
  - Ensure the vehicle has a complete and current first aid kit and fire extinguisher.
- Study the area maps, photos, driving routes.

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- Be familiar with GPS use and compass skills (if remote work location).
- Identify the safest spot to park field vehicles.
- Place heavy objects behind a secure safety cage if they must be carried in a passenger compartment.

Discuss potential job, biological, physical, chemical, and ergonomic hazards with Project Manager prior to departure.

ANTICIPATED JOB HAZARDS

JOB HAZARDS (CHECK ALL ANTICIPATED HAZARDS)	
☒ Highway Driving	☐ Unfamiliar Project Location
☐ Driving on Unimproved Roads	☐ Unfamiliar Task
☐ Poor/Inclement Weather Conditions	☐ Unfamiliar Tools or Sampling Equipment
☐ Traveling on Foot	☐ Other: Click here to enter text.
☐ Remote Location/Project Site	☐ Other: Click here to enter text.
☒ Communication	☐ Other: Click here to enter text.
☒ Unfamiliar Project Crew	☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated job hazards including the following:

- **Highway Driving** – Potential hazards include unfamiliar roads, mechanical failure, flat tires, vehicle fire, vehicle collision.
  - ☐ Inform your Project Manager of your destination and estimated time of return.
  - ☐ Carry extra food, water, and clothing.
  - ☐ Drive defensively.
  - ☐ Inspect vehicle prior to departure (see Pre-Job Activities)
- **Unfamiliar Crew and Tasks** – Potential hazards include crew does not notify site owner/manager, unaware of the job site hazards and steps to prevent injury, appropriate personnel protective equipment not worn.
  - ☐ Conduct a tailgate safety meeting discussing the jobs, the hazards and actions that will be taken to prevent injury.
  - ☐ Discuss "Stop Work Authority" as it applies to each site member.
  - ☐ Discuss appropriate Personal Protection Equipment (PPE) including high visibility clothing such as reflective vest.
  - ☐ Notify attendant and/or site owner/manager of work activities and location.
  - ☐ Discuss appropriate PPE including high visibility clothing such as reflective vest.
  - ☐ Set up exclusion zone surrounding work area.
- **Communication** – Potential hazards include lack of cell phone coverage, use heavy equipment, large job site without clear address or entrance for emergency crews.
  - ☐ Verify cell phone is working.
  - ☐ Maintain communication with Project Manager throughout job task.

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- ☐ Maintain communication and line of sight with heavy equipment operators.
- ☐ Verify location and contact numbers for emergency medical assistance or 911.
- ☐ Verify designated job site entrance/exit and job site emergency procedures.
- ☐ Review job site health and safety plan.

ELEVATED RISK ACTIVITIES

Does this project have Elevated Risk Activities? Yes ☒ or No ☐

ELEVATED RISK ACTIVITIES	ASSOCIATED PRIMARY FIELD TASK(S)	SEPARATE ERA JHA COMPLETED?
Heat/Cold Injury Risk	Sediment Sampling	See Section 5.1.1 and 5.1.2
Work Over/Near Water	Sediment Sampling	See Section 5.1.3
Choose an item.		

5.1.1 Cold Stress Prevention

Working in cold environments presents many hazards to Site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing) or hypothermia (lowering of the core body temperature). The combination of wind and cold temperatures increases the degree of cold stress experienced by Site personnel. Site personnel shall be trained in the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

Additional details of GeoEngineers' **Cold Stress Prevention Program** are presented in Appendix D.

5.1.2 Heat Stress Prevention

State and federal OSHA regulations provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with these requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

Site personnel shall be trained in the signs and symptoms of heat-related illnesses, how the human body adapts to hot environments, and how to prevent the onset of heat-related illnesses. When employee exposure is at or above an applicable temperature listed in the Heat Stress table below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.
- A cooled, shaded rest area should be available to workers.

HEAT STRESS

TYPE OF CLOTHING	OUTDOOR TEMPERATURE ACTION LEVELS
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°

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TYPE OF CLOTHING	OUTDOOR TEMPERATURE ACTION LEVELS
All other clothing	89°

Additional details of GeoEngineers' **Heat Stress Prevention Program** are presented in Appendix E.

5.1.3 Boat, Over Water and Near Water Safety Program

Use of a boat for work requires safe boating practices, good equipment, and training. These procedures are not meant to replace the safety manuals that are provided by the U.S. Coast Guard. Instead, they should highlight some of the areas of concern and address specific GeoEngineers, Inc. work procedures. While working near water over waist deep or while on a boat, using a Coast Guard approved flotation device should be used. Remember that being submerged in water increases the chance of hypothermia. It is recommended to have a dry set of clothes and work with a buddy if you are working around water. If an employee is required to work in the water, they should wear appropriate gear including a wet suit or dry suit if necessary for safe accomplishment of the task.

Additional details of GeoEngineers' **Working Over Water Safety Program** are presented in Appendix F.

5.2 PHYSICAL HAZARDS

Physical hazards potentially at the Site and mitigation measures and/or procedures for addressing potential physical hazards are summarized below.

ANTICIPATED PHYSICAL HAZARDS

PHYSICAL HAZARDS (CHECK ALL ANTICIPATED HAZARDS)	
☒ Drill Rig and Support Truck	☐ Overhead Hazards/Power Lines
☐ Backhoe	☒ Tripping/Puncture/Pinch Hazards
☐ Trackhoe	☐ Unusual Traffic Hazard
☐ Crane	☒ Noise
☐ Front End Loader	☒ Other: Over-Water Work
☐ Excavations/Trenching (1:1 Slopes for Type B soil)	☐ Other: Click here to enter text.
☐ Shored/Braced Excavation (Greater than 4' Deep)	☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated physical hazards including the following:

- High-visibility vests and life jackets will be worn by on-site personnel to ensure they can be seen by equipment operators. Use proper lighting in the work areas.
- Field personnel will be aware at all times of the location and motion of equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating equipment only when they are certain, the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Personnel will avoid tripping hazards and other hazardous encumbrances.

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5.3 BIOLOGICAL HAZARDS

Biological hazards potentially at the Site and mitigation measures and/or procedures for addressing potential biological hazards are summarized below.

ANTICIPATED BIOLOGICAL HAZARDS

BIOLOGICAL HAZARDS (CHECK THE HAZARDS ANTICIPATED FOR THE PROJECT)
☒ Wildlife (insects, snakes, etc.)
☐ Human Waste
☒ Animal Waste
☐ Hypodermic needles or other infectious hazards
☐ Poison Ivy or other vegetation
☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated biological hazards including the following:

- Animal/Wildlife Hazards:
  - Use insect repellant as necessary.
  - If employee has bee sting allergy, carry epi-pen.
  - Stay alert and safe distance away from any other biological hazards (e.g. otters, seals, hunters).
  - Wear appropriate PPE including gloves, long sleeves and pants, mosquito hats and waders if probability of encountering biting or stinging insects.

5.4 ERGONOMIC HAZARDS

Ergonomic hazards potentially at the Site and mitigation measures and/or procedures for addressing potential ergonomic hazards are summarized below.

ANTICIPATED ERGONOMIC HAZARDS

ERGONOMIC HAZARDS (CHECK THE HAZARDS ANTICIPATED FOR THE PROJECT)
☒ Heavy Lifting
☒ Repetitive Motion
☐ Force
☐ Awkward Positioning Held for a Long Time
☐ Contact Stress
☐ Vibration
☐ Other:
☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated ergonomic hazards including the following:

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- Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
- Avoid overextending by standing up when retrieving objects on shelves.
- Keep your back in shape with regular stretching exercises.
- Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.
- Proper Lifting Techniques:
  - Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.
  - Bend at the knees, keeping your back straight. Wrap your arms around the object.
  - Let your legs do the lifting.
  - Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

5.5 CHEMICAL HAZARDS

The following tables presents a summary of the chemicals known to be historically or currently present at the Site of regulatory concern and their range of detected concentrations based on previous investigations and their associated occupational exposure limits (OEL). GeoEngineers typically uses the most conservative (lowest) of the limits published for the protection of its' workers. Note that additional contaminants of concern in addition to those listed may be present. Additional information regarding the listed chemical compounds is presented in Appendix G. Associated occupational exposure limits (OEL) for listed chemical compounds are presented in Appendix H.

ANTICIPATED CHEMICAL HAZARDS, EXPOSURE ROUTES AND SYMPTOMS

CHEMICAL COMPOUND	MAXIMUM DETECTED CONCENTRATION	UNIT	MEDIA OF CONCERN	EXPOSURE ROUTES	SYMPTOMS OF EXPOSURE
Arsenic	14	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin. Target organs: liver, kidneys, skin, lungs, lymphatic system (lung and lymphatic cancer)
Cadmium	2	mg/kg	Sediment	inhalation, ingestion, skin and/or eye contact	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]

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CHEMICAL COMPOUND	MAXIMUM DETECTED CONCENTRATION	UNIT	MEDIA OF CONCERN	EXPOSURE ROUTES	SYMPTOMS OF EXPOSURE
Chromium	124	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	Chromium III is an essential nutrient, Chromium VI can cause irritation to nose, skin ulcers, linked to cancer.
Copper	248	mg/kg	Sediment	Inhalation, ingestion, skin and eye contact	Irritated eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis
Lead	23	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, wrist and ankle paralysis, encephalopathy, kidney disease, irritated eyes, hypotension
Mercury	0.5	mg/kg	Sediment	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes and skin, coughing, chest pain, difficulty breathing, bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion), stomatitis, salivation, gastrointestinal disturbance, anorexia, weight loss, proteinuria
Zinc	784	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]
Tributyltin	382	µg/kg	Sediment	See Below	See Below
cPAHs	1,174	mg/kg	Sediment	Ingestion, inhalation, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen
PCBs	160	µg/kg	Sediment	Skin absorption, ingestion, inhalation	Immunological (Immune System), Neurological (Nervous System), Skin, thyroid, stomach and liver damage, EPA: Probable human carcinogen
Dioxin/ Furans	11.26	ng/kg	Sediment	See Below	See Below

Notes:
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram
ng/kg = nanogram per kilogram

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5.5.1 Tributyltin

Organotins are tin-based compounds historically used in marine antifouling paints, PVC stabilizers, pesticides, and industrial processes. The most significant environmental source is legacy contamination from antifouling paints containing Tributyltin (TBT) and Triphenyltin (TBT), which leached into waterways and now persist in sediments, particularly around marinas and shipyards. Additional sources include leaching from Polyvinyl chloride (PVC) products and historical agricultural uses.

Organotins are highly toxic and act as endocrine disruptors, affecting hormone systems, reproduction, and metabolism in both humans and wildlife. They can suppress immune function, impact neurological development, and bioaccumulate in aquatic organisms. Ecologically, they are best known for causing "imposex" in marine snails and broader toxicity to aquatic life, making them a long-term concern in contaminated sediments even after regulatory bans.

Organotins can affect people primarily through ingestion (contaminated seafood), skin contact, or inhalation in occupational settings. Health concerns include endocrine disruption (hormone interference), immune suppression, neurological effects, and potential impacts on metabolism and reproduction. Exposure to organotins such as TBT can cause a range of symptoms depending on dose and duration. Short-term exposure may lead to skin and eye irritation, headaches, dizziness, nausea, and respiratory irritation, while long-term exposure is associated with endocrine disruption, weakened immune function, neurological effects like difficulty concentrating, and potential reproductive impacts. Symptoms are uncommon at typical environmental levels but are more likely in occupational settings or with direct contact with contaminated materials.

To prevent exposure, the most effective measures are avoiding direct contact with contaminated sediments or materials, using appropriate personal protective equipment (gloves, protective clothing) in occupational settings, and following good hygiene practices (washing hands, preventing ingestion of soil/sediment).

5.5.2 Dioxins/Furans

Dioxins and furans are persistent organic pollutants that enter marine sediments primarily through combustion and industrial processes. Key sources include waste incineration (especially incomplete combustion of chlorinated materials), historical pulp and paper bleaching, metal smelting, chlorine-based chemical manufacturing, and burning of treated wood or fuels containing chlorine compounds. These compounds—often grouped as "dioxins" (e.g., 2,3,7,8-TCDD) and "furans"—are transported through the air and deposited onto land and water surfaces, where they strongly bind to organic matter and accumulate in sediments, particularly in low-energy marine environments like harbors, slips, and industrial shorelines.

For site workers, exposure routes include direct skin contact with contaminated sediment or dredged material, incidental ingestion from hand-to-mouth contact, and inhalation of contaminated dust or aerosols during activities like dredging, excavation, or sediment handling. Because these compounds are highly lipophilic, dermal absorption can also contribute over time if proper controls are not used.

Health effects from significant or repeated exposure include skin conditions such as chloracne (a hallmark effect), liver enzyme changes, immune system suppression, endocrine disruption, and potential developmental and reproductive toxicity. Long-term exposure is also associated with increased cancer risk. In most modern work environments, risk is managed through controls such as protective clothing,

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respiratory protection when dust is generated, hygiene measures (handwashing and avoiding ingestion), and dust suppression during sediment disturbance.

6.0 Personal Protective Equipment

The appropriate personal protective equipment (PPE) will be selected on a daily or task-specific basis. These PPE selections will be communicated to field personnel during the pre-work briefing, **before** the start of site operations. PPE ensemble shall be selected daily or before each separate task to provide protection against known or anticipated hazards. To obtain maximum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE.

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.
- Anticipated Personal Protective Equipment for Use

ANTICIPATED PPE FOR THE PROJECT (CHECK ALL THAT APPLY)	
Head Protection	**Eye & Face Protection**
☒ Hard Hat	☒ Safety Glasses
☐ Climbing Helmut	☐ Face Shield
☐ Sunhat	☐ Goggles
☐ Other: Click here to enter text.	☒ Sunglasses
Ear & Hearing Protection	**Hand Protection**
☒ Ear Plugs	☒ Nitrile
☒ Ear Muffs	☐ Latex
☐ Flanges	☐ Leather
☐ Other: Click here to enter text.	☐ Cut Resistant/Kevlar/Leather
Feet Protection	**Protective Clothing**
☒ Leather Boot (steel toe)	☒ High-vis Vest
☒ Rubber Boot (steel toe)	☐ Tyvek (if dry conditions are encountered, Tyvek is sufficient) (modified Level D or Level C)
☐ Hiking Boot	☐ Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue) (modified Level D or Level C)
☒ Hip Wader	☐ Snake Chaps
☒ Chest Wader	☐ Fire Retardant Clothing
☐ Other: Click here to enter text.	☒ Rain gear (as needed)

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ANTICIPATED PPE FOR THE PROJECT (CHECK ALL THAT APPLY)	
☐ Other: Click here to enter text.	☒ Long Sleeve Shirt
☐ Other: Click here to enter text.	☒ Layered warm clothing (as needed)
☐ Other: Click here to enter text.	☒ Other: Life Jacket

Additional details of GeoEngineers' **Personal Protective Equipment Program** are presented in Appendix I.

7.0 Personnel Medical Surveillance

Field personnel on this job site are ☐; are not ☒ entered in a GeoEngineers provided medical surveillance program.

GeoEngineers employees are required to be in a medical surveillance program when they fall into the category of "Employees Covered" in OSHA 1910.120(f)(2) (or Chapter 296-842 WAC). This includes:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.
- All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations.
- All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

8.0 Air Monitoring Plan

Air monitoring for personal exposures will ☐, will not ☒ be implemented as part of this HASP.

Due to the nature of the media of concern (i.e., sediment) and sampling methodology (i.e., grab samples), inhalation of volatiles and/or dust particulates is not expected as sampling activities will be performed under saturated conditions. Other potential exposure routes (skin absorption, ingestion, and eye contact) will be mitigated through the use of PPE and safe work practices.

9.0 Site Control Plan

9.1 TRAFFIC OR VEHICLE ACCESS CONTROL PLAN

Traffic or Vehicle Access Control Plan will ☐, will not ☒ be implemented as part of this HASP.

Sampling equipment utilized for implementation of the field activities requires the use of a research vessel. Therefore, a Traffic/Vehicle Access Control Plan has **not** been developed as part of this HASP.

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9.2 SITE WORK ZONES

The work zone for the project is considered to be all working areas onboard the research vessel. Employees should work upwind of the machinery if possible. To the extent practicable, use the buddy system. Do not approach heavy equipment unless you are sure the operator sees you and has indicated it is safe to approach. For this project, the following are established:

- **Exclusion Zone** – An exclusion zone will be established as all working spaces onboard the research vessel. Only people with the appropriate training will enter this perimeter while work is being conducted in these exclusion zones. Drinking, eating and smoking are not allowed.
- **Reduction Zone** – The reduction zone is established as the at which personnel exit the working area of the research vessel. Used PPE (gloves, rags, etc.) must be placed in a garbage bag prior to exiting the reduction zone. Personnel should wash hands before eating or leaving the reduction zone. Drinking, eating, and smoking are not allowed.
  - Decontamination, at a minimum, should include removing and disposing of PPE when exiting the exclusion zone and washing your hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using buckets and brushes provided on site in the contamination reduction zone. If needed, inner gloves will then be removed, and hands and face will be washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and wash before eating, drinking or leaving the site.
  - Reusable equipment decontamination will include:
    - Seawater rinse over equipment to dislodge and remove any sediment (deionized water will be used for the samples collected on land);
    - Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
    - Deionized water rinse.
- **Support Zone** – The support zone is established as the shoreline or dock areas. Drinking, eating, smoking and using phone are allowed.

9.3 BUDDY SYSTEM

Personnel on site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on site, a buddy system can be arranged with subcontractor/ contractor personnel.

- Positive communications (within sight and hearing distance or via radio) should be maintained between workers on site, with the pair remaining in proximity to assist each other in case of emergencies. The field team should prearrange other emergency signals for communication when voice communication becomes impaired (including cases of dropped cell phone or radio breakdown) and an agreed upon location for an emergency assembly area.
- All personnel from GeoEngineers and subcontractor(s) should be made aware of safety features during safety tailgate meetings (drill rig shutoff switch, location of fire extinguishers, cell phone numbers, etc.).
- On-site personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus only when they are certain the operator has indicated it is safe to do so. (“Show My Hands Technic” or another agreed sign language).

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9.4 SPILL CONTAINMENT PLANS

Will spill containment contingencies be needed on this project? Yes ☐ or No ☒

9.5 SAMPLING, MANAGING AND HANDLING DRUMS AND CONTAINERS

There will be drums or sealed containers on site during this project? Yes ☒ or No ☐

Drums and containers used during the investigation and/or cleanup activities shall meet the appropriate Department of Transportation (DOT), OSHA, U.S. Environmental Protection Agency (EPA) and applicable state regulations for the waste that they contain. Site operations shall be organized to minimize the number of drum or container on-site temporary storage and movement. When practicable, drums and containers shall be inspected, and their integrity shall be ensured before they are moved. Unlabeled drums and containers shall be considered to contain hazardous substances and handled accordingly until the contents are positively identified and labeled. Before drums or containers are moved, all employees involved in the transfer operation shall be warned of the potential hazards associated with the contents. Personnel involved with the coordination of the drum or container's off-site disposal shall ensure that the off-site disposal facility is approved by the Project Manager and the Client.

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupturing may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

INVESTIGATIVE DERIVED WASTE (IDW) DISPOSAL OR STORAGE

IDW TYPE	ACTION
Sediment	☒ Secured (list method): Contained at the Ports Pier 2 facility within sealed and secured 35/55-gallon drum
	☒ Other (describe destination, responsible parties): Disposal pending chemical analysis and disposal vendor subcontracting.
PPE	Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered de minimis and will be disposed of in a local trash receptacle or county disposal facility.

9.6 SANITATION

Sanitary facilities are available at Port facilities and local restaurants/businesses.

9.7 LIGHTING

Work is anticipated to be performed during daylight hours. Work may extend slightly into the evening provided adequate lighting is used (e.g. portable flood lights).

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10.0 Emergency Response Plan

EMERGENCY EVENT	RESPONSE PLAN
Medical	Call 911
High Winds	Maritime small vessel restrictions are in effect.
Heavy Rain	Use rain gears as appropriate.
Choose an item.	

10.1 GENERAL RESPONSE GUIDANCE

- If any member of the field crew experiences any adverse exposure symptoms while on site or an injury, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety Officer.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and re-evaluation of the hazard and the level of protection required.
- As soon as feasible, notify GeoEngineers' PM and follow the GeoEngineers' Incident Reporting and Investigation Program, and Health and Safety Injury Management Procedures Flowchart (see copy attached to this HASP).
- If an accident occurs, the Site Safety Officer and the injured person are to complete, within 24 hours, an Incident Report for submittal to the PM, the HSPM, and HR. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

10.2 STANDARD EMERGENCY PROCEDURES

- Get help.
  - Send another worker to phone 9-1-1 (if necessary)
  - As soon as feasible, notify the GeoEngineers' Project Manager and/or GeoEngineers HSM and follow the GeoEngineers' Incident Reporting and Investigation Program, and Health and Safety Injury Management Procedures Flowchart (see copy attached to this HASP).
- Reduce risk to injured person.
  - Turn off equipment.
  - Move person from injury location to safer area (if in life-threatening situation only)
  - Keep person warm
  - Perform CPR (if necessary)
- Transport injured person to medical treatment facility (if necessary).
  - By ambulance (if necessary) or GeoEngineers vehicle.
  - Stay with person at medical facility.
  - Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation.

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- Accidents involving injuries requiring professional medical attention must be reported as soon as feasible to the Site Safety Officer and/or Health and Safety Team.
- First aid cases not involving professional medical attention must be reported within 24 hours after occurrence.
- Incidents involving property damage must be reported within 24 hours of occurrence.
- After hours illnesses must be reported within 24 hours (i.e. flu, rashes).

Emergency/Hospital Contact Information and Directions are presented in Appendix J.

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Appendices

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Appendix A
Site Safety Meeting Record

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Site Safety Meeting Record (Daily or Weekly)

Project Name:_____ Project Location:_____ File No.:_____

Site Safety meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities. Site safety meeting should be completed prior implementing site activities at a minimum in the beginning of each day and/or at a minimum weekly for similar activities performed few consecutive days.

- Use in conjunction with the HASP Hazard Review and ERA Job Hazard Analyses (JHA) Form 3 to help identify hazards with the planned activities and activities performed concurrently by others at the site in the vicinity of the working areas.

Date: _____ **Site Safety Officer (SSO):**_____

Topics: _____

_____

Attendees:

Print Name Company **Signature**

_____

_____

_____

_____

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Appendix B
Functional Responsibility

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Appendix B
Functional Responsibility

HEALTH AND SAFETY MANAGER (HSM)

GeoEngineers' Health and Safety Manager (HSM) is responsible for implementing and promoting employee participation in the company Health and Safety Program. The HSM has overall responsibility for the general health and safety of GeoEngineers personnel. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

HEALTH AND SAFETY SPECIALIST (HSS)

GeoEngineers' Health and Safety Specialist (HSS) is a designated safety specialist. The HSS provides technical support to the PM and Site Safety Officer (SSO) to ensure that that GeoEngineers staff are following GeoEngineers safety program and safe work practices during site activities. The HSS works with the PM and SSO to ensure the subcontractors' crews are following the site general HASPs, the activities HASP/JHAs and safe work practices. The HSS may periodically go on-site to perform safety observations and mentor on-site personnel on safety behavior practices. Additionally, the HSS has the authority to suspend work or modify work practices for safety reasons and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others. The HSS shall keep the PM and HSM informed of the project's health- and safety-related matters, as necessary.

HEALTH AND SAFETY AUTHORIZED CONSULTANT (HSC)

GeoEngineers' Health and Safety Authorized Consultant is a GeoEngineers employee who is given written authorization to act in the role of a Consultant with regard to Health and Safety on project sites. The HSC provides technical support to the PM and Site Safety Officer (SSO) to ensure that that GeoEngineers staff follow GeoEngineers safety program and safe work practices during site activities. The HSC works with the PM and SSO to ensure the subcontractors' crews are following the site general HASPs, the activities HASP/JHAs and safe work practices. The HSC may periodically go on-site to perform safety observations and mentor on-site personnel on safety behavior practices. Additionally, the HSC has the authority to suspend work or modify site work practices for safety reasons and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others. The HSC shall keep the PM, HSS, and HSM informed of the project's health- and safety-related matters, as necessary.

PROJECT MANAGER (PM)

A PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM has the responsibility of ensuring the safety of all GeoEngineers personnel on job sites. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or Site Safety Plan. He or she is also responsible for assuring that appropriate HASPs are developed. The PM will provide a summary of chemical analysis to personnel completing the HASP. PMs shall also see that their project budgets

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consider health and safety costs. The PM shall keep the HSM and HSS or HSC informed of the project's health- and safety-related matters as necessary. The PM shall designate the project Site Safety Officer (SSO) and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in site safety plans and checklists to appropriate field personnel. Additionally, the PM and SSO shall hold a site safety briefing before any field activities begin. The PM is responsible for transmitting health and safety information to the Site Safety Officer (SSO) when appropriate.

SITE SAFETY OFFICER/HAZWOPER (SSO)

The SSO will have the on-site responsibility and authority to modify and stop work, or remove GeoEngineers personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and CPR qualified and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training when working at hazardous waste sites. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced fieldwork experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring staff compliance with its guidelines.
- Ensuring that all GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Lead the pre-entry briefing (at the beginning of the site activities) and the site safety meetings (daily and/or weekly), with onsite personnel. These meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities
- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with all health and safety practices in the field.
- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM, the HSC or HSS, and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified, and corrective action taken.

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- Documenting all site accidents, injuries, illnesses and unsafe activities or conditions and/or near misses, and reporting them to the PM, HSC or HSC and the HSM as soon as practical, but no later than the end of the day.
- Directing decontamination operations of equipment and personnel.

FIELD EMPLOYEES

All employees working on site that have the potential of coming in contact with hazardous substances or chemical, biological, and/or physical hazards are responsible for participating in the health and safety program and complying with the site-specific health and safety plans. These employees are required to:

- Read, participate and be familiar with the GeoEngineers health and safety programs located in SharePoint. Attend to applicable specific safety training.
- Notify the SSO that when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan discussed during the health and safety pre-entry briefing
- Review applicable Job Hazard Analysis (JHAs) prior starting a new activity and follow the recommended critical actions to mitigate hazards.
- Think through potential hazards at the beginning of a new task, before changing tasks, and when conditions changes and after a near miss or incident.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to near misses, incidents or accidents that could result in physical injury or exposure to hazardous materials and/or equipment damage.
- Participate in health and safety training, including initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program, if applicable.
- Any field employee working on site may stop work if the employee believes the work is unsafe.

GEOENGINEERS LABORATORY MANAGER

When GeoEngineers lab use is anticipated, the Laboratory Manager will coordinate the receipt of samples for analysis with the Project Manager. The communication will include historical environmental data and/or field screening results. The Laboratory Manager will ensure all laboratory staff are following SOPs for the soils type or limited chemical constituents. SOPs will be developed and maintained under the direction of the Laboratory Manager and the HSM.

CONTRACTORS UNDER GEOENGINEERS SUPERVISION

Contractors working on the site directly for the Client will have their own Health and Safety Plans or Job Hazard Analysis. Sub-contractors working on the site under GeoEngineers supervision that have the potential of coming in contact with hazardous substances or chemical, biological and/or physical hazards shall have their own health and safety programs and safety plan that is generally consistent with the requirements of this HASP.

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Appendix C
Incident Reporting and Investigation Program

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GeoEngineers

Incident Reporting and Investigation Program

Revised September 2022

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Attachments

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Incident Reporting and Investigation Program

Purpose

The purpose of the Incident Reporting and Investigation Program is to establish procedures for reporting incidents involving work-related injuries, illnesses, property damage, or near-miss events and guidelines for investigating and implementing corrective measures to prevent reoccurrence. GeoEngineers is committed to the prevention of jobsite engineering, personnel, and security-related incidents and correcting the cause behind any such incidents which occur through easy, safe, and effective incident reporting and investigation programs.

Scope

This program applies to all GeoEngineers employees, project and office locations, unless the Health and Safety Manager grants a variance from the requirements.

Responsibilities

Principals/Associates/Project Managers/Group Leaders/Site Supervisors—Responsible for ensuring that the provisions of this program are implemented and followed at locations in which they have oversight and influence. Including:

- Ensuring employees are aware of incident reporting procedures.
- Immediately reporting up all workplace related injuries, illnesses, and jobsite security incidents which occur in their area of responsibility. Provide written reports of all investigations and planned corrective actions to the Health and Safety Manager.
- Correct identified workplace hazards found in the risk assessment or report up deficiencies they cannot correct.
- Communicate key health and safety regulations to affected employees and ensuring they are aware of jobsite security incidents and reporting procedures.

Health and Safety Manager—GeoEngineers' Health and Safety Manager (HSM) shall monitor and evaluate the Incident Report and Investigation Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements shall be promptly addressed. Additional duties include:

- Conduct worksite evaluations in cooperation with supervisors and employees to identify potential hazards and the ways to avoid or correct them to prevent injuries.
- Establish a system for communicating with employees in readily understandable methods relevant and up to date information related to their safety and health.
- Maintain records of activities and training related to incident reporting.
- Review the effectiveness of the incident reporting system and investigation programs with supervisor and employee input at least annually.

Employees—GeoEngineers employees are responsible and accountable for complying with this program. Including:

- Attending all required training programs provided.

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- Reporting known or suspected safety hazards to their Supervisor or Safety Coordinator through incident reporting procedures, including injuries and jobsite security incidents, immediately.
- Reporting all workplace related injuries or illnesses to their supervisor.

Definitions

Occupational Safety and Health Administration (OSHA)—part of the United States Depart of Labor and is the agency assigned to enforce the regulations of the Occupational Safety and Health Act of 1970.

OSHA Recordable Incident—an injury or illness that is work related and results in one of the following:

- Death
- Days away from work
- Restricted work activity
- Transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- Significant injury or illness diagnosed by a Licensed Health Care Provider (LHCP)

The following are generally considered first-aid treatment (e.g., one-time treatment and subsequent observation of minor injuries) and are not OSHA recordable if the work-related injury does not involve loss of consciousness or any of the case types listed above.

First Aid Treatment: (This is a limited list)

- Using non-prescription medications at non-prescription strength;
- Tetanus immunizations;
- Cleaning, flushing, or soaking surface wounds;
- Wound coverings, butterfly bandages, steri-strips;
- Hot or cold therapy;
- Non-rigid means of support;
- Temporary immobilization device used to transport accident victims;
- Drilling of fingernail or toenail, draining fluid from blister;
- Eye patches;
- Removing foreign bodies from eye using irrigation or cotton swab;
- Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs, or other simple means;
- Finger guards;
- Massages;
- Drinking fluids for relief of heat stress;
- Visits to a Licensed Health Care Provider for observation or counseling;

If first aid, but no medical treatment was given to the injured employee, the incident is not OSHA recordable.

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Root Cause Analysis (RCA)—an investigative procedure which helps to determine the most basic cause that can reasonably be identified, that management has control to fix, and for which effective corrective actions for preventing recurrence can be generated.

General Requirements

Work related near-misses, injuries and illnesses must be reported at the time of the incident or as soon as possible afterwards (see flowchart on page 3). Fatalities must be reported within 8 hours and all other incidents within 24 hours. Timely and accurate reporting is necessary for documenting incident details, evaluating preventive and corrective actions, enabling post-incident management and to comply with OSHA recordkeeping requirements.

Whenever possible, reporting should be done online through GeoEngineers Safety Hub website so that the report will be sent out to all relevant parties and archived. Safety Hub can be reached through connect.geoengineers.com or though this link.

An incident investigation shall be conducted for all OSHA defined recordable incidents and work-related incidents resulting in property damage – with or without injuries. First aid and near-misses will also be investigated as necessary by the Health and Safety Manager, for use in sharing lessons learned with the Company. All investigation will be documented in an incident report and if necessary published.

Implementation

Incident Reporting Procedures

Work related injuries and illnesses must be reported at the time of the incident to the affected employee's supervisor, the job site supervisor, project manager, or if none of those are available the current HSM. Initial notification should be verbal, though later reports may be digital or written. If Emergency Medical Services (EMS) are required, dial 911 for an ambulance. If an ambulance is not required, the injured/ill employee should drive or be driven to the medical facility as follows:

- As soon as safe to do so incidents are reported using the Safety Hub Incident Reporting system.
- An employee with a non-emergency illness such as poison ivy or a skin rash, for example can transport him/herself to a facility that provides medical attention.
- Injuries/illness of a more serious nature may require that the employee be driven for medical treatment by another GeoEngineers employee or other available individual.
- Serious accidents (such as those involving fatal injury, staff admitted to a hospital, or excessive property damage) should also be reported to the building or property owner, the police, and the appropriate OSHA or State approved authority. The scene should be left secured and undisturbed, if possible, for the purposes of follow-up investigation.
- Attachment A. Health and Safety Injury Management Procedures Flowchart presents the process for response to an incident utilizing the Safety Hub Incident reporting system.

After an employee is involved in an incident that causes injury or a significant near miss, the employee involved must verbally report it to their Project Manager or Supervisor. The Project Manager or Supervisor shall notify the HSM within one (1) hour of the event or as soon as possible. This must be done regardless of whether there appears to be a significant injury at the time. The employee submits the Incident Report Form using the Safety Hub Incident Reporting system. The employee fills out sections of this form that they know at the time. Based on the type of incident, the employee will receive documents that will be required

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for insurance purposes: Vehicle Accidents (Enclosure 1); Property Damage (Enclosure 2); Stolen Equipment (Enclosure 3). A witness statement form is included in Enclosure 1.

Project Manager /Supervisor Immediate Response

When a Project Manager (PM) or Supervisor learns that an employee has been involved in an incident, the priority is to ensure the health and well-being of the employee involved and others on site.

The supervisor also helps to ensure that the incident scene is not disturbed to the extent possible; and that preserving the scene does not interfere with the immediate treatment of any employees. An undisturbed accident scene will provide the best answers as to the cause of the accident during the investigation phase. The scene should be marked off by cones, tape, or guards if necessary to prevent contamination or alteration. If the accident is potentially serious, the Supervisor should, after discussion with PM/HSM, discontinue work until the accident has been investigated and the cause of the accident corrected.

After the injured employee has recovered to the point that they can complete paperwork, they must complete the Employee's section of the Incident Report Form. If medical care is sought, the employee must also complete a claim form for Worker's Compensation.

If the incident caused a fatality, probable fatality, or the hospitalization of two or more persons, the PM or Supervisor shall immediately notify their supervisor, the HSM and Human Resources. The HSM must make a report to State/OSHA within eight (8) hours. In addition to the Company's own internal investigation, State/OSHA may also conduct one as well. The accident scene must be blocked off and left undisturbed until State/OSHA arrives, unless it is necessary to move something to treat the victim(s).

Incident Investigations

Injuries to people, accidents, significant near misses, unsafe conditions and unsafe practices shall be investigated by the HSM or their qualified designee. RCA process shall be used to investigate an incident and implement corrective measures to prevent reoccurrence. All members of the investigation team will be trained and competent in investigations.

Prior to the investigation beginning, all emergency response procedures must be completed, and the incident site must be safe and secure for entry and investigation. All evidence must be recorded and preserved.

An incident investigation should include a thorough review of the following areas:

- Physical conditions at the time of the incident;
- Location of the incident;
- Action of the person injured;
- A description of the injury;
- The methods/procedures in use while conducting work;
- Training of personnel involved;
- Experience level of personnel;
- Date, time, and shift on which incident occurred;
- Other person(s) involved (including subcontractors or client);
- Unusual job conditions

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- Routine/Non-routine work;
- Property damage or vehicle;
- Vehicle: To fast? Other causes?

A tool/equipment accident investigation will include a thorough review of the following physical conditions:

- Machines; Guarded? Adjusted? Maintained? Right one for the job?
- Tools: Portable equipment? Proper materials? Proper handling of equipment? Proper tool for job? Condition and correct use of the equipment?
- Environment; Lighting? Floor surface? Vapors, smoke, fumes? Layout – crowded or congested? Noise? Hot or cold?

Basic questions to ask:

- Has a Job Hazard Analysis (JHA) or Health and Safety Plan (HASP) been developed for the job?
- Was the JHA/HASP followed?
- Should changes have been made to procedures?
- Who was involved?
  - Who is the principal lead and/or PM?
  - Who was the incident victim any?
  - What subcontractor(s) were involved?
- What was the incident?
  - Any severe injuries?
  - Name of the project it happened on?
  - Who witnessed the injury?
  - What hospital was the injured person taken to?
  - Any equipment involved?
- When did the incident occur?
  - During work hours or off time?
  - Start of project, middle, or end?
  - Any new employees on site?
- Where did the incident occur?
  - What state?
  - In city or rural? Along road?
    - Traffic Safety Control Plan?
  - What work site?
- Why did the incident happen? (speculate)
  - Where conditions unusual?

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- What was the weather like?
- Has the subcontractor been used before?
- What is the safety record on site?
- Did employees receive all safety training for site?

Resources: (Found on Health and Safety Department page)

- Incident Report Form;
- Root Cause Analysis Form;
- Job Hazard Analysis (JHA);
- Safety regulations – OSHA regulations, GeoEngineers Health and Safety Program, Client policies;
- Health and safety training records (Ask Health and Safety Administrator or Office Manager).

When conducting RCA:

- Let people talk, don't ask leading questions;
- Allow for personality traits and don't assign blame;
- Be specific when questioning;
- Get all sides of the story;
- Establish specific corrective actions and dates to prevent a reoccurrence.
- Remember – a copy of the incident investigation report may be requested by external parties (e.g., regulatory agencies, clients, insurance companies, judges, lawyers, etc.). The report must be prepared professionally and must only contain incident facts, not supposition.

GeoEngineers Return to Work program will be referred to, as necessary. Attachment C, Return to Work Arrangements worksheet, is provided for use when an incident requires a doctor's visit or when other than first aid is provided.

Investigation recommendations will be given to the PM of the site of the injury and if beneficial further distributed to relevant employees for educational purposes. Corrective actions will be documented in the investigation report and implemented by the PM and site supervisors.

Training and Record Keeping

Awareness training regarding this program shall be provided during new employee orientation, a manager webinar or brown bag meeting, and periodically through other forms of electronic communication (such as feature safety articles). Additionally, employees working at client sites may need to complete client specific training pertaining to accident/injury prevention and investigation. Training will be documented in Ascent.

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Attachments

The following forms shall be used for documenting activities associated with this procedure:

- Attachment A. Health and Safety Injury Management Procedures Flowchart
- Attachment B. Incident Report Form
  - Insurance Report Enclosure 1 — Vehicle Accident
  - Insurance Report Enclosure 2 — Property Damage
  - Insurance Report Enclosure 3 – Stolen Equipment
- Attachment C. Return to Work Arrangements Form

Issued March 1, 2014
Revised August, 2018
Revised September 7, 2022

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Attachment A

Health and Safety Injury Management Procedures Flowchart

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Key Contacts

HEALTH & SAFETY TEAM

Lucas Miller, H&S Manager.....509.209.2830 (desk)
208.451.5307 (cell)

Connor Jordan, H&S Specialist 253.722.2426

OFFICE CONTACTS

OFFICE CONTACTS

Baton Rouge/Houston, Nikki Landry 225.293.2460

Bellingham, Susan Arrigoni 360.647.1510

Boise, Michelle Skow.....208.433.8098

Boston/Southborough, Dawn Tosca/Natalia Lebedeva 617.749.9220/508.283.6354

Portland/Lake Oswego, Colleen Baker.....503.624.9274

Redmond, Jackie Weber.....425.861.6000

Seattle/Tacoma, Lisa Huston 253.383.4940

Springfield, Karla Burgbacher 417.831.9700

Spokane/Kennewick, Laura McCulluch 509.363.3125

INSURANCE QUESTIONS

Emily Dahl.....206.239.3229

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Quick Guide to Incident Response & Reporting

1 Assess

– Call 911 if there is an injury that requires emergency medical treatment.
– Use a first aid kit for injuries that do not require professional medical treatment.

IN A VEHICLE ACCIDENT

Call the police if the roadway is blocked or causing a backup, there are uncooperative parties or significant property damage.

Turn your ignition off, use flashers/ leave lights on and remain in the vehicle (if it's dark).

Don't argue, accuse anyone or admit fault. Keep calm!

*Collect information about the other driver, witness(es) and responding officer (if applicable) for insurance purposes (**see Incident Report—Enclosure 1**) for what to collect.*

If the accident occurs in your personal vehicle, provide your personal contact information to the other driver

Take photos of the vehicle(s), damaged area(s) and license plate(s).

2 Notify

Call Lucas Miller, H&S Manager
509.209.2830 (desk) or 208.451.5307 (cell)
If you cannot reach Lucas, contact Connor Jordan: 253.722.2426

– Call your Group Leader and/or Supervisor if an injury requires professional medical treatment
– Call your Administrative Services Manager if you need assistance with a vehicle after an incident.

3 Document

– Fill out the Incident Report Form via Safety Hub.
– If the Incident Report was successfully submitted via Safety Hub, you should receive a confirmation email. Follow up as needed with the Health and Safety Team, Project Manager and other relevant parties.

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Health and Safety Injury Management Procedures Flowchart

Assess **Notify** **Document**

Incident Report Documentation

- Incident Report Form
- Vehicle Accident Insurance Enclosure 1
- Property Damage Insurance Enclosure 2
- Stolen Equipment Insurance Enclosure 3
- Root Cause Analysis
- Return to Work Arrangements
- Incident Reporting and Investigation Program

1. Vehicle Accidents

All vehicle incidents/accidents (meaning any damage to a vehicle resulting in marking, scraping, or denting) involving GeoEngineers employees or vehicles, regardless of seriousness, vehicle weight, vehicle ownership, or fault shall be reported as soon as practical, but always within 24 hours.

Serious accidents and accidents involving commercial motor vehicles (those greater than 10,000 lbs) must be reported at the time of the accident. A "serious accident" is one that involves minor or major injuries to a GeoEngineers employee, the general public and/or causes any resultant property damage greater than $1,000.

If the employee is a technical person, report the incident to the Project Manager. The Project Manager will tell the employee's supervisor. If the employee is a non-technical person, report it to their Supervisor.

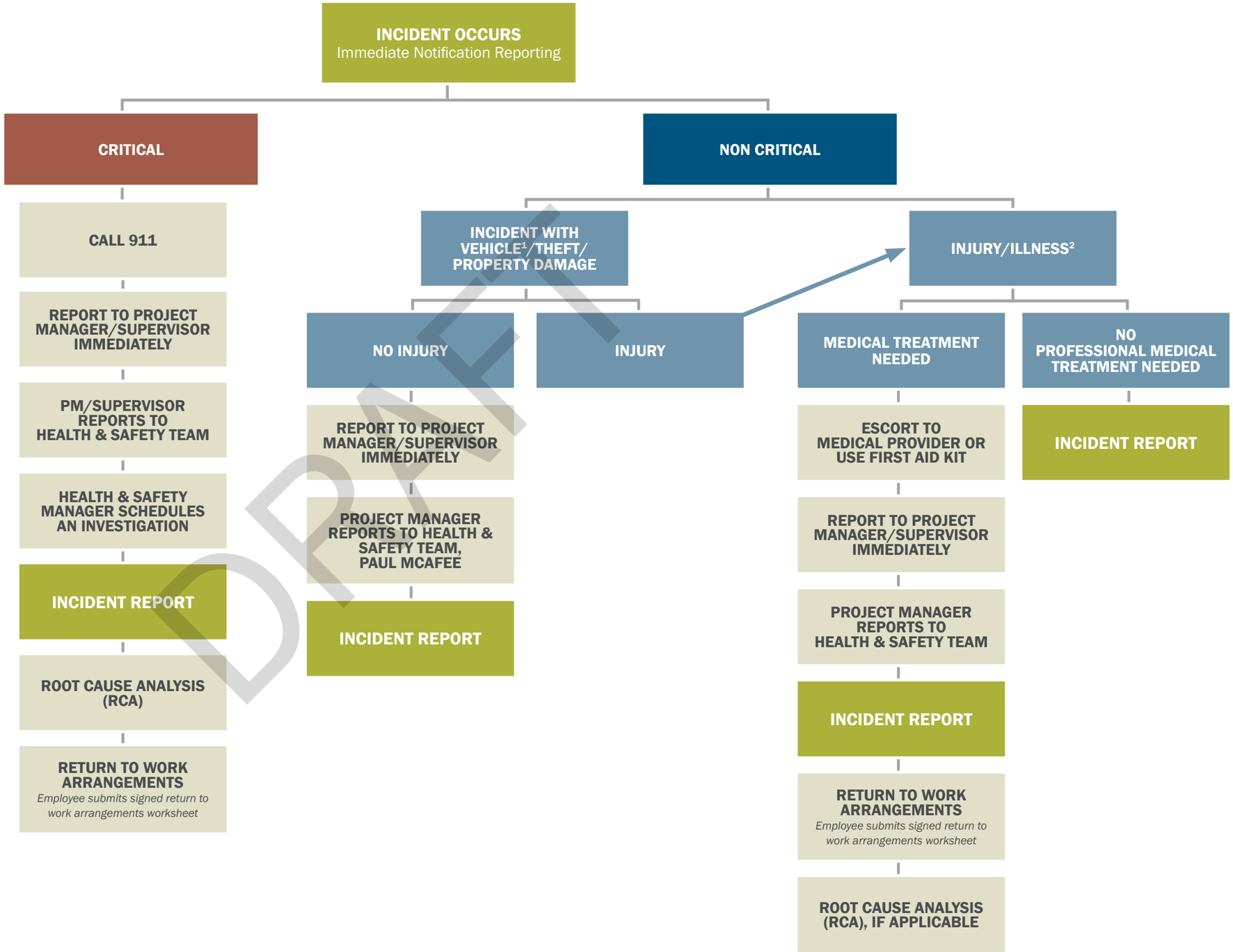
2. Incidents

If Emergency Medical Services (EMS) are required, dial 911 from a cell phone. (Do not use Skype)

If an ambulance is not required, the employee should drive or be driven to the medical facility as follows:

- An employee with a non-emergency illness, such as poison ivy or a skin rash, can transport him/herself for medical attention.
- Injuries/illnesses of a more serious nature require the employee be driven for medical treatment by another GeoEngineers employee, preferably the employee's supervisor.
- Injuries/illnesses that require modified work duties need Return to Work paperwork filled out by physician.

If the employee is a technical person, report the incident to the Project Manager. The Project Manager will tell the employee's supervisor. If the employee is a non-technical person, report it to their Supervisor.



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Attachment B
Incident Report Form

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Incident Report

INCIDENT INFORMATION

Business Unit:	☐ South ☐ West ☐ Puget Sound ☐ Pipeline ☐ Performance Based Design ☐ Corporate		
Injured/Ill Person's Name:		☐ Employee ☐ Other	
Employee Submitting Report: (if not same)			
Incident Location:		Job Number:	☐ N/A
Incident Date and Time:	☐ AM ☐ PM	Supervisor Name:	
Time Employee Started Work:	☐ AM ☐ PM	Date & Time Supervisor Notified:	☐ AM ☐ PM
Notified Project Manager/PA?	☐ YES ☐ NO ☐ N/A	PM/PA Notified:	
Client Notification Required?	☐ YES ☐ NO ☐ N/A	Person Notified:	

INCIDENT DETAILS

What happened? Describe how the incident occurred. Where the employee was located at the time of incident?			
Describe the activity as well as the tools, equipment, or material being used.			
Describe the part of the body that was affected and how. ☐ N/A			
What level of medical treatment was received?	☐ First Aid ☐ Clinic/Physician ☐ Emergency Room ☐ Refused/None		
State the primary cause and contributing factors.			
Was a JHA/HASP prepared?	☐ YES ☐ NO	Did you perform a TSA before starting work?	☐ YES ☐ NO
How do you think this type of incident could be prevented or avoided in the future?			

INSURANCE DETAILS (CHECK ALL APPLICABLE ITEMS)

Vehicular Accident ☐ (**Complete Insurance Enclosure 1**)	Property (Non-Vehicle) Damage ☐ (**Complete Insurance Enclosure 2**)	
☐ Company Owned	☐ Company (owned, leased rented)	☐ Fire
☐ Rental	☐ Client/Subcontractor	☐ Explosion
☐ Personal	☐ Other	☐ Flash
Stolen Equipment ☐ (**Complete Insurance Enclosure 3**)		

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SUPERVISOR COMMENTS

Supervisor Name:		Date:	

PROJECT MANAGER COMMENTS

Project Manager Name:		Date:	

HEALTH & SAFETY REPRESENTATIVE COMMENTS

H&S Representative Name:		Date:	

CORRECTIVE ACTION

H&S Representative Name:		Date:	

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Insurance Report Enclosure 1 — Vehicle Accident

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Insurance Report—Enclosure 1

VEHICLE ACCIDENT

Accident Information

Employee Name:			
Date of Accident:		Time:	☐ AM ☐ PM
Accident Location (City, State):			

Driver and Vehicle

Name (if not same):			
Office:		Phone Number:	
VIN:			
Vehicle Year/Make/ Model:			☐ Company Owned ☐ Rental ☐ Personal
Driver's License No.:		License Plate No.:	
Vehicle Damage:			
Estimated Level of Damage	☐ Light	☐ Moderate	☐ Severe

Witness(es) *N/A* ☐

Witness 1 Name:			
Phone (Home):		Phone (Work):	
Address:			
Where located at time of accident:			

Witness 2 Name:			
Phone (Home):		Phone (Work):	
Address:			
Where located at time of accident:			

Police *N/A* ☐

Notified or investigated?	☐ Yes ☐ No	When?	
Name of Officer:			
Station:			
Jurisdiction:			☐ Police ☐ State Patrol ☐ Sheriff
Badge #:		Case or Report #:	
Was anyone cited?	☐ Yes ☐ No	For what reason?	

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Other Vehicle and Driver N/A ☐

Name:		Age:	
Phone (Home):		Phone (Work):	
Address:			
Driver's License No.:		License Plate No.:	
Owner's Name *(if different than operator):*			
Phone (Home):		Phone (Work):	
Address:			
Vehicle insured?	☐ Yes ☐ No	By what company?	
Insurance Agent Name:		Agent Phone Number:	
Vehicle Make/Model/ Year			
Damage to other vehicle or property:			
Where can insured vehicle be seen by adjuster?			

Injured Person(s) N/A ☐

Injured Name 1:		Age:	
Phone (Home):		Phone (Work):	
Address:			
Nature of Injury:			
Which vehicle were they in?:			
Pedestrian?	☐ Yes ☐ No	Were they treated at the scene or removed by medical aid?	☐ At Scene ☐ Removed

Injured Name 2:		Age:	
Phone (Home):		Phone (Work):	
Address:			
Nature of Injury:			
Which vehicle were they in?:			
Pedestrian?	☐ Yes ☐ No	Were they treated at the scene or removed by medical aid?	☐ At Scene ☐ Removed

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Accident Description

What happened just before and at the time of the accident?	
In what direction were you proceeding?	
At what speed?	
Weather?	
Any unsafe conditions contributing to the accident (such as faulty brakes, inclement weather, road obstructions, etc.)?	
Any unsafe acts contributing to the accident (such as turning from wrong lane, speeding, failing to signal, etc.)?	
Who do you believe is at fault for this accident?	

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Witness Statement (if applicable)

Witness Name:		Employee Involved Name:	
Accident Date:		Approximate Time of Accident:	☐ AM ☐ PM
Describe the incident in as much detail as possible (attach additional pages if needed).			
Signature of Individual Providing Statement:			
Phone:		Date:	

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Insurance Report Enclosure 2— Property Damage

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Insurance Report—Enclosure 2

PROPERTY DAMAGE

Incident Information

Employee Name:			
Incident Date:		Time of Incident:	☐ AM ☐ PM
Incident Description:			
Incident Location			
Client Name *(if different than owner)*		Client Phone Number:	
Client Address:			
Contractor that repaired the property and charged for repairs:			
Name and contact information for witnesses:			
Check and attach the following documents, if available:	☐ Copy of contractor's invoice ☐ Pictures taken prior to and after the incident ☐ Copy of police report		

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Insurance Report Enclosure 3— Stolen Equipment

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Insurance Report—Enclosure 3

STOLEN EQUIPMENT

Incident Information

Employee Name:			
Incident Date:		Approximate Time of Incident:	☐ AM ☐ PM
Incident Location:			
Events leading up to the theft:			
Describe equipment or property, including model and serial number (where applicable):			
Check and attach the following documents, if available:	☐ Invoice for purchase of equipment stolen ☐ Invoice for purchase of replacement equipment ☐ Copy of police report		

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Attachment C

Return to Work Arrangements Form

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Return to Work Arrangements for GeoEngineers, Inc.

INJURED EMPLOYEE DETAILS

Employee Name:		Work Location:	
Pre-Injury Job Title:			
Pre-Injury Days/Work Hours:			

Describe the specific duties and tasks required. Include any physical and other requirements, e.g. lifting, sitting, rotation of tasks, etc. Employee check the duties that apply to your daily activities. Job Description Attached? □ YES □ NO

☐ Laboratory

- The ability to perform a wide range of physical activities and do heavy work including exerting up to 50 pounds of force occasionally.
- Ability to perform consistent work on PC.

☐ Field Duties

- The ability to perform a wide range of physical activities and do heavy work including exerting up to 50 pounds of force occasionally.
- Limited work-related driving duties.

☐ Roughneck

- Ability to perform a wide range of physical activities and perform heavy manual labor tasks,
- Ability to stand for long periods of time and exert up to 50 pounds of force repeatedly throughout the day as well as 100 pounds of force occasionally.
- Limited work-related driving duties.

☐ Office Duties

- Limited walking, bending, twisting, standing and reaching.
- Normal office environment with moderate noise levels, occasional lifting of up to 25 lbs., regular walking, sitting, bending, twisting, standing and reaching.
- Ability to perform consistent work on PC.

RETURN TO WORK ARRANGEMENTS

Are workplace supports, aids or modifications to be provided: ☐ YES ☐ NO ☐ N/A

Describe workplace supports, aids or modifications, e.g. rest breaks, buddy system, special tools, equipment, training, etc.

Are specific duties or tasks to be avoided: ☐ YES ☐ NO ☐ N/A

Describe the specific duties and tasks that are to be avoided or restricted, e.g. no loading pallets, tasks that are only to be undertaken with the assistance of another worker.

Are there medical restrictions: ☐ YES ☐ NO ☐ N/A

Describe the restrictions below. From what date or period(s) do these restrictions apply?

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List hours of work and gradual increases in hours, if restrictions are recommended.								
Week	**Mon**	**Tues**	**Wed**	**Thurs**	**Fri**	**Sat**	**Sun**	**Total Hours**
1								
2								
3								
4								

KEY PEOPLE INVOLVED

Employee

I will participate in these return to work arrangements.

Name:		Signed:	
Phone:		Date:	

Physician

These return to work arrangements are consistent with the worker's capacity.

Name:		Signed:	
Phone:		Date:	

Health & Safety Manager

I will monitor and review these return to work arrangements.

Name:		Signed:	
Phone:		Date:	

Supervisor

I will implement these return to work arrangements in the work area.

Name:		Signed:	
Phone:		Date:	

ADDITIONAL INFORMATION

Please attach any supporting documentation e.g. medical reports, position description, photos etc. that support this form.

Please return completed form to:

Lucas Miller, GeoEngineers, Inc. Health and Safety Manager

Telephone: (509) 209-2830 | Email: lmiller@geoengineers.com

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Appendix D

Cold Stress Prevention Program

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GeoEngineers

Cold Stress Prevention Program

Revised August 2020

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GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Cold Stress Prevention Program

Purpose

This program establishes GeoEngineers' requirements for the prevention of work-related injuries and illnesses resulting from participating in outdoor field work during cold weather conditions.

Scope

This program applies in its entirety to GeoEngineers employees and locations unless the Health and Safety Program Manager grants a variance from the requirements.

Responsibilities

Principals/Associates/Project Managers—Responsible and accountable for ensuring that the provisions of this program are implemented and followed at all projects for which the Principal/Associate or Project Manager has oversight and responsibility.

Group Leaders/Field Supervisors—Responsible and accountable for ensuring compliance with this program within their areas of responsibility and at their work sites on a daily basis. All supervisors must lead by example to promote cold stress awareness and enact practices to protect their staff in high temperature conditions. Supervisors will be trained capable of identifying cold injury symptoms.

Health and Safety Coordinators—Responsible for assisting in the implementation of activities associated with this program.

Health and Safety Program Manager—GeoEngineers' HSM shall monitor and evaluate the Cold Stress Prevention Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements will be promptly incorporated under their direction.

Employees—GeoEngineers' employees are responsible and accountable for complying with this program. Employees who will be working in high cold and high risk conditions will be trained to detect cold injury symptoms and avoidance work procedures.

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Definitions

Acclimatization—the physiological changes that take place after prolonged exposure to cold which help the body maintain a warm core temperature. Acclimatization takes place over several days, with the greatest benefit occurring during the first four to five days. However, acclimatization is reversible after cessation of exposure.

Abnormal Temperature—abnormal or extreme cold weather conditions that can expose workers to cold stress. In this condition, work performance is likely to become impaired before any clinical/observable effects are produced. Illnesses caused by exposure to temperature extremes are progressive and can be life-threatening.

Cold Stress—the condition that occurs when the rate of the body heat loss exceeds the rate of heat production. Meaning the body cannot adequately warm itself. Injuries related to cold stress include frostbite, chilblains and, when severe, hypothermia, which can result in death if not addressed.

Frostbite—the destruction of body tissues by freezing (usually exposed skin on the face, and extremities such as ears, fingers, and toes). Circulation of blood in these tissues is slowed and eventually stopped; the skin appears waxy white and becomes numb.

Hypothermia—a life-threatening condition in which the body's core temperature falls below the normal temperature of 98.6°F because of the sudden and radical lowering of body temperature or because of prolonged exposure to cold.

Chilblains—often mistaken for frostbite, chilblains is a medical condition which occurs in cold and humid conditions. The primary effects are tissue damage to the blood vessels, most often in extremities such as the fingers, nose, ears, and toes. Affected regions often appear swollen, inflamed, and red or dark blue with accompanying pain or itchy sensations.

Wind Chill— the result of the wind on still-air temperature that increases its cooling effect on exposed skin. Table 2 shows the wind chill for various still-air temperatures and wind speeds.

General Information

Staff become hypothermic from two primary sources: (1) the environmental conditions in which they work in and (2) from personal conditions including health and clothing worn.

Cold stress can occur even in temperatures one may not consider "cold". An individual's level of acclimatization affects their body's ability to handle cold conditions and how susceptible it is to cold stress injury. Employees who are acclimated to warm conditions must be given time to acclimate to cold conditions before serious exposure is risked. Acclimation can take up to two weeks for most individuals.

Signs and Symptoms of Cold-related illness

Table 1 below provides examples of cold-related illness, symptoms, and first aid measure to take to treat the illness. Project Managers and Supervisors should be familiar with these types of cold-related illnesses and the response measures to take to ensure staff safety.

Field Staff shall use the following as a guide for recognizing the signs and symptoms of cold-related illnesses to prevent the onset of cold-related injuries.

TABLE 1. COLD-RELATED DISORDERS INCLUDING SYMPTOMS, SIGNS, CAUSES AND STEPS FOR FIRST AID

Disorder	Symptoms	Signs	Causes	First Aid
Hypothermia	Chills; Pain in extremities; Fatigue or drowsiness.	Euphoria in late stages; Slow, weak pulse; Slurred speech: Collapse; Shivering; Unconsciousness; Body temperature < 95F (35C).	Excessive exposure, exhaustion or dehydration, subnormal tolerance, drug/alcohol abuse.	Move to warm area and remove wet clothing. Modest external warming (external hear packs, etc.). Drink warm, sweet fluids if conscious. Transport to hospital.

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Disorder	Symptoms	Signs	Causes	First Aid
Frostbite	Burning sensation at first. Coldness, numbness, tingling.	Skin color white or grayish yellow to reddish violet to black. Blisters. Response to touch depends on depth of freezing.	Exposure to cold, vascular disease.	Move to warm area and remove wet clothing. Give external warming (put close to heat source, use body heat etc.). Drink warm, sweet fluids if conscious. Transport to hospital.
Frostnip	Possible itching or pain.	Skin color white	Exposure to cold (above freezing) and dampness.	Similar to frostbite.
Trench Foot	Severe pain; Tingling, itching.	Edema; Blisters; Response to touch depends on depth of freezing.	Exposure to cold (above freezing) and dampness. Can occur in conditions as warm as 60°F if the affected area is constantly wet.	Similar to frostbite.
Chilblains	Burning or itching sensation; Inflammation of affected areas (usually extremities);	Skin discoloration (red or dark blue); Blisters in affected area	Exposure to cold, poor blood circulation. Can occur in conditions as warm as 60°F if the affected areas are repeatedly exposed to cold.	Similar to frostbite. Can also warm affected area in warm water. Vitamin B improves circulation and may also be effective.

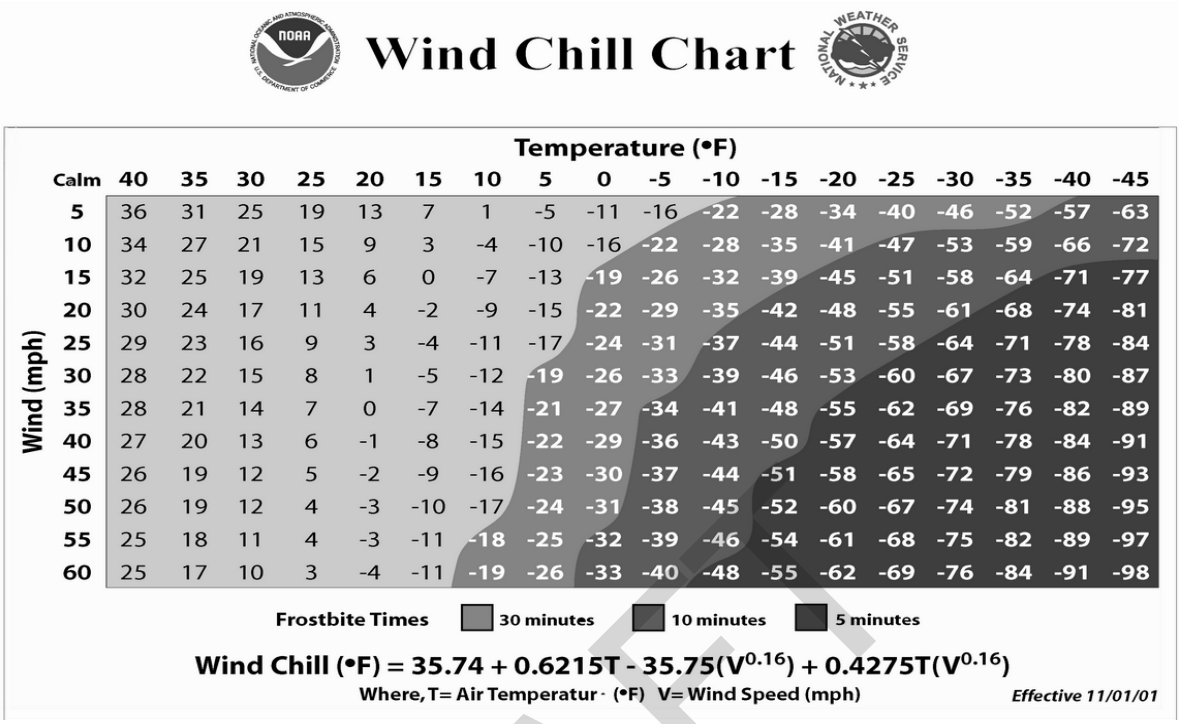
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Determining Risk: Wind Chill

The actual temperature felt by employees working in the field will vary based on environmental conditions. Primarily the weather in the operational area. Windy and wet weather can increase the stress put on the body and further decrease the temperature an exposed field worker experiences.

Table 2 below shows how wind chill affects the actual temperature felt by an average, healthy individual without protective gear on. It also shows how long on average such a person can be exposed to that temperature before they start to suffer from frostbite. Project Managers and Supervisors should be familiar with the types of cold-related illnesses and symptoms and take appropriate measures to ensure employee safety.

TABLE 2. WIND-CHILL EQUIVALENT TEMPERATURES (ºF)



Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperatur · (°F) V= Wind Speed (mph)

Effective 11/01/01

National Oceanic and Atmospheric Administration and National Weather Service Wind Chill Chart.

Where acceptable temperature cannot be maintained, all outdoor work should be scheduled so as to minimize exposure to extreme temperatures. Consideration should be given to thermal conditions when new equipment or work processes are to be introduced into the workplace.

Temperature and conditions in the work area should be monitored. Job Hazard Analysis and Site Safety Plans include the following and will be discussed in the Field Briefing before the project starts and ensured in Task Safety Assessment that are a part of every jobs Job Hazard Analysis/Site Safety Plan:

- Walkways and travel ways shall be sanded, salted, or cleared of snow and ice as soon as possible.
- Cold weather supplies should be regularly inspected and restocked.
- Consider other factors that would exacerbate the situation (for example: wet clothing, wind chill).
- Employees working in cold weather conditions are under constant protective observation by a co-worker or supervisors. We work in teams of two to ensure safety.
- Warm beverages should be made available.

Employees are required to dress appropriately for the relevant working conditions, including normal weather extremes. Limiting the time of exposure and wearing protective clothing will reduce the dangers of exposure to cold. Clothing should:

- Be loose-fitting and multi-layered to trap warm air in layers;

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- Allow perspiration to escape before condensation occurs; and
- Be weatherproof/rainproof.

Monitoring

Temperature and conditions in the work area that pose a risk should be monitored by the Project Manager or Supervisory personnel to prevent employees from being overexposed (See table 2).

Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) shall be used as appropriate.

- Gloves shall be made available when air temperatures fall below 60°F for sedentary work, 40°F for light work and 20°F for moderate work. When selecting gloves, be sure to purchase cold-condition gloves which are rated for the temperatures you will be facing. A good source for cold-condition gloves is found here.
- If work is to be performed with bare hands for more than 20 minutes in an environment <40°F, then the use of warm air jets, radiant heaters or contact warm plates should be evaluated and implemented to keep workers' hands warm.
- Total body protection is required when work is to be performed in environments with temperatures <20°F. This shall consist of clothing for the trunk and extremities and shall include an insulated head liner (providing head, ear and full face coverage), heavy socks, insulated steel-toed/steel-shank boots, insulated long underwear and insulated body coverall.
- If there is potential for clothing to become wet, then the outer layer of clothing shall be water repellent/proof.
- If body clothing is insufficient in preventing the sensation of cold or frostbite, then work activities shall be terminated until more appropriate clothing is obtained or weather conditions improve.
- Cold-weather footwear should be waterproof and insulated, with deep treads to enable grip on icy or snowy surfaces. Insulated and/or wool socks are also recommended.

Other Considerations

Depending on the situation, other considerations include:

- Shield the immediate work area with vehicles or tarps to reduce the cooling effects of the wind.
- Individuals suffering from diseases or who are taking medication which interferes with normal body temperature regulation shall not be allowed to work in temperatures <30°F. Employees shall notify supervisor when these conditions exist.
- Avoid overexertion. Cold weather itself, without any physical exertion, puts an extra strain on the heart. Take caution when shoveling snow, walking fast, cleaning tanks, etc.
- The insulating properties of protective clothing are greatly reduced when that clothing becomes wet, either from contact with water or from sweating. Therefore, wet clothing shall be immediately replaced.

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- Remember to drink often to stay hydrated. The body expends extra energy to keep itself warm in cold environments, and all energy expenditures require water. An individual may not feel the need to drink in cold weather due to ambient conditions but should drink water regularly regardless. Warm water-based beverages are also acceptable.
- Icy or snowy conditions can create slip hazards for both pedestrian traffic and vehicular traffic. Even small amounts of ice or snow can cause an employee to lose footing or a vehicle to momentarily lose traction. To prevent this, employees should wear appropriate cold-weather boots with deep lug-soles which can provide better grip on icy or snowy surfaces. For vehicles, employees should keep on hand a vehicle-compatible set of chains or wires to install on their vehicles. It is recommended that employees practice putting on their chains/wires in non-emergency conditions prior to having to use them in an emergency. If hazardous slip conditions exist which might require crampons or heavy chains on vehicles, they should be avoided if possible.

Work Stoppage Requirements

In extreme conditions, cessation of work or early release from work may become necessary to ensure worker safety. Table 3, shown below, of this program provides an example for when cessation of work may be necessary based strictly on ambient temperature and wind conditions alone. Multiple other factors play a part in the decision to cease work due to extreme cold weather, including:

- Clothing worn or immediately available to employees in the event of an unforeseen weather shift.
- Road conditions and the distance employees must travel to return home.
- Levels of fatigue that employees on site are experiencing which may impede their driving abilities on the drive home.
- Weather reports for future which indicate un-mitigatable cold weather conditions are incoming.

Due to the varied conditions of GeoEngineers work sites, employee readiness, and the shifting nature of weather, set “limits” which when surpassed mean work on-site must cease must largely be calculated and implemented by the Health and Safety Coordinators or other supervisors on site with employee input.

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TABLE 3. GENERIC WORK/WARM-UP SCHEDULE FOR 4 HOUR SHIFTS

Air Temperature -- Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C	°F	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks
-26 to -28	-15 to -19	Normal Breaks		Normal Breaks		75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Normal Breaks		75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
-43 & below	-45 & below	Non-emergency work should cease									

(Schedule applies to any 4-hour work period with moderate to heavy work activity; with warm-up periods of ten (10) minutes in a warm location and with an extended break (e.g. lunch) at the end of the 4-hour work period in a warm location.

Training

Awareness training may be provided to effected staff and managers through in-person training, Ascent, at staff meetings or field briefings. Select field personnel may receive annual training through HAZWOPER refresher or other expanded training

The training should cover the following issues:

- Identification of the causes, signs and prevention of cold stress.
- General awareness of personal factors that may increase susceptibility to cold-related illness including, but not limited to, an individual's age, degree of acclimatization, medical conditions, drinking water consumption, alcohol use, caffeine use, nicotine use and use of medications that affect the body's responses to cold. This information is for the employee's personal use.
- The importance of acclimatization.
- The importance of wearing proper cold-weather PPE.
- The importance of immediately reporting signs or symptoms of cold-related illness in either themselves or in co-workers to the person in charge and the procedures the employee must follow including appropriate emergency response procedures.

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Recordkeeping

Training will be documented by a sign-in sheet, quiz, or other field-based form (to include a brief description of the training and trainer's name) and the date will be documented in site files and/or GeoEngineers' Ascent.

Revised December 2019
Revised April 2020
Revised August 2020

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Appendix E
Heat Stress Prevention Program

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GeoEngineers

Heat Stress Prevention Program

Revised April 2020

GeoEngineers
Health & Safety World
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Heat Stress Prevention Program

Purpose

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This program applies in its entirety to all GeoEngineers employees and locations unless the Health and Safety Manager grants a variance from the requirements.

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Principals/Associates/Project Managers—Responsible and accountable for ensuring that the provisions of this program are implemented and followed at all projects for which the Principal/Associate or Project Manager has oversight and responsibility.

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Employees—GeoEngineers' employees are responsible and accountable for complying with this this program. Employees who will be working in high heat high risk conditions will be trained to detect heat injury symptoms and avoidance work procedures.

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Definitions

Acclimatization—the positive physiological changes that take place after prolonged exposure to heat, which partly involve increased sweat production. Core body temperature can be controlled within acceptable limits, and the body then becomes accustomed to a hot environment. Acclimatization takes place over several days, with the greatest benefit occurring during the first four to five days.

Dehydration—the loss or deficiency of water in body tissues, which may be caused by perspiration, vomiting or diarrhea. Symptoms include excessive thirst, nausea and exhaustion.

Heat Cramps—often the first sign of heat stress or heat exhaustion. Symptoms include painful muscle spasms, sweaty skin and normal body temperature.

Heat Exhaustion—caused by stress on body organs and includes poor blood circulation from insufficient cardiovascular function or dehydration. Symptoms include moist, clammy skin, weakness and fatigue, nausea and vomiting, slightly elevated temperature, headache and disorientation.

Heat Index— also occasionally known as apparent temperature, is what the temperature feels like to the average human body in direct sunlight when relative humidity is combined with ambient temperature.

Heat Stress—there are three forms of heat stress: Heat Cramps, Heat Exhaustion and Heat Stroke. The risk of heat-related disorders and accidents increases substantially with increasing heat stress.

Heat Strain—the series of physiological responses to heat stress. These responses reflect the degree of heat stress. When the strain is excessive for the exposed individual, a feeling of discomfort or distress may result, and, finally, a heat disorder may ensue. The severity of strain will depend not only on the magnitude of the prevailing stress, but also on the age, physical fitness, degree of acclimatization and dehydration of the worker.

Heat Stroke—the most extreme and serious form of Heat Stress. In this life-threatening condition, the body's temperature regulation mechanism has failed, and the victim's temperature is rising to critically high levels. Symptoms include hot, dry, red skin, mental confusion, convulsions and possible loss of consciousness.

Humidity (Relative)—the ratio of the water vapor content of air to the maximum possible water vapor content of air at the same temperature and air pressure.

Wet Bulb Globe Temperature (WBGT)—a measure of relative heat stress in direct sunlight taking into account multiple factors including: temperature, humidity, wind speed, sun angle and cloud cover.

General Information

Staff become overheated from two primary sources: (1) the environmental conditions in which they work and (2) the internal heat generated by physical labor.

Heat-related illnesses occur when the body is not able to lose enough heat to balance the heat generated by external heat sources and/or physical work.

Signs and Symptoms of Heat-related Illness

Table 1. provides examples of heat-related Illness, symptoms and first aid measures to take in the event of heat overexposure. Project Managers and Supervisors should be familiar with these types of heat-related illnesses and the response measures to take to ensure staff safety.

Field Staff shall use the following as a guide for recognizing the signs and symptoms of heat-related illnesses to prevent the onset of heat-related injuries.

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TABLE 1. HEAT-RELATED ILLNESSES: SYMPTOMS AND FIRST AID

Heat-related Illness	Symptoms	First Aid
Heat Fatigue	Weakness; impaired motor skills; reduced ability to concentrate	Take a short break in a cooler area. Pushing yourself to work through the condition can lead to a more serious illness.
Heat Cramps	Painful muscle spasms caused by salt imbalances in the body because of sweating	Drinking sodium (electrolyte) replacement liquids may not eliminate the pain but helps during recovery. Prevent by drinking small amounts of water every 15 to 20 minutes – even if you aren't thirsty.
Heat Rash	Irritation, especially where skin is wet with sweat or clothing is tight.	Move to cooler area. Wash and change clothing.
Heat Collapse	A person suddenly faints. Happens when the brain doesn't get enough oxygen because the blood has pooled in the victim's arms or legs.	Remove the victim to a cooler area to lie down during recovery. Do not give liquids to an unconscious person.
Heat Exhaustion	Headache, nausea, dizziness, thirst and giddiness. Can lead to vomiting and/or fainting. Victim has pale, clammy (moist) skin.	Remove victim to a cool, shaded area. Give water if the victim is alert and not nauseated. Don't leave the person alone. Cool the victim with a spray mist or wet cloth. If the person does not feel better in a few minutes, call for emergency help.
Heat Stroke	Victim has dry, pale skin (no sweating) or hot, red skin (looks like a sunburn) and is confused. Victim may have seizures and pass out.	Call for emergency assistance immediately. Remove the victim to lie down in a cool, shaded area. Don't leave the person alone. If the victim is alert and not nauseated, give water. Cool the person. Place ice packs under the arm pits and in groin area.

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Determining Risk: The Heat Index Value

A Heat Index (HI) value is a measure of the synergistic effects of ambient temperature and humidity at a work area. This combined value better reflects the heat conditions as felt by field staff. Using a HI value is a superior metric to just using temperature alone when forecasting heat risk.

TABLE 2. HEAT INDEX VALUES

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

TABLE 3. HEAT INDEX VALUE RISK LEVEL DEFINITIONS

Heat Index	Risk Level	Protective Measures
Less than 91°F	Lower (Caution)	Basic heat safety and planning
91°F to 103°F	Moderate	Implement precautions and heighten awareness
103°F to 115°F	High	Additional precautions to protect workers
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures

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To determine daily HI, obtain the expected peak ambient temperature and humidity for that workday. On the table above, find the junction between the row containing the peak humidity and the column of the peak temperature.

A HI's color reflects its' risk (Table 3.). A HI falling in the deep red zone indicates a need to enact the highest level of heat precautions for field staff. That HI value is the starting point for mitigative planning.

Additional risk factors should include:

- Work in direct sunlight - adds up to 15 degrees to the heat index.
- Performance of prolonged or strenuous work.
- Use of heavy protective clothing or impermeable suits dramatically increases heat stress risk.
- This information is also available for reference by downloading the OSHA-NIOSH Heat Safety APP here

For work occurring in Washington State (WAC 296-307-09710) between May 1 through September 30, heat related protections become required when the following clothing-influenced Outdoor Temperature Action Levels (Table 4) are met. Protective measures are discussed in the next section.

TABLE 4. WASHINGTON STATE HEAT STRESS PREVENTION ACTION LEVELS

Outdoor Temperature Action Levels	
All other clothing work clothing	89°F
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°F
Nonbreathing clothes (raincoats) including vapor barrier clothing or PPE such as chemical resistant coveralls	52°F

Protecting Field Staff from Heat-related Illness

Whether planning for heat exposures based on HI values (Tables 2 and 3), or under Washington State regulations (Table 4), the same precautions will be met. GeoEngineers field Supervisors/Project Managers will ensure the following are performed:

1. Field Supervisors must be properly trained to and actively observe staff for alertness and signs/symptoms of heat illness prior to supervising employees.
2. Field Supervisors must maintain effective communication at all times with heat exposed employees.
3. GeoEngineers will have ensure that all effected staff will have access to sufficient drinking water throughout the shift; and will communicate the benefit of maintaining hydration.
4. Field Supervisors will consider the recommended Work/Rest Cycle when staffing projects.
5. Field Supervisors will be aware and plan accordingly when using newly hired or transferred field staff allowing for a heat acclimatization period when determined appropriate.

Hydration Requirements and Replenishing Sodium

Water loss should be balanced with water intake. To stay hydrated, a minimum consumption rate of 1 gallon of water per day is recommended. This rate may be elevated as exertion levels or clothing requirements increase sweat and respiration water loss. During exertive work, staff should drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body. Additionally, some sodium must be replenished in the body daily to keep muscles and nerves working properly.

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Keep these hydrations tips in mind when planning for hot weather field work:

- Fluids should be replaced frequently in amounts of at least 1 gallon per day.
- Offered water shall be kept cool.
- Sodium (electrolyte) replacement can be in the form of a commercial non-caffeinated sports drink. Salted food items may also be used so long as it is balanced with water intake.
- Avoid excessive caffeine (including coffee and tea), which may lead to dehydration.

When working in Washington, GeoEngineers is required to make up to 1 quart of water per hour available for workers regardless of actual consumption. This volume can be resupplied throughout a workday as needed.

Appropriate Dress

Staff should dress appropriately for the heat expected. Keeping clothing protective and comfortable but not overly heat retaining is the goal for all field work. General recommendations for clothing follow.

High Heat Work Clothing should be:

- Light colored
- Lightweight – as light as the work performed allows (PPE matches task)
- Natural breathable fibers
- Brimmed hats (when appropriate)
- Cooling vest, neck "gaiters" or cooling bandanas may be helpful in some cases

Rest Breaks and Acclimatization

When HI values are high or work tasks require medium to heavy exertion, breaks should be taken periodically throughout the day to avoid over-heating.

Every person on the job site may have a different tolerance for heat and exertion. Staff should be encouraged to know their personal limits and to take breaks as necessary. Field Supervisors should be knowledgeable of those limits and plan accordingly.

Heat acclimatization is a physiological process that allows workers to gradually take on larger workloads in higher than normal heat environments. Full acclimatization can take up to 2 weeks. If a previously acclimated staff member is away from heat for more than 2 weeks, they may need to undergo another acclimatization process.

The National Institute for Occupational for Safety and Health (NIOSH) recommendations for high HI work/rest cycles are provided in Table 5, below. Dark red boxes indicate the highest risk conditions for heat injury. Note the assumptions used to developed Table 5 listed beneath the table. If these assumptions are exceeded, refer to Table 6 for corresponding additive temperature adjustments.

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TABLE 5. NIOSH WORK/REST CYCLE SCHEDULE RECOMMENDATIONS

Temperature (°F)	Light Work Minutes Work/Rest	Moderate Work Minutes Work/Rest	Heavy Work Minutes Work/Rest
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	**Normal**	**30/30**	**20/40**
105	Normal	25/35	15/45
106	45/15	20/40	**Caution**
107	40/20	15/45	**Caution**
108	**35/25**	**Caution**	**Caution**
109	30/30	**Caution**	**Caution**
110	15/45	**Caution**	**Caution**
111	**Caution**	**Caution**	**Caution**
112	**Caution**	**Caution**	**Caution**

Assumptions: workers are physically fit, well-rested, fully hydrated, under age 40, and environment has 30% humidity and perceptible air movement.

TABLE 6. TEMPERATURE ADJUSTMENTS FOR NIOSH WORK/REST CYCLE TABLE

Environmental Conditions	Humidity
Full sun (no clouds): Add 13 °F	40% Humidity: Add 3°F
Partly cloudy/overcast: Add 7 °F	50% Humidity: Add 6°F
In shade or at night: No adjustment	60% Humidity: Add 9°F

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Shelter (Shade) from the Sunlight

Periodic access to shade should be available to staff as respite from heat generated by direct sunlight. Field tarps or canopies are acceptable whenever air-conditioned spaces/work vehicles are not available. Workers should be encouraged to take off unnecessary PPE when at rest to permit rapid cooling. Fans are also useful cooling aides, when feasible.

Additional Factors in Heat Management Planning

Project Managers and Field Staff should the following additional guidelines when planning field events:

- Consider a worker's physical condition when determining fitness to work in hot environments. Obesity, lack of conditioning, pregnancy and inadequate rest can increase susceptibility to heat stress.
- Schedule strenuous physical activity at the beginning and end of the day, when external temperatures may be cooler.
- Consider the effects of medications being taken (such as for heart conditions) or treatments (such as low-sodium diets) that can increase the risk from heat exposure.
- Seek medical advice when symptoms of heat stress appear. Contact your Project Manager or Health and Safety Manager for assistance if needed.
- Your plan for heat risk reduction should be part of your site-specific health and safety plan or job hazard analysis.
- Wet Bulb Globe Temperature (WBGT) Meters can be obtained on a per project basis if required. Contact your Project Manager for additional information if this is a contractual need.

Training

Awareness training may be provided to effected staff and managers through in-person training, Ascent, at staff meetings or field briefings. Select field personnel may receive annual training through HAZWOPER refresher or other expanded training.

The training should cover the following issues:

- The environmental factors that contribute to the risk of heat-related illness.
- General awareness of personal factors that may increase susceptibility to heat-related illness including, but not limited to, an individual's age, degree of acclimatization, medical conditions, drinking water consumption, alcohol use, caffeine use, nicotine use and use of medications that affect the body's responses to heat. This information is for the employee's personal use.
- The importance of removing heat-retaining personal protective equipment such as non-breathable chemical-resistant clothing during all breaks.
- The importance of frequent consumption of small quantities of drinking water or other acceptable beverages.
- The importance of acclimatization.

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- The different types of heat-related illness, the common signs and symptoms of heat-related illness.
- The importance of immediately reporting signs or symptoms of heat-related illness in either themselves or in co-workers to the person in charge and the procedures the employee must follow including appropriate emergency response procedures.

Recordkeeping

Training will be documented by a sign-in sheet, quiz, or other field-based form (to include a brief description of the training and trainer's name) and the date will be documented in site files and/or GeoEngineers' Ascent.

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Appendix F
Working Over Water Safety Program

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GeoEngineers

Working Over Water Safety Program

Revised May 2022

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Working Over Water Safety Program

Purpose

The purpose of the GeoEngineers Working Over Water Safety Program is to protect the health and safety of employees working on or near water.

Scope

This policy and procedure applies in its entirety to all GeoEngineers employees who have an actual or potential exposure to drowning.

Responsibilities

Principals/Associates/Project Managers/Health and Safety Coordinators—Responsible and accountable for ensuring that the provisions of this policy and procedure are implemented and followed at offices and projects in which they have oversight and responsibility.

Employees—GeoEngineers' employees are responsible and accountable for complying with this policy and procedure as it applies to them.

Health and Safety Program Manager—GeoEngineers' HSM shall monitor and evaluate for compliance, effectiveness and improvement opportunities and changes in regulations as needed.

Definitions

Boat Operator—the locally licensed individual responsible for operating the boat.

Bow—the bow of a boat is the front part of the vessel.

Coaming—any vertical surface on a ship designed to deflect or prevent entry of water. It usually refers to raised section of deck plating around an opening, such as a hatch. Coamings also provide a frame onto which to fit a hatch cover.

Dispatcher—the member of the boating team responsible for maintaining shore communication with the boat operator. The dispatcher will always remain on land and will track the boat's location.

Fender/ing—a cushioned place between boats or between a pier and a boat to prevent damage. Fendering is relying on said cushion to prevent impact damage to your boat when docking.

Freeboard—the minimum vertical distance from the surface of the water to the gunwale (upper edge of the boats sides.

Gunwale—the upper edge of the boat's sides that stay out of the water generally.

Hull—the body of the boat that remains in the water.

Hypothermia—a symptom of severe cold stress resulting from the body core temperature dropping below 95 degrees Fahrenheit. Signs of hypothermia include uncontrollable shivering, mental confusion, and fatigue. In extreme and untreated cases, a warm or euphoric feeling is experienced.

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International Waters—areas of water outside the 12-mile offshore exclusive economic zone of any nation.

Inboard—towards the center of a vessel or dock.

Jacob's Ladder—a rope or metal ladder used to board vessels along its side.

Lee—the side of a vessel sheltered from the wind.

Outboard—towards the edges of a vessel or dock.

Personal Flotation Devices (PFDs) or Lifejacket Types—See Personal Floatation Device (PFD) Specifications Section.

Port—the left side of the boat from the perspective of looking forward in the boat.

Starboard—the right side of the boat from the perspective of looking forward in the boat.

Stern—the stern of a boat is the back part of the vessel.

Regulatory References

When working near water, over water or on a barge, Occupational Safety and Health Administration (OSHA) has authority. The U.S. Coast Guard has authority 12 miles off shore until international waters begin. The Coast Guard also has authority over operations on the Great Lakes.

This safety program is based on the following state and federal regulations:

- OSHA 1926.106 Working over or near water; 1926.605 Marine operations and equipment; Access to vessels 1915.74 and Access to barges and river towboats 1918.26 (Idaho, Missouri)
- Washington Administrative Code (WAC) 296-800-160 Personal Protective Equipment for PFD (Washington)
- OR-OSHA 1926 (Oregon)
- AAC Title 8 (Alaska)
- HIOSH Title 12 (Hawaii)
- Cal/OSHA Title 8 (California)

General Requirements

Use of a boat for work requires safe boating practices, good equipment, and training. These procedures are not meant to replace the safety manuals provided by the Coast Guard. Instead, they should highlight some of the areas of concern and address specific GeoEngineers. work procedures. While working near water that is over waist deep or while on a boat, always wear a Coast Guard approved personal flotation device. Remember that being submersed in water increases the chance of hypothermia. Have a dry set of clothes and work with a buddy if you are working around water. If an employee is required to work partially or fully immersed in the water for long periods of time, they

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will wear appropriate gear including waders, a wet suit, or dry suit if necessary for safe accomplishment of the task.

The Coast Guard's Federal Requirements state, "All recreational boats must carry one wearable PFD (Type I, II, III, or Type V) for each person aboard… [and that] any boat 16 feet and longer (except canoes and kayaks) must also carry one throw-able Type IV PFD."

GeoEngineers' insurance for working over water is covered under the USL&H policy (worker's comp over water) and is not specific to the individuals participating. For work in arctic waters, an additional site safety plan will be created to address the additional hazards of working in extremely cold water. Refer to GeoEngineers Cold Stress Prevention Program for cold weather guidance.

For work on barges or boats or areas near water that have an OSHA standard height and strength guardrail, PFDs are not required while working behind the guardrail. The access to the barge or near water area also requires that the gangway be protected by guardrails. If employees are not wearing PFDs, there cannot be a risk of falling in the water. Fall protection rules can be utilized on projects where employees are not within 6 feet of a leading edge and there is no risk of falling in the water.

Implementation

Procedures for Using Boats

Three people will always be involved with the use of the boat. The boat operator, the assistant operator, and the dispatcher back on land. The boat operator will be locally licensed to operate the boat and should always plan a course of travel which is the safest and minimizes the distance to the shore. The dispatcher must be able to maintain communication with the boat operator while back on land. As a general courtesy, the boat should be cleaned up by the user after each day.

Maneuvering a Boat

- To move boat from dock, move stern away then bow (but not into waves or wind)
- Try not to depend on fendering, slow down
- Communicate with other person in boat when:
    - Increase or decrease speed
    - Dramatically change direction
    - Approach pilings/docking so hands and objects hanging off the side of the boat can be put inside

Right-of-Way

- Watch out for ferry traffic—large vessels have right of way and cannot stop
- Larger vessel has right of way over smaller
- With boats of similar size, sailboat have right of way
- When lights are visible, green has the right of way over red

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Ferryboats

Do not cut off ferryboats or other vessels, they move much faster than they appear to. If the boat breaks down in a ferry lane, use radio, flares, and wave and make sure they see you until help arrives. See Emergency Procedures Section for additional details.

Load Limits

Cargo should be evenly distributed and there should be a safe amount of freeboard, which depends on water conditions. In more turbulent water, give the boat more freeboard. When loading up the boat for travel that goes beyond the protection of the pier, the employee should drive to the end of the pier and check wave conditions before entering. Check the boat's loading limits and safety information via the operator's manual.

Engine Use

When using an outboard motor, the boat operator will wear the tether kill switch. This will hook to the operator's wrist and turn off the engine if the boat operator were to be launched into the water.

Personal Floatation Device (PFD)

Type 1 PFDs will be worn in the boat at all times when on ocean or fast moving waters. PFDs will be the correct size for the wearer and will be securely fastened. The PFD should be inspected for damage prior to each use.

In you end up in water with PFD, to help prevent water from lowering body temperature:

- 1 person: cross arms pull knees up
- 2 or more persons: huddle together

The chances of swimming 100 yards or finding help in open water is not very good, so the best strategy is to stay with the boat. The boat should always be closer to shore than this distance during transport so the employee would be close enough to swim to shore.

Throwing Lines

- Make first two coils larger
- Kneel in boat
- Shoulder pointed to victim
- Throw over their head

Water on Board

- A five-gallon bucket will always be available on the boat to bale water that comes inside the boat

Towing

- Take time to set up
- Look at lines
- Stay in step with waves
- For logs, may want to tow from bow. Use timber hitch, shackle to weigh down
- Don't overstress lines

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- Don't shock load lines
- Sea anchor—can use to slow down tow, make more controllable. For some situations, a sea anchor is not necessary and could make things worse.

Safety and Signals

- Horn blasts: 5 short signals danger
- Lights: Employees will not be traveling between terminals in the dark. If it becomes dark while working, the operator will moor the boat at that terminal for the night. A flashlight will be available in the waterproof box stored in the workboat.

Vessel, Barge or Platform Procedures

Any work within 6 feet of an unprotected leading edge will require a life jacket if water is below the leading edge. Railings must be present if a leading edge is above a hard surface. Refer to GeoEngineers' Fall Protection Program for additional details.

Employees shall not be permitted to walk along the sides of covered lighters or barges with coamings more than 5 feet high, unless there is a 3-foot clear walkway, or a grab rail, or a taut hand line is provided.

Employees shall not be permitted to walk over deck loads from rail to coaming unless there is a safe passage. If it is necessary to stand at the outboard or inboard edge of the deck load where less than 24 inches of bulwark, rail, coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deck load.

The employer shall ensure that there is in the vicinity of each barge in use at least one Coast Guard-approved 30-inch life ring with not less than 90 feet of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

Whenever practicable, a gangway of not less than 20 inches walking surface of adequate strength, maintained in safe repair and safely secured shall be used. If a gangway is not practicable, a substantial straight ladder, extending at least 36 inches above the upper landing surface and adequately secured against shifting or slipping shall be provided. When conditions are such that neither a gangway nor a straight ladder can be used, a double-rung or flat tread type of Jacob's ladder may be used. The Jacob's ladder must hang without slack from its lashings or be pulled up entirely when not in use.

Means of access and all work areas will be adequately illuminated at all times.

Loads of cargo will not pass over employees nor will they be stored over areas where employees may reasonably congregate.

Cranes/ Hoists/ Cables

Employees need to use caution when working in areas where cranes, hoists and cables are in use. Refer to the GeoEngineers' Drilling and Rigging Safety Program.

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Working Near Water Procedures

GeoEngineers' employees working over or near water, where the danger of drowning exists, shall be provided with Coast Guard-approved life jacket or buoyant work vests. If the employee is over 6 feet away from the water, they will not be required to wear the life vest.

Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective units shall not be used.

Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

At least one lifesaving skiff or similar vessel shall be immediately available at locations where employees are working over or adjacent to water to perform rescue when necessary if the employee falls into the water.

Emergency Procedures

The following topics are items that are important for handling an emergency. The boat operator should know these procedures and follow them at all times.

Communication

The Marine Radio will be with the boat operator at all times. Before entering the boat, the operator will call in to the dispatcher and notify them of the location and destination of the boat. Each time an employee enters or exits the boat, this will be recorded by the dispatcher. This contact should occur at departure and arrival for long transits.

In the event the Coast Guard must be called for an emergency, use the following reporting procedure:

1. Tune the radio to Channel 16 (Coast Guard)
2. Clearly say MAYDAY three times for life threatening emergencies or PAN-PAN for non-life threatening emergencies
3. Give your vessels name and current position
4. Describe your vessel and give its registration number
5. Give the number of personnel on board
6. Describe the emergency
7. Say OVER and repeat process if no response
8. While waiting for rescue, blow horn five short times to signal danger near your location

Engine Problems

In the event of engine problems, contact the dispatcher and notify them of the situation immediately. Depending on the situation, a rescue could be dispatched by the Coast Guard, another employee, or a contractor. If a repair is made in the interim while waiting for the tow, call the dispatcher again and notify them of the situation. If the boat is mobile, head back to dock until the engine can be fully repaired or replaced.

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Spare plugs will be in the waterproof kit for offshore engine problems only. The boat operator will be required to take a spare tank and line for fuel, thus eliminating the need for spare line.

Distress Flares

Distress flares will be located in the waterproof boxes that the boat operator will ensure are on the boat before each travel session. Boat operators should also make sure that they are familiar with the operation of these flares.

Person Overboard / Rescue

Boat operators should be familiar with in water rescue techniques. The following steps are a general procedure for rescuing individuals who have gone overboard.

1. Yell "Person Overboard!" to get everyone's attention
2. Designate one person to maintain visual contact with the victim
3. Position the boat downwind so the victim will naturally float towards the boat
4. Throw the victim bright, buoyant objects on a line. Ensure the line is secured prior to throwing
5. Turn the engine off during rescue to avoid possible injury
6. Slowly pull the victim in towards the boat
7. Dry and warm victim

If you go overboard, follow these guidelines to increase your chances of survival if rescue isn't immediate.

- Remain calm, try to conserve energy
- Pull your knees in and hold them to your chest to minimize body heat loss
- Don't try to swim to safety unless it is very close by and visible

Fire

Each workboat will be equipped with a 5 lb. ABC fire extinguisher located near the bow. The fire extinguisher should be checked each time the boat is used to ensure that it is ready to operate.

Work Related Injuries

Work related injuries that are not threatening to the safety of the persons on board should be reported to the Supervisor as soon as possible. Any work related injury that impairs operation of the boat should be called in to the GeoEngineers' office immediately. The office will call for the Coast Guard and or the Fire Department in the event of a serious injury.

Weather/Tides

If the visibility is very low due to fog or other conditions, the operator will not take the boat out.

Fog

If a boat gets trapped in fog, employees will stay within sight of the shoreline and/or head in and tie up. Employees are not likely to be caught unexpected in dense fog as long as they turn on all lights and use the boat horn. Remember, many boats cannot pick you up on radar and cannot stop quickly.

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Rough Water

If possible, rough water should be avoided. However, if the boat operator is experienced, work will not be impeded by rough water, and such conditions were planned for appropriately in the JHA or HASP, work may be approved in rough water. Here are some basic tips for boating in rough water.

- Look for lee and stay in it if possible
- Head into swells, throttle up when approaching, throttle down when dropping down
- Check wave conditions before taking the boat out and regularly check for updates
- Head in at 45 degree angle at times, depending on wave size

Tides

Tidal changes in the Puget Sound and northern areas can be significant. Employees should always be aware of the tide changes and plan their work accordingly. There have been several instances where work under the docks became dangerous due to changing tides and lack of planning.

Storms

GeoEngineers employees will not work on boats in stormy weather. If stormy weather is reported as incoming or caught by unexpected stormy weather while on water, GeoEngineers employees will return to harbor as soon as safely possible.

List of Supplies

In addition to the list of supplies necessary for the project and those generated as necessary at the Maritime Training Center, the Coast Guard identified the following items to be critical for safe boating.

Items to be stored with the boat at all times:

- Oars and oarlocks
- Anchor
- Bucket for baling water
- Fire Extinguisher
- 1 spare fuel tank and line
- 1 change of dry clothes per person
- Emergency food and water

Items that will be brought onto the boat when in use:

- Marine radio
- Watertight box with first aid kit, flashlight, and flares
- Personal Floatation Device(s)
- Knife with serrated edge
- Tide book
- Spare plugs and wrench

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Personal Floatation Device (PFD) Specifications

Personal Flotation Device (PFD) use applies to terminals and piers and employees working near other bodies of water. It also applies to all activities conducted by GeoEngineers employees at these facilities, including construction, maintenance, inspections, tours, and operations. Type I PFDs will be worn in the boats at all times. PFD will be the correct size for the wearer and will be securely fastened. The PFD should be inspected for damage prior to each use. Boats longer than 16 feet must carry at least one Type I, II, III, or V PFD for each person on board.

In addition, at least one Type IV (throw-able device) must be carried on the vessel for use in person overboard procedures. No one may not use a Type IV "flotation cushion" as the sole PFD in any situation.

PFDs are required for:

- Any employee in a boat/skiff/barge,
- Any employee is working on top of, or beyond the bull rail (a railing for docking the boat), or
- Employees working near water where the danger of drowning exists

PFDs are not specifically required when:

- Employees are working behind standard height and strength guardrails.
- Employees are working inside operating cabs or stations that eliminate the possibility of accidentally falling into the water.
- Employees are wearing an approved safety harness with a lifeline attached that prevents the possibility of accidentally falling into the water.
- Employees are working more than 6 feet from the edge.
- Working over shallow water (less than chest deep) where floatation would not be achieved (other protective measures required).

Provide your employees with PFDs approved by the Coast Guard for use on commercial or merchant vessels. The following are appropriate or allowable United States Coast Guard-approved PFDs:

Type of PFD	General Description
Type I	Off-Shore Life Jacket–effective for all waters or where rescue may be delayed. Should turn ALL wearers upright in water. Most buoyant.
Type II	Near-Shore Buoyant Vest–intended for calm, inland water or where there is a good chance of quick rescue. Will turn SOME wearers upright in water. Check weight category.
Type III	Flotation aid–good for calm, inland water, or where there is a good chance of rescue. Will NOT turn wearers upright in water.
Type IV	Flotation aid–(throwable device) rings, buoyant cushions, horseshoe buoys. Meant to supplement other PFDs or for pulling in for rescue.

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Off-Shore Life Jacket (Type I PFD)

Best for open, rough, or remote water, where rescue may be slow coming.

- Advantages
  - Floats person the best
  - Turns most unconscious wearers face-up in water
  - Highly visible color
- Disadvantages
  - Bulky

Near-Shore Buoyant Vest (Type II PFD)

Good for calm, inland water, or where there is good chance for fast rescue.

- Advantages
  - Turns some unconscious wearers face-up in water
  - Less bulky, more comfortable than Off-Shore Life Jacket (Type I PFD)
  - Compromise between Type I PFD performance and wearer comfort
- Disadvantages
  - May be uncomfortable wearing for extended periods
  - Will not turn as many people face-up as a Type I PFD will
  - In rough water, a wearer's face may often be covered by waves
  - Not for extended survival in rough water

Flotation Aid (Type III PFD)

Good for calm, inland water, or where there is good chance of fast rescue.

- Advantages
  - Generally, the most comfortable type for continuous wear
  - Freedom of movement for water skiing, small boat sailing, fishing, etc.
  - Available in many styles, including vests and flotation coats
- Disadvantages
  - Not for rough water
  - Wearer may have to tilt head back to avoid face-down position in water

Flotation Aid Throwable Device (Type IV PFD)

Used for rescue during overboard procedures.

- Advantages
  - Easy to throw and grab onto
  - Don't have to be worn constantly.
- Disadvantages
  - Inadequate by themselves to keep individuals safely afloat
  - Require someone else to throw the PFD to the overboard individual

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Training

Each state has specific boat training requirements. In addition, the Coast Guard can also be contacted for local training opportunities. All GeoEngineers employees operating a boat should have documented training and be locally licensed/certified.

GeoEngineers employees who will be working over water must review the GeoEngineers Working Over Water training module at least once prior to work commencing.

GeoEngineers employees working over or near water should be trained in the contents of the Working Over Water Safety Program. At the start of each project in which working over or near water presents a danger of drowning employees should have a tailgate safety meeting and discuss the following:

- The danger of drowning where it exists
- Use of Coast Guard-approved life jacket or buoyant work vests
- Life jacket or buoyant work vests inspections
- Location of ring buoys for emergency rescue operations
- Location of a lifesaving skiff for rescue if needed

Training shall be recorded in Ascent.

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Appendix G
TOXFAQS Guides

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Arsenic - ToxFAQs™

CAS # 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic

CAS # 7440-38-2

compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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Cadmium- ToxFAQs™

CAS # 7440-43-9

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- Cadmium does not break down in the environment, but can change forms.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- Some forms of cadmium dissolve in water.
- Cadmium binds strongly to soil particles.
- Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- Eating foods containing cadmium; low levels are found in all foods (highest levels are found in leafy vegetables, grains, legumes, and kidney meat).
- Smoking cigarettes or breathing cigarette smoke.
- Breathing contaminated workplace air.
- Drinking contaminated water.
- Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that cadmium and cadmium compounds are human carcinogens. The EPA determined that cadmium is a probable human carcinogen (group B1).

Cadmium

CAS # 7440-43-9

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney and lung damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. Studies in animals exposed to high levels of cadmium during pregnancy have resulted in harmful effects to the young. Young animals exposed to cadmium before birth have shown effects on behavior and learning. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risk of exposure to cadmium?

- Do not allow children to play with batteries. Dispose of nickel-cadmium batteries properly.
- Cadmium is a component of tobacco smoke. Avoid smoking and smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to determine whether I've been exposed to cadmium?

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 milligrams per liter (0.04 mg/L) for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 mg/L cadmium is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 $\mu g/m^3$ for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Chromium - ToxFAQs™

CAS # 7440-47-3

This fact sheet answers the most frequently asked health questions (FAQs) about chromium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chromium occurs from ingesting contaminated food or drinking water or breathing contaminated workplace air. Chromium(VI) at high levels can damage the nose and cause cancer. Ingesting high levels of chromium(VI) may result in anemia or damage to the stomach or intestines. Chromium(III) is an essential nutrient. Chromium has been found in at least 1,127 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What is chromium?

Chromium is a naturally occurring element found in rocks, animals, plants, and soil. It can exist in several different forms. Depending on the form it takes, it can be a liquid, solid, or gas. The most common forms are chromium(0), chromium(III), and chromium(VI). No taste or odor is associated with chromium compounds.

The metal chromium, which is the chromium(0) form, is used for making steel. Chromium(VI) and chromium(III) are used for chrome plating, dyes and pigments, leather tanning, and wood preserving.

What happens to chromium when it enters the environment?

- Chromium can be found in air, soil, and water after release from the manufacture, use, and disposal of chromium-based products, and during the manufacturing process.
- Chromium does not usually remain in the atmosphere, but is deposited into the soil and water.
- Chromium can easily change from one form to another in water and soil, depending on the conditions present.
- Fish do not accumulate much chromium in their bodies from water.

How might I be exposed to chromium?

- Eating food containing chromium(III).
- Breathing contaminated workplace air or skin contact during use in the workplace.
- Drinking contaminated well water.
- Living near uncontrolled hazardous waste sites containing chromium or industries that use chromium.

How can chromium affect my health?

Chromium(III) is an essential nutrient that helps the body use sugar, protein, and fat.

Breathing high levels of chromium(VI) can cause irritation to the lining of the nose, nose ulcers, runny nose, and breathing problems, such as asthma, cough, shortness of breath, or wheezing. The concentrations of chromium in air that can cause these effects may be different for different types of chromium compounds, with effects occurring at much lower concentrations for chromium(VI) compared to chromium(III).

The main health problems seen in animals following ingestion of chromium(VI) compounds are irritation and ulcers in the stomach and small intestine and anemia. Chromium(III) compounds are much less toxic and do not appear to cause these problems.

Sperm damage and damage to the male reproductive system have also been seen in laboratory animals exposed to chromium(VI).

Skin contact with certain chromium(VI) compounds can cause skin ulcers. Some people are extremely sensitive tochromium(VI) or chromium(III). Allergic reactions consisting of severe redness and swelling of the skin have been noted.

Chromium

CAS # 7440-47-3

How likely is chromium to cause cancer?

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have determined that chromium(VI) compounds are known human carcinogens.

In workers, inhalation of chromium(VI) has been shown to cause lung cancer. Chromium(VI) also causes lung cancer in animals. An increase in stomach tumors was observed in humans and animals exposed to chromium(VI) in drinking water.

How can chromium affect children?

It is likely that health effects seen in children exposed to high amounts of chromium will be similar to the effects seen in adults.

We do not know if exposure to chromium will result in birth defects or other developmental effects in people. Some developmental effects have been observed in animals exposed to chromium(VI).

How can families reduce the risk of exposure to chromium?

- Children should avoid playing in soils near uncontrolled hazardous waste sites where chromium may have been discarded.
- Chromium is a component of tobacco smoke. Avoid smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- Although chromium(III) is an essential nutrient, you should avoid excessive use of dietary supplements containing chromium.

Is there a medical test to determine whether I've been exposed to chromium?

Since chromium(III) is an essential element and naturally occurs in food, there will always be some level of chromium in your body. Chromium can be measured in hair, urine, and blood.

Higher than normal levels of chromium in blood or urine may indicate that a person has been exposed to chromium. However, increases in blood and urine chromium levels cannot be used to predict the kind of health effects that might develop from that exposure.

Has the federal government made recommendations to protect human health?

The EPA has established a maximum contaminant level of 0.1 mg/L for total chromium in drinking water.

The FDA has determined that the chromium concentration in bottled drinking water should not exceed 0.1 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 0.005 mg/m^3 chromium(VI), 0.5 mg/m^3 chromium(III), and 1.0 mg/m^3 chromium(0) for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Chromium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Copper - ToxFAQs™

What is copper?

Copper (Cu) is an element and metal. It is found in rocks, soils, water, and air. Copper is an essential nutrient for humans and is in many foods. It's also essential to animals and plants. Copper and substances containing copper are used in many industries in the U.S.. Copper can be found in materials and products such as wiring, plumbing, pesticides, cookware, and dietary supplements, among others. Copper scrap can be combined with other metals to make brass and bronze pipes. In the U.S., copper is mined and recovered from metal through smelting.

What happens to copper in the environment?

- Copper is released from natural sources, such as windblown dusts, decaying vegetation, and from human activities like municipial solid waste management and fossil fuel burning.
- In air, copper usually attaches to particles (particulate matter) and can travel far from its source.
- In water, copper will usually attach to soils if possible, or dissolve.
- Copper attaches to soils, where it can be taken up by plants.
- Mollusks, such as clams and oysters, can build up copper in their bodies.
- Copper does not break down in the environment.

Ingesting copper in food is necessary for human health. Too much copper can be harmful.

How can I be exposed to copper?

- People ingest copper from drinking water and food, inhale copper from air, and may touch copper or products that contain copper.
- Drinking water can contain high levels of copper if your home has copper pipes and acidic water. This is more likely to occur in new or recently renovated buildings/homes using copper plumbing.
- Blue copper sulfate crystals are available to purchase and have been accidentally ingested by people who confused them for candy or toys.
- You may be exposed to copper fumes if you work or live near a site that uses copper in mining, agriculture, or in a facilitity that processes copper.
- Soils near mines, processing facilities, or waste dump sites may have a lot of copper.

How can copper affect my health?

It is essential for people to ingest small amounts of copper everyday in food and water. Ingesting too much or too little copper can lead to illness and/or disease. Ingesting a high amount of copper, usually in drinking water, can cause vomiting, nausea, abdominal pain, and/or diarrhea. Ingesting higher than recommended amounts of copper every day over time, such as in water or in copper supplements, can lead to severe illness, such as kidney and liver damage.

Breathing in copper dusts, sprays, or crystals can irritate your nose and throat, and cause dizziness and headaches. People who have ingested these substances have gotten very sick and/or died.

Copper is essential to the development of babies and children, and is found in breastmilk. Babies and children are expected to have symptoms similar to adults when exposed to high levels of copper in air, water, or food. If you have a disorder that causes copper to build up in your body, like Wilson's disease, you may be especially vulnerable to high copper levels in air, food, or water.

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Copper

Can copper cause cancer?

The U.S. Department of Health and Human Services (DHHS) has not evaluated the carcinogenicity (whether it causes cancer) of copper.

The U.S. Environmental Protection Agency (EPA) has not classified if copper is carcinogenic (cancer causing) to humans.

The International Agency for Research on Cancer (IARC) has not evaluated the carcinogenicity of copper. IARC lists copper 8-hydroyquinoline as a group 3 agent indicating the carcinogenicity in humans cannot be classified due to lack of cancer studies in humans and animals.

Can I get a medical test to check for copper?

There are tests to measure the amount of copper in your blood, urine, nails, and hair. Your medical provider can help decide if a test is needed and which is the most appropriate for you. High levels of copper in these tests can show if you have been exposed to a lot of copper or if there is a problem with copper regulation in the body. These tests will not predict if you will have health problems. These tests are not part of standard health tests that are done at your doctor's office and are done through a special lab. If you think you may have been exposed to high levels of copper, talk to your doctor, nurse, or clinic, or call poison control.

How can I protect my family from copper exposure?

If your water is metallic or bitter in taste or smell, and/or is green-blue in color this may be a sign that there is too much copper in your drinking water. If you have copper piping, it can leach into water if your home is new or recently renovated, or if your water is corrosive. Regularly cleaning or flushing out your system can help avoid this. There are tests available to check if your water is corrosive or if copper levels in your water are high.

Safely store copper powders, crystals, or dusts away from children, pets, or other adults.

Monitor your copper intake if you are adding more copper to your diet, such as by taking dietary supplements with copper, to make sure you are not eating too much. Talk to your doctor, nurse, or clinic to figure out if you are taking the proper amount of copper.

If you work with copper, wear the necessary protective clothing and equipment, and always follow safety procedures. Shower and change your clothes before going home each day.

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Want more information?

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Copper

Go to ATSDR's Toxic Substances Portal: http://www.atsdr.cdc.gov/substances/index.asp

If you have any more questions or concerns, you can also find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHLORINATED DIBENZO-p-DIOXINS (CDDs)

Division of Toxicology and Environmental Medicine ToxFAQs™ February 1999

This fact sheet answers the most frequently asked health questions (FAQs) about dibenzo-p-dioxins. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chlorinated dibenzo-p-dioxins (CDDs) (75 chemicals) occurs mainly from eating food that contains the chemicals. One chemical in this group, 2,3,7,8-tetrachlorodibenzo-p-dioxin or 2,3,7,8-TCDD, has been shown to be very toxic in animal studies. It causes effects on the skin and may cause cancer in people. This chemical has been found in at least 91 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

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What are CDDs?

CDDs are a family of 75 chemically related compounds commonly known as chlorinated dioxins. One of these compounds is called 2,3,7,8-TCDD. It is one of the most toxic of the CDDs and is the one most studied.

In the pure form, CDDs are crystals or colorless solids. CDDs enter the environment as mixtures containing a number of individual components. 2,3,7,8-TCDD is odorless and the odors of the other CDDs are not known.

CDDs are not intentionally manufactured by industry except for research purposes. They (mainly 2,3,7,8-TCDD) may be formed during the chlorine bleaching process at pulp and paper mills. CDDs are also formed during chlorination by waste and drinking water treatment plants. They can occur as contaminants in the manufacture of certain organic chemicals. CDDs are released into the air in emissions from municipal solid waste and industrial incinerators.

What happens to CDDs when they enter the environment?

❏ When released into the air, some CDDs may be transported long distances, even around the globe.

❏ When released in waste waters, some CDDs are broken down by sunlight, some evaporate to air, but most attach to soil and settle to the bottom sediment in water.

❏ CDD concentrations may build up in the food chain, resulting in measurable levels in animals.

How might I be exposed to CDDs?

❏ Eating food, primarily meat, dairy products, and fish, makes up more than 90% of the intake of CDDs for the general population.

❏ Breathing low levels in air and drinking low levels in water.

❏ Skin contact with certain pesticides and herbicides.

❏ Living near an uncontrolled hazardous waste site containing CDDs or incinerators releasing CDDs.

❏ Working in industries involved in producing certain pesticides containing CDDs as impurities, working at paper and pulp mills, or operating incinerators.

How can CDDs affect my health?

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate liver damage also are seen in people. Exposure to high concentrations of CDDs may induce longterm alterations in glucose metabolism and subtle changes in hormonal levels.

In certain animal species, 2,3,7,8-TCDD is especially harmful and can cause death after a single exposure. Exposure to lower levels can cause a variety of effects in

animals, such as weight loss, liver damage, and disruption of the endocrine system. In many species of animals, 2,3,7,8-TCDD weakens the immune system and causes a decrease in the system's ability to fight bacteria and viruses. In other animal studies, exposure to 2,3,7,8-TCDD has caused reproductive damage and birth defects. Some animal species exposed to CDDs during pregnancy had miscarriages and the offspring of animals exposed to 2,3,7,8-TCDD during pregnancy often had severe birth defects including skeletal deformities, kidney defects, and weakened immune responses.

How likely are CDDs to cause cancer?

Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people. Animal studies have also shown an increased risk of cancer from exposure to 2,3,7,8-TCDD.
The World Health Organization (WHO) has determined that 2,3,7,8-TCDD is a human carcinogen.
The Department of Health and Human Services (DHHS) has determined that 2,3,7,8-TCDD may reasonably be anticipated to cause cancer.

How can CDDs affect children?

Very few studies have looked at the effects of CDDs on children. Chloracne has been seen in children exposed to high levels of CDDs. We don't know if CDDs affect the ability of people to have children or if it causes birth defects, but given the effects observed in animal studies, this cannot be ruled out.

How can families reduce the risk of exposure to CDDs?

❏ Children should avoid playing in soils near uncontrolled hazardous waste sites.
❏ Discourage children from eating dirt or putting toys or other objects in their mouths.
❏ Everyone should wash hands frequently if playing or working near uncontrolled hazardous waste sites.
❏ For new mothers and young children, restrict eating foods from the proximity of uncontrolled sites with known CDDs.
❏ Children and adults should eat a balanced diet preferably containing low to moderate amounts of animal fats including meat and dairy products, and fish that contain lower amounts of CDDs and eat larger amounts of fruits, vegetables, and grains.

Is there a medical test to determine whether I've been exposed to CDDs?

Tests are available to measure CDD levels in body fat, blood, and breast milk, but these tests are not routinely available. Most people have low levels of CDDs in their body fat and blood, and levels considerably above these levels indicate past exposure to above-normal levels of 2,3,7,8-TCDD. Although CDDs stay in body fat for a long time, tests cannot be used to determine when exposure occurred.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.00003 micrograms of 2,3,7,8-TCDD per liter of drinking water (0.00003 µg/L). Discharges, spills, or accidental releases of 1 pound or more of 2,3,7,8-TCDD must be reported to EPA. The Food and Drug Administration (FDA) recommends against eating fish and shellfish with levels of 2,3,7,8-TCDD greater than 50 parts per trillion (50 ppt).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological Profile for Chlorinated Dibenzo-p-Dioxins. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-62, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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Chlorodibenzofurans (CDFs) - ToxFAQs™

What are chlorodibenzofurans (CDFs)?

Chlorodibenzofurans, or CDFs, are a family of chemicals that contain one to eight chlorine atoms attached to the carbon atoms of the parent chemical, dibenzofuran. There are 135 different types of CDFs called congeners. The different congeners have varying harmful health effects. CDF congeners that contain chlorine atoms at the 2,3,7,8- positions of the dibenzofuran molecule are known to be especially harmful.

There is no known use for these chemicals. Other than for research purposes, they are not deliberately produced by industry. Most CDFs are produced in small amounts as undesirable byproducts during the manufacturing of other chemicals. CDFs can also be released from incinerators and landfill fires.

What happens to CDFs in the environment?

CDFs in the environment can be found in air, soil, and sediment. Most CDFs are not soluble in water. In the air, CDFs are bound to particles or exist as vapors. CDFs can be removed from the air by snow or rain. CDFs bind to soil and sediment and are not likely to move into groundwater from soil. They accumulate in fish at much higher levels than levels found in the water or sediment. CDFs can also build up in other animals, birds, and people that are exposed to them in their food.

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How can I be exposed to CDFs?

You could be exposed to very small amounts of CDFs in contaminated food, such as meat, fish, and dairy products. Consuming high amounts of fatty fish may result in exposure to higher levels of CDFs. You could also be exposed to CDFs in air, in drinking water, by using certain consumer products, or in soil in areas near incinerators or landfill fires, but these sources of exposure are less likely.

How can CDFs affect my health?

CDFs can stay in your body for a long time after you were exposed. Studies in animals show that CDFs with chlorine atoms in the 2,3,7,8 positions are the most harmful. The most harmful congener appears to be 2,3,4,7,8-pentaCDF (CDF with 5 chlorine atoms in the 2, 3, 4, 7, and 8 positions).

CDFs are persistent in the environment and body.

Most of the information on health problems comes from studies in people who were accidentally exposed to food contaminated with CDFs. The amount of CDFs was much higher than from environmental exposures or from a normal diet. CDFs caused skin and eye irritations, including severe acne, darkened skin color, and swollen eyelids with discharge from the eyes. CDF poisoning also caused vomiting and diarrhea, anemia, more frequent lung infections, numbness in arms and legs, and other effects on the nervous system.

Chlorodibenzofurans (CDFs)

Many of the same effects that occurred in people also occurred in laboratory animals that ate CDFs. Animals also had severe weight loss, and their stomachs, livers, kidneys, and immune systems were seriously damaged. Some animals had birth defects, and in severe cases, some animals died. These effects in animals were seen when they were fed large amounts of CDFs over a short time, or small amounts over several weeks or months.

Can CDFs cause cancer?

The U.S. Department of Health and Human Services (DHHS) has not evaluated the potential of CDFs to cause cancer in humans.

The U.S. Environmental Protection Agency (EPA) has not evaluated the potential of CDFs to cause cancer in humans.

The International Agency for Research on Cancer (IARC) has determined that 2,3,4,7,8-pentaCDF is carcinogenic to humans; other CDF congeners are not classifiable as to their carcinogenicity to humans.

Can I get a medical test to check for CDFs?

Tests are available to measure levels of CDFs in blood, body fat, and breast milk. These tests cannot predict whether you will have health problems from exposure to CDFs. Doctor's offices do not routinely offer these tests. If you think you have been exposed to CDFs, call your doctor, nurse, or poison control center.

How can I protect myself and my family from CDFs?

Most people don't need to take any special steps to avoid CDFs in their daily lives. Children should avoid playing in the dirt near hazardous waste sites to avoid coming in contact with CDFs.

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For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for CDFs: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=938&tid=194

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Lead - ToxFAQs™

What is lead?

Lead is a metal found naturally in the earth's crust. It can be found in all parts of our environment, including air, water, and soil. Lead can combine with other chemicals to make different compounds.

Lead is used in the production of batteries, ammunition, and metal products (solder and pipes). Because of health concerns, the use of lead in paints, ceramic products, caulking, and pipe solder has been dramatically reduced. The use of lead as an additive to automobile gasoline was banned in 1996 in the United States.

What happens to lead in the environment?

- Lead is an element, so it does not break down.
- When lead is released into the air, it may be transported long distances before it lands and stays on the ground.
- Once on the ground, lead can often stick to soil particles.
- Lead in soil can get into groundwater, but the amount of lead that moves into groundwater will depend on the lead compound and soil type.

How can I be exposed to lead?

Lead can cause health problems in almost every organ and system in your body.

- Eating food or drinking water that contains lead.
- Drinking water from pipes that were soldered with lead can cause exposure.
- Spending time or living in homes with lead-based paints can result in exposure when the paint breaks down and forms dust, which can get on your hands, or into your mouth and nose and be swallowed.
- Spending time in areas where the soil is contaminated with lead.
- Working in a job where lead is used or participating in certain hobbies where lead is used, such as making stained glass.
- Using healthcare products from other countries, alternative treatments, or folk remedies.

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How can lead affect my health?

The effects of lead are the same whether it enters the body by breathing it in or eating it. Lead can affect almost every organ and system in your body. The nervous system is the main target for lead poisoning in children and adults. Long-term exposure can result in decreased learning, memory, and attention, and weakness in fingers, wrists, or ankles. Lead exposure can cause anemia (low iron in the blood) and damage to the kidneys. It can also cause increases in blood pressure, particularly in middle-aged and older individuals. Exposure to high lead levels can severely damage the brain and kidneys and can cause death. In pregnant women, exposure to high levels of lead may cause a miscarriage. In men, it can cause damage to reproductive organs.

Lead

How can lead affect children?

Children are more vulnerable to lead poisoning than adults because their nervous system is still developing. Children can be exposed to lead in their environment and before birth from lead in their mother's body. At lower levels of exposure, lead can decrease mental development, especially learning, intelligence, and behavior. Physical growth may also be decreased. A child who swallows large amounts of lead may develop anemia, severe stomachache, muscle weakness, and brain damage. Exposure to lead during pregnancy can also result in premature births. Some effects of lead poisoning in a child may continue into adulthood.

Can lead cause cancer?

Several agencies and organizations both in the United States and internationally have reviewed studies and made an assessment about whether lead can cause cancer.

- The Department of Health and Human Services (HHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens (causing cancer in people).
- The U.S. Environmental Protection Agency (EPA) has classified lead as a probable human carcinogen.
- The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans, and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Can I get a medical test to check for lead?

A blood test is available to measure the amount of lead in your blood. Blood tests are commonly used to screen children for lead poisoning. Your doctor can draw blood samples and send them to appropriate laboratories for analysis. If you think you or anyone in your family has been exposed to lead, contact your doctor, nurse, or poison control center.

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How can I protect my family from lead exposure?

- Avoid exposure to sources of lead.
- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- If your home contains lead-based paint (built before 1978), or if you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house to remove lead dust and lead tracked in soil.
- Certain water pipes may contain lead, so if you know that pipes have lead solder, you should avoid drinking from that source.
- Check for lead in some products such as toys and jewelry and avoid such products.
- Lead is sometimes in candies imported from other countries or traditional home remedies; find out if yours has any lead and avoid using these products or giving them to children.
- You can learn more about preventing lead poisoning here: https://www.cdc.gov/nceh/lead/faqs/lead-faqs.htm

Want more information?

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Lead

CDC Lead Poisoning Prevention Program https://www.cdc.gov/nceh/lead/default.htm

Environmental Protection Agency https://www.epa.gov/lead/protect-your-family-exposures-lead

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

If you have any more questions or concerns, you can also find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Mercury - ToxFAQs™

What is mercury?

Mercury is a naturally occurring element with a chemical symbol of Hg. Elemental mercury is a silver liquid at room temperature that can also evaporate into the air as a gas or become a solid at very low temperatures. It can combine with other substances to form solid compounds that are categorized into two groups: inorganic mercury salts and organic mercury compounds. Mercury and mercury compounds are odorless.

Mercury is used in a number of industries and products. It is primarily used in the manufacture of electronics, fluorescent-lighting, and production of chlorine-caustic soda. It is also used in dental products (fillings), although uses in dentistry are being phased-out. Other historical uses of mercury (batteries; thermometers and other scientific and medical devices; electronic switches and lighting applications; paints and pigments; fungicides and pesticides) have been eliminated or drastically reduced.

What happens to mercury in the environment?

Because mercury is a naturally occurring element, it can be found in the air, water, or soil. It can also be found in the environment due to industrial releases to air and water. Industrial releases to air have steadily decreased over the past few decades.

Mercury does not break down in the environment. In air, mercury may spread far from where it was released. Mercury seldom appears as a silver liquid in the environment. In water, mercury can evaporate into the air. In soil, it can adhere (stick) to soil and sediments (dirt deposits at the bottom of bodies of water). One type of organic mercury compound called methylmercury can build up in plants and fish.

How can I be exposed to mercury?

Most people are exposed to organic mercury compounds (typically methylmercury) in food (such as fish, seafood, rice) or to elemental mercury from dental fillings. Food is the most common form of exposure. Most people are not exposed to inorganic mercury salts. Industrial and dental workers who use mercury are primarily exposed to elemental mercury. Some cultures use mercury in traditional medicines or religious practices, although this is not recommended or approved for use in the United States.

How can mercury affect my health?

Mercury can affect the nervous system and kidneys. The health effects from exposure to mercury depend on a number of factors including the amount and form of mercury, route and length of exposure, and age.

All forms of mercury can affect the nervous system and the kidneys. Workers exposed to elemental mercury vapor and people who eat foods with high levels of methylmercury experienced tremors, incoordination, impaired vision, impaired learning and memory, and mood changes. Some children born in communities that ate food with high levels of organic mercury had learning, sensory, and movement problems. In people exposed to high levels of methylmercury in their diets, birth defects have occurred. Some humans and animals that ate mercury compounds had high blood pressure and alterations in their immune systems. Animals that breathed elemental mercury vapor or ate organic or inorganic mercury compounds in their diets showed nervous system effects and/or kidney damage. Animals that ate high levels of mercury compounds showed decreased fertility and/or birth defects.

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Mercury

Can mercury cause cancer?

Rats that ate an inorganic mercury compound for a long period of time developed stomach or thyroid cancer. Rats and mice that ate organic mercury compounds for a long period of time developed kidney cancer.

The U.S. Department of Health and Human Services (DHHS) has not evaluated the potential of mercury or mercury compounds to cause cancer in people.

The U.S. Environmental Protection Agency (EPA) has determined that mercuric chloride (inorganic mercury salt) and methylmercury (organic mercury compound) are possible human carcinogens (cause cancer). The EPA did not classify the potential of elemental mercury to cause cancer in humans.

The International Agency for Research on Cancer (IARC) classified methylmercury compounds as possibly carcinogenic to humans. IARC designated inorganic mercury and elemental mercury as not classifiable for causing cancer in humans.

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Can I get a medical test to check for mercury?

Mercury can be measured in your blood, urine, hair, or toenails. However, tests cannot determine which form of mercury you were exposed to. Tests also cannot predict whether you will have health problems. If you think you have been exposed to mercury, call your doctor, nurse, or poison control center.

How can I protect myself and my family from mercury?

People should avoid eating fish that contain high levels of methylmercury. This is particularly important for pregnant women and children. Follow your state's health advisories that tell you about whether it is okay to eat fish or wildlife caught in contaminated areas. Avoid all contact with spills of the liquid form of elemental mercury (the type of mercury found in old thermometers). If a spill occurs, refer to https://www.atsdr.cdc.gov/dontmesswithmercury for safe clean-up practices. Most people don't need to take any special steps to avoid exposure to inorganic mercury salts in their daily lives. Keep children from playing in areas near hazardous waste sites to avoid coming in contact with mercury.

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for mercury: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=115&tid=24

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

Polycyclic Aromatic Hydrocarbons

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polychlorinated Biphenyls - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over

Polychlorinated Biphenyls

several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. PCBs have been classified as probably carcinogenic, and carcinogenic to humans (group 1) by the Environmental Protection Agency (EPA) and International Agency for Research on Cancer (IARC), respectively.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risks of exposure to PCBs?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

TIN AND TIN COMPOUNDS

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about tin and tin compounds. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: The main route of exposure to tin and tin compounds is by eating food contaminated with these compounds. Swallowing large amounts of inorganic tin compounds may cause stomachache, anemia, and liver and kidney problems. Humans exposed for a short period of time to some organic tin compounds have experienced skin and eye irritation and neurological problems; exposure to very high amounts may be lethal. Metallic tin and inorganic tin compounds have been found in at least 214 of the 1,662 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA). Organic tin compounds have been identified in at least 8 of the NPL sites.

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What are tin and tin compounds?

Tin is a natural element in the earth's crust. It is a soft, white, silvery metal that does not dissolve in water. It is present in brass, bronze, pewter, and some soldering materials. Tin metal is used to line cans for food, beverages, and aerosols.

Tin can combine with other chemicals to form compounds. Combinations with chemicals like chlorine, sulfur, or oxygen are called inorganic tin compounds (i.e., stannous chloride, stannous sulfide, stannic oxide). These are used in toothpaste, perfumes, soaps, food additives and dyes. Tin also can combine with carbon to form organotin compounds (i.e., dibutyltin, tributyltin, triphenyltin). These compounds are used to make plastics, food packages, plastic pipes, pesticides, paints, and pest repellents.

Tin metal, and inorganic and organic tin compounds can be found in the air, water, and soil near places where they are naturally present in the rocks, or where they are mined, manufactured, or used.

What happens to tin and tin compounds when they enter the environment?

❑ Tin is released into the environment by both natural processes and human activities, such as mining, coal and oil combustion, and the production and use of tin compounds. Metallic tin released to the environment will quickly form inorganic tin compounds.

❑ Inorganic tin cannot be destroyed in the environment; it can only change its form. Organic tin compounds can be degraded to inorganic tin compounds by sunlight and bacteria.

❑ In the atmosphere, tin exists as gases and fumes, and attaches to dust particles. Particles in the air containing tin may be transported by wind or washed out of the air by rain or snow.

❑ Inorganic tin binds to soil and to sediments in water. Some inorganic tin compounds dissolve in water.

❑ Organic tin compounds stick to soil sediment, and particles in water.

❑ The time each organic tin compound stays in water and soil differs for each compound. In water it may range from days to weeks and in soil it may be years.

❑ Organic tin compounds can build up in fish, other organisms, and plants.

How might I be exposed to tin and tin compounds?

❑ Eating food or drinking liquids from tin-lined cans (today greater than 90% of tin-lined cans used for food are protected with lacquer).

❑ Breathing air or touching dusts that contains tin in the workplace or near hazardous waste sites.

❑ Exposure to some organotins can occur by eating seafood from coastal waters or from contact with household products that contain organotin compounds (i.e., some plastics).

How can tin and tin compounds affect my health?

Metallic tin is not very toxic due to its poor gastrointestinal absorption. Human and animal studies show that ingestion

of large amounts of inorganic tin compounds can cause stomachache, anemia, and liver and kidney problems. Breathing or swallowing, or skin contact with some organotins, such as trimethyltin and triethyltin compounds, can interfere with the way the brain and nervous system work. In severe cases, it can cause death.

Some organotin compounds, such as dibutyltins and tributyltins, have been shown to affect the immune system in animals, but this has not been examined in people. Studies in animals also have shown that some organotins, such as dibutyltins, tributyltins, and triphenyltins can affect the reproductive system. This, also, has not been examined in people.

Inorganic or organic tin compounds placed on the skin or in the eyes can produce skin and eye irritation.

How likely are tin and tin compounds to cause cancer?

There is no evidence that tin or tin compounds cause cancer in humans. Studies in animals have not shown evidence of carcinogenicity for inorganic tin. A study in rats and another in mice showed that a specific organotin, triphenyltin hydroxide, can produce cancer in animals after long-term oral administration.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified metallic tin or inorganic tin compounds for carcinogenicity. The EPA has determined that a specific organotin, tributyltin oxide, is not classifiable as to human carcinogenicity.

How can tin and tin compounds affect children?

There are no studies on health effects in children exposed to tin and tin compounds. However, it is reasonable to assume that children would exhibit the same type of health effects observed in exposed adults. There are no reports of adverse developmental effects in humans exposed to tin or its compounds. There are no studies examining developmental effects in animals exposed to inorganic tin. Exposure of rodents to some organotins during pregnancy has produced birth defects in the newborn animals. A study with tributyltin in rats found that exposure during gestation, lactation, and following lactation affected the development of some sexual characteristics in female rats. We do not know whether tin and tin compounds can be passed to newborn animals in maternal milk. We know that some organotins can cross the placenta and reach the fetus in animals.

How can families reduce the risk of exposure to tin and tin compounds?

- ❏ Because tin is naturally found in the environment, we cannot avoid being exposed to it.
- ❏ Reduce the amount of canned products you eat or drink and store unused portions in separate containers.
- ❏ Reduce your consumption of seafood from waters that may be contaminated with organic tin compounds and your contact with household products that contain organotin compounds (for example, silicon-coated baking parchment paper).

Is there a medical test to show whether I've been exposed to tin and tin compounds?

There are tests to measure total tin and specific organotin compounds in your blood, urine, feces, and body tissues. Normally, small amounts of tin can be found in the body because of the daily exposure to small amounts in the food. Therefore, the available tests cannot tell you when you were exposed or the exact amount of tin to which you were exposed, but can help determine if you were recently exposed to an unusually high amount of tin. These tests are not routinely performed at your doctor's office, but your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 milligrams per cubic meter of air (0.1 mg/m^3) in the workplace for organotin compounds and 2.0 mg/m^3 for inorganic tin compounds, except oxides.

The Food and Drug Administration (FDA) regulates the use of some organic tin compounds in coatings and plastic food packaging. The FDA also has set limits for the use of an inorganic tin compound, stannous chloride, as an additive for food.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Tin and Compounds (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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ZINC

CAS # 7440-66-6

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about zinc. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Zinc is a naturally occurring element. Exposure to high levels of zinc occurs mostly from eating food, drinking water, or breathing workplace air that is contaminated. Low levels of zinc are essential for maintaining good health. Exposure to large amounts of zinc can be harmful. It can cause stomach cramps, anemia, and changes in cholesterol levels. Zinc has been found in at least 985 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

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What is zinc?

Zinc is one of the most common elements in the earth's crust. It is found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

❏ Some is released into the environment by natural processes, but most comes from human activities like mining, steel production, coal burning, and burning of waste.
❏ It attaches to soil, sediments, and dust particles in the air.
❏ Rain and snow remove zinc dust particles from the air.
❏ Depending on the type of soil, some zinc compounds can move into the groundwater and into lakes, streams, and rivers.
❏ Most of the zinc in soil stays bound to soil particles and does not dissolve in water.
❏ It builds up in fish and other organisms, but it does not build up in plants.

How might I be exposed to zinc?

❏ Ingesting small amounts present in your food and water.
❏ Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.
❏ Eating too many dietary supplements that contain zinc.
❏ Working on any of the following jobs: construction, painting, automobile mechanics, mining, smelting, and welding; manufacture of brass, bronze, or other zinc-containing alloys; manufacture of galvanized metals; and manufacture of machine parts, rubber, paint, linoleum, oilcloths, batteries, some kind of glass, ceramics, and dyes.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause problems, but too much zinc is also harmful.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol. We do not know if high levels of zinc affect reproduction in humans. Rats that were fed large amounts of zinc became infertile.

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

❑ Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.

❑ Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.

❑ If you use medicines or vitamin supplements containing zinc, make sure you use them appropriately and keep them out of the reach of children.

Is there a medical test to determine whether I've been exposed to zinc?

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m^3 for zinc chloride fumes and 5 mg/m^3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek.

Similarly, the National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Zinc (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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Appendix H

Occupational Exposure Limits (OEL) for Contaminants of Potential Concern

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CHEMICAL HAZARD EXPOSURE LIMITS

COMPOUND/ DESCRIPTION	OSHA PEL EXPOSURE LIMIT	WA-DOSH PEL EXPOSURE LIMIT	ACGIH TLV EXPOSURE LIMITS	NIOSH REL EXPOSURE LIMITS
Arsenic, metallic grey solid/dust	PEL: 0.010 mg/m³	PEL: 10 mg/m³	TLV: 0.01 mg/m³	REL: 0.002 mg/m³ IDLH: 5 mg/ m³
Cadmium, soft, silvery-white metal. Usually found as dust	TWA: 0.005 mg/m³ IDLH: 9 mg/m³	No available data	TLV: 0.01 mg/m³ (total particulates) TLV: 0.002 mg/m³ respirable particulate	ALARA
Chromium, steely-grey, lustrous, hard, and brittle transition metal	PEL: 1 mg/ m³ IDLH: 250 mg/m³	No available data	TLV: 0.5 mg/m³	REL: 0.5 mg/m³ IDLH: 250 mg/m³
Lead, soft heavy metal that is silvery with a hint of blue; it tarnishes to a dull gray color when exposed to air	PEL: 0.05 mg/m³	AL: 30 µg/m³ PEL: 0.05 mg/m³	TLV: 0.05 mg/m³	REL: 0.05 mg/m³ IDLH: 100 mg/m³
Mercury (and inorganic compounds as mercury), silvery liquid metal in pure forms	No available data	No available data	No available data	No available data
Nickel, silvery-white lustrous metal with a slight golden tinge	PEL as metal 0.5 mg/m³, insoluble 0.1 mg/m³, soluble 0.05 mg/m³	No available data	IHL: 0.1 mg/m³	TWA: 0.015 mg/m³
Zinc, slightly brittle metal and has a silvery-greyish appearance when oxidation is removed	TLV/PEL none Treat as Particles not otherwise specified and maintain levels below 3 mg/m³ respirable and 10 mg/m³ inhalable	No available data	No available data	No available data
Tributyltin	No available data	No available data	No available data	No available data
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)* coal tar pitch volatiles	PEL: 0.2 mg/m³	TWA: 0.2 mg/m³ STEL: 0.6 mg/ m³	0.2 mg/m³ (TLV)	0.1 mg/m³ (TWA) 80 mg/m³ (IDLH)

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COMPOUND/ DESCRIPTION	OSHA PEL EXPOSURE LIMIT	WA-DOSH PEL EXPOSURE LIMIT	ACGIH TLV EXPOSURE LIMITS	NIOSH REL EXPOSURE LIMITS
Polychlorinated biphenyls (PCBs), pale-yellow viscous liquids	No available data	No available data	TLV = 0.5 mg/m^3	No available data
Dioxins/Furans	No available data	No available data	No available data	No available data

Notes:

*If a State has established a PEL more restrictive than the OSHA limits, then the applicable State limit becomes the legal limit.
IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
NIOSH = National Institute of Occupational Safety & Health
mg/m3 = milligrams per cubic meter (dust or particulate conc.)
TWA = time-weighted average (Over 8 hrs.), basis of most exposure limits
PEL = permissible exposure limit, legally enforceable
TLV = threshold limit value (over 8 hrs)
REL= recommended exposure limit (over 10 hrs)
STEL = short-term exposure limit (15 min)
Ceiling (C) – concentration never to be exceeded
ppm = parts per million (vapor conc.)

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Appendix I
Personal Protective Equipment Program

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GeoEngineers

Personal Protective Equipment Program

Revised September 2023

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Personal Protective Equipment Program

Purpose

The purpose of the GeoEngineers Personal Protective Equipment (PPE) Program is to reduce employee exposure to hazards through the use of PPE when engineering and administrative controls are not feasible or able to completely remove the hazards.

Scope

This program covers each employee who may need to wear PPE and ensures that they have been properly trained and/or retrained when the workplace changes; previous training becomes obsolete; the type of PPE changes; or when the employee demonstrates lack of use, improper use, or insufficient skill or understanding in using the PPE.

Responsibilities

Principals/Associates/Project Managers/Group Leaders/Site Supervisors—Responsible for ensuring that the provisions of this program are implemented and followed at locations in which they have oversight and influence. Including:

- Conducting worksite evaluations in cooperation with other supervisors and Health and Safety Program Managers to identify if PPE is being properly utilized.
- Ensuring effective first aid response and supplies are readily available.
- Ensuring employees are properly trained in safe worksite habits and understand how to use and the role of their PPE.
- Immediately reporting up all workplace related injuries and illnesses which occur in their area of responsibility. Provide written reports of all investigations and planned corrective actions to the Health and Safety Manager.
- Correct identified workplace hazards or report up deficiencies they cannot correct.
- Communicate key health and safety regulations to affected employees

Health and Safety Manager (HSM)—GeoEngineers' HSM shall monitor and evaluate the Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements shall be promptly addressed. Additional duties include:

- Conduct worksite evaluations in cooperation with supervisors and employees to identify workplace hazards and the ways to avoid or correct them to prevent injuries.
- Establish systems for ensuring supervisors and employees comply with the company or worksite PPE policy and utilize the safety tools, equipment, and safety training for their tasks.
- Establish a system for communicating with employees in readily understandable methods relevant and up to date information related to their safety and health.
- Provide training to employees and supervisors that allows them to identify workplace hazards so that they can prevent injuries.
- Maintain records of activities and training related to the PPE program.
- Review the effectiveness of the PPE program with supervisor and employee input at least annually.

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Employees—GeoEngineers' employees are responsible and accountable for complying with this program, including:

- Attending all required training programs provided.
- Maintaining their PPE in good working condition and replacing PPE when necessary.
- Complying with worksite policies regarding safety and work practices.
- Reporting known or suspected safety hazards to their Supervisor or Safety Coordinator.
- Reporting all workplace related injuries or illnesses to their supervisor.

Definitions

Personal Protective Equipment (PPE)—includes a variety of devices and garments to protect workers from injuries. PPE is designed to protect Eyes/Face; Head; Ears/Hearing; Feet; Respiratory System and; Hands, Arms, and Whole Body. PPE includes such items as: Safety glasses; Goggles; Face shields; Hard hats; Safety shoes; Gloves; High Visibility Garments

General Requirements

This program provides guidance on the use, issuing, inspection, maintenance, and replacement of PPE and protective work clothing. All basic work-required PPE will be provided to GeoEngineers' employees at no cost to them in a sanitary and reliable condition. Additional PPE may be required based on the hazard or client requirements. PPE selected must be fitted to each affected employee. Defective and damaged equipment SHALL NOT be used.

GeoEngineers will provide reimbursement for an initial field clothing allowance for new employees who work in the field to purchase steel-toed work boots, rubber muck boots, and outerwear for protection from all weather conditions (rain, cold, heat, etc.), up to a combined total of $400. Employees who work in the field are eligible for subsequent $400 reimbursement every 2 years following their first year of employment, with the exception of field technicians and drillers, who will be eligible for the $400 reimbursement every year. Manager approval will be required for allowance exceedances.

GeoEngineers Safety Store provides pre-approved PPE for GeoEngineers' employees to order at no cost to them. The Safety Store is accessible on the Health and Safety Department page.

GeoEngineers field staff shall have in their possession and wear on project sites a full accompaniment of basic PPE including:

- Hard hat.
- Safety vest or similar high visibility clothing.
- Appropriate footwear to mitigate potential hazards associated with slips, falls (i.e., traction) and protection of the feet. Steel toed boots are required when working around or with heavy materials and equipment.

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- Appropriate gloves (accounting for dexterity needs as well as potential chemical and/or sharp object protection) to mitigate potential hazards associated with cutting, grasping and hand exposures.
- Appropriate eye protection (e.g., safety glasses and/or face shields) to mitigate potential hazards associated with foreign objects or materials that could enter the eyes.
- Appropriate hearing protection (e.g., ear plugs and/or noise reducing ear muffs) to mitigate potential hearing damage from loud noises.

Implementation

Safety Glasses

Safety glasses worn by employees shall have permanent side shields and meet the requirements of ANSI/ISEA standard; Z87.1-2010, and ANSI Z87.1-2003, Occupational and Educational Personal Eye and Face Protection Devices.

In general, eye protection must:

- Fit comfortably.
- Be durable.
- Be easy to clean.
- Not restricting vision or movement.
- Not interfering with other PPE.
- Be inspected daily for damage and replaced as soon as possible if damaged.

Prescription Safety Glasses

Employees who wear prescription glasses may utilize a stipend to purchase prescription eye protection as well. Refer to GeoEngineers Expense Guidelines for the current reimbursable allowance provided for eye exams and glasses. Current reimbursement as of writing this program is $180 every 2 years. Employees who wear corrective lenses must wear eye protection which incorporates their prescription in its design. Ordinary corrective eyewear does not provide the required level of protection. Contact lenses should not be used in any hazardous environment.

Hard Hat

A hard hat shall be worn on project field sites as standard protection and to demonstrate to the public that we are conducting official business. The only exception is when the hard hat creates more of a hazard to wear it than not or during desk work in the field. In those situations, alternate head gear such as bump hats or skill hats should be discussed with the HSM.

- Where site-specific job safety analysis and PPE assessments have not been completed, hard hats are mandatory with the exception inside vehicle cabs and office areas.
- Hard hats are required in construction areas.
- Hard hats for electrical maintenance and construction work shall meet the applicable health and safety standards/requirements for limiting electric shock, burns or impact.
- Head protection is to be used in accordance with the manufacturer's instructions.

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Protective hats must meet ANSI STD. Z89.1 – 2009 and ANSI STD Z89.1-2003. There are three general classes of head protection which have been updated.

Classifications Under Old and New Standards			
Z89.1 – 1986 (Old Standard)	Z89.1 – 1997 onward (New Standard)	Application	Test Voltage
A	G	General	2,200 Volts
B	E	Electrical	20,000 Volts
C	C	Conductive	Not Tested

Types and Classes

- Type 1 Hard Hat—These devices are intended only to reduce the force of impact resulting from a blow to the top of the head. Hard hats that meet the requirements of the Z89.1 - 2009 revision should meet this specification also. Both cap and hat design styles can be a Type 1.
- Type 2 Hard Hat—A Type 2 head protector is a hat or cap that provides side impact protection as well as the top or vertical impact protection of a Type 1 device. They are typically lined with high density foam on the inside.
- Class G (General)—Class G head protectors are intended to reduce the danger of contact exposure to low voltage conductors. Test samples are proof tested at 2,200 volts (phase to ground). These were formerly known as Class A hard hats.
- Class E (Electrical)—Class E helmets are intended to reduce the danger of contact exposure to low voltage conductors. Test samples are proof tested at 20,000 volts (phase to ground). These were formerly known as Class E hard hats.
- Class C (Conductive)—Class C hard hats are not intended to provide protection against contact with electrical conductors.
- Note: Neither the Class G nor Class E electrical insulation properties are intended as an indication of the voltage at which the hard hat will protect the wearer.
- Bump Caps—Bump caps do not meet the ANSI requirements. They are recommended for areas where protection is needed from head bumps and lacerations.

Hard Hat Maintenance

- Inspect your hard hat for dents, cuts, breaks, and other damage regularly.
- Do not put excessive stickers or paint on your hard hat unless approved by a supervisor.
- Replace your hard hat if it is involved in an impact collision.
- Replace your hard hat suspension system once a year.
- Replace your hard hat entirely every five years.

Safety Shoes

Safety shoes must be closed shoes which, at a minimum, provide both impact and compression protection in/around the toe area shall be worn as minimum foot protection when in the field, laboratory areas and construction areas.

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- Footwear shall be non-porous and must cover the toes and instep.
- Selected safety footwear for personnel working in the field, should provide ankle support.
- Safety footwear shall have smooth leather uppers, (no suede). Soles may be leather, rubber, or composition with either a tread or rugged surface.
- When working in wet conditions rubber boots should be worn over the safety footwear.
- Where fall hazards are present steel-toed protection must meet or exceed ASTM F-2413-2005.

The following table gives PPE boot materials and the general benefits they provide.

Safety Feature	Benefits
Impact-resistant toes	Protects feet from falling objects or compression
Heat-resistant soles	Protects feet from extreme heat
Puncture resistant metal insoles	Protects the soles of the feet from sharp debris common on construction sites
Rubber	Provides traction and flexibility
Electrically conductive soles	Grounds the wearer to avoid static discharge in explosive environments
Electrically nonconductive soles	Insulates feet from electrically charged materials or surfaces

Purchase of Safety Shoes

Refer to GeoEngineers Expense Guidelines for the current reimbursable allowance provided for safety shoes and rubber boots. As of writing this program, the current stipend is $400 every 2 years for all self-purchased PPE, including safety shores. Field technicians and drillers are eligible for their 400$ PPE reimbursement every year instead of every 2 years.

Clothing

Long trousers must be worn (no shorts). Short-sleeve shirts must have a minimum of 4-inch sleeves (no sleeveless shirts or tank tops). Note: Personnel working with or in the vicinity of rotating equipment should not wear loose clothing (e.g., unbuttoned long sleeves, unfastened coveralls, un-tucked shirts, neck wear, etc.). Branded clothing is available on the GeoEngineers company store and may be subject to reimbursement or discounts upon purchase. See below for details.

High Visibility Clothing

High visibility clothing shall be provided by GeoEngineers and worn for field operations. High visibility vests are required on construction sites, on terminals, while conducting recons, working on roads, paths, and locations where there is moving equipment. Vest must be both bright in color and reflective.

Rain Gear

Refer to GeoEngineers Expense Guidelines for the current reimbursable allowance provided for rain gear. As of writing this program, rain gear may be purchased as PPE using the $400 self-purchased PPE stipend. Rain gear purchased from the Company Store by non-field employees receives a 50% discount.

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Fire Retardant Clothing

Fire retardant clothing is required predominantly on oil and gas sites, but based on client requirement may also be required on other sites as well. Fire retardant clothing may be made from several types of thermal protective fabrics (see below). Fire retardant clothing required by the client shall be purchased by GeoEngineers and replaced when needed. An assessment process such as the Safety Conversation/Observation shall be used to maintain compliance.

THERMAL PROTECTIVE PERFORMANCE (TPP) OF VARIOUS FABRICS **

Fabric	Nominal Weight (oz/yd^2)	Ignites (Yes/No)	TPP (cal/cm^2)
NOMEX IIIA	4.5	NO	10.6
NOMEX IIIA	6.0	NO	13.1
NOMEX III (Without static-dissipative fiber)	6.0	NO	13.1
Cotton	6.5	YES	***
Polyester/Cotton Blend (65%/35%)	7.0	YES	***
Flame-Retardant Treated Cotton	6.0	NO	7.6
Flame Retardant Treated Cotton	9.0	NO	9.8

Notes:

Fabric was tested according to ASTM D-4108 recommended mounting procedures to test single-layer fabrics, using combined radiant and convective heat.

** Each fabric was home laundered five times prior to testing

*** Fabric ignited and did not pass the flame resistance test (vertical flame test), so meaningful TPP values could not be obtained.

As of writing this program, fire retardant clothing may be purchased by a GeoEngineers employee and reimbursed up to $500 every two years.

Hearing Protection

Hearing protection will be provided to employees to guard against noise levels in excess of 90 decibels (dBA) and is required to be worn. Employees whose daily noise exposure exceeds an 8 hour, time weighted average (TWA) of 85 dBA must wear hearing protection and must participate in the GeoEngineers hearing conservation program. Hearing protection standards and practices will be based on the most up to date guidance from Occupational Safety and Health Administration (OSHA) standard 1910.95 – Occupational Noise Exposure.

Additionally, if the average noise level over an 8-hour period is averaging 105 dBA or louder, double hearing protection is required. Meaning usage of both internal ear plugs and external ear muffs.

For more details on hearing protection, see GeoEngineers Hearing Conservation Program.

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Gloves

Gloves made with a material(s) suitable for protection against specific hazards that may be encountered (e.g., chemical resistant gloves) should be worn or readily available when any task with potential hand hazards is undertaken. This would include handling contaminated soil or materials and handling items that could result in pinches, cuts, or scrapes, when drilling, sampling, or performing maintenance.

- Loose gloves should not be worn when working with rotating equipment (e.g., drill presses, shafts, sheaves, gears, sprockets, pedestal, grinders, and "in-rolling" pinch points, etc.) where there is a chance the glove "catches" and pulls an employee's arm into the equipment.
- When performing job specific tasks, which could require the gloves to be removed, they may be removed to perform that task and then put back on upon completion of the specific task. Examples would be writing, pressing small start/stop buttons, intricate electrical work, etc.
- Cut-resistant (Kevlar® or equivalent) gloves should be worn when working with knives, blades, razors, box-cutters, glass, or other sharp objects even for general office tasks.

The following table gives PPE glove materials and the general benefits they provide.

PPE	Benefits
Latex, butyl, nitrile, neoprene, synthetics	Protection against burns, chemical burns, biological hazards, irritation, and dermatitis (depending on the specific glove)
Metal mesh, leather, canvas	Protection against cuts, abrasions, punctures, and burns
Fabric and fabric-coated	Protection against dirt and abrasions
Rubber	Protection against cuts, punctures, and abrasions
Insulated	Protection against extreme heat or cold

Personal Flotation Devices (PFDs)

Personal Flotation Device (PFD) use applies to terminals and piers and employees working near other bodies of water. It also applies to activities conducted by GeoEngineers employees at these facilities, including construction, maintenance, inspections, tours and operations. As of June 26, 2002, the inflatable style PFD has not been approved by the Department of Labor and Industries. The regulations for PFDs are in three L&I locations: WAC 296-800-16070 Personal flotation devices, WAC 296-155-235 Working over or adjacent to water, and WAC 296-56-60115 – Other protective measures.

For more detailed information on working over water, see GeoEngineers Working Over Water program.

PFDs are required for the following:

- Any employee in a boat/skiff/barge,
- Any employee is working on top of, or beyond the bull rail

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PFDs are not specifically required when:

- Working behind a guardrail of standard height and strength or other stable restraint
- A single person is working more than 6 feet from the edge
- Working over shallow water (less than chest deep) where floatation would not be achieved (other protective measures required).

Off-Shore Life Jacket (Type I PFD)
Best for open, rough, or remote water, where rescue may be slow coming.

Advantages

- Floats you the best
- Turns most unconscious wearers face-up in water
- Highly visible color

Disadvantages

- Bulky

Near-Shore Buoyant Vest (Type II PFD)
Good for calm, inland water, or where there is good chance for fast rescue.

Advantages

- Turns some unconscious wearers face-up in water
- Less bulky, more comfortable than Off-Shore Life Jacket (Type I PFD)
- Compromise between Type I PFD performance and wearer comfort

Disadvantages

- May be uncomfortable wearing for extended periods
- Will not turn as many people face-up as a Type I PFD will
- In rough water, a wearer's face may often be covered by waves
- Not for extended survival in rough water

Flotation Aid (Type III PFD)
Good for calm, inland water, or where there is good chance of fast rescue.

Advantages

- Generally, the most comfortable type for continuous wear
- Freedom of movement for water skiing, small boat sailing, fishing, etc.
- Available in many styles, including vests and flotation coats

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Disadvantages

- Not for rough water
- Wearer may have to tilt head back to avoid face-down position in water

Respiratory Protection

Respiratory protection is covered in the GeoEngineers Respiratory Protection Program.

Employee-Owned Equipment

As a general rule, employees will not use employee-owned PPE. Exceptions must be approved by the Health and Safety Manager. Any approved employee-owned equipment shall be adequate, maintained and in good sanitary condition before use.

Maintenance and Replacement

Protective equipment must be routinely inspected and maintained/replaced if any damage or defects are identified. Mandatory protective work clothing and personal protective equipment must be maintained and replaced as necessary in accordance with the PPE program.

Site-Specific Hazard Assessments

Site-specific PPE Hazard Assessments shall be completed as part of job hazard analysis or health and safety plans.

Training

Training regarding this program shall be provided during new employee orientation, manager webinar or brown bag meetings, and periodically through other forms of communication such as feature safety articles and annual HAZWOPER Refresher. Training shall be documented in Ascent.

Proper training on PPE will include how to properly don, doff, adjust, and wear PPE. The limitations of PPE and proper care/maintenance, useful life expectancy of the PPE, and proper disposal. Retraining will take place when the workplace or type of PPE changes, or when employees display a lack of training in proper use of their PPE

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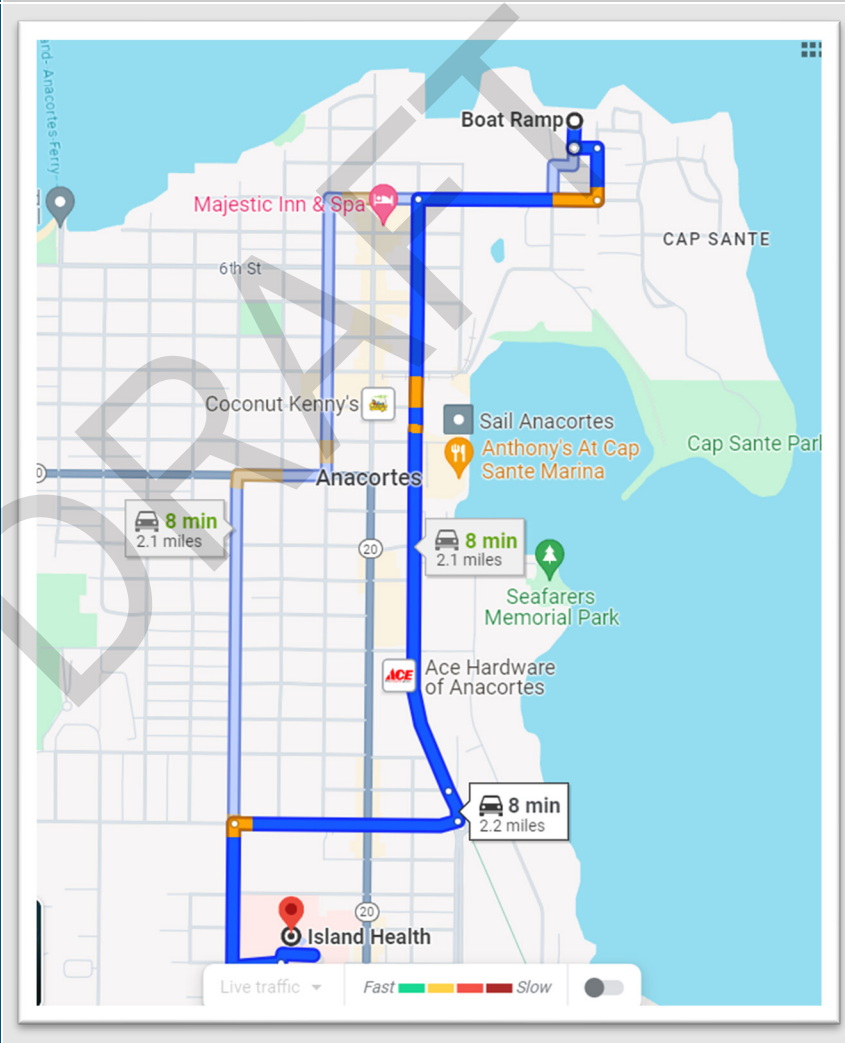
Issued March 1, 2007
Revised September 1, 2015
Revised January 8, 2020
Revised April 25, 2023
Revised September 25, 2023

Appendix J

Emergency/Hospital Contact Information and Directions

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HOSPITAL AND DIRECTIONS

HOSPITAL NAME	**Island Hospital**
HOSPITAL ADDRESS	1211 24th St, Anacortes, WA 98221
PHONE NUMBER (HOSPITAL ER)	(360) 299-1300
DRIVING DISTANCE	2.2 Miles
DRIVING DIRECTIONS	1. Take **4th St** to Q Ave 2. Turn **left** onto **Q Ave** 3. Turn **right** onto **22nd Street** 4. Turn **left** onto **M Avenue** 5. Turn **left** onto **26th Street** 6. Arrive at Destination
DRIVING MAP	

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Attachment 2

Compliance Monitoring Plan

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Compliance Monitoring and Quality Assurance Project Plan

Anacortes Port Log Yard
Anacortes, Washington
Facility Site No. 21898438
Cleanup Site No. 3604
Ecology Agreed Order No. DE 10630

for

Washington State Department of Ecology
on Behalf of Port of Anacortes

October 5, 2026

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2101 4th Avenue, Suite 950
Seattle, Washington 98121
206.728.2674

GeoEngineers

Compliance Monitoring and Quality Assurance Project Plan

Anacortes Port Log Yard
Anacortes, Washington

File No. 5147-016-15
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Appendix A. Compliance Monitoring Health and Safety Plan

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Acronyms and Abbreviations

%D	percent difference
%R	percent recovery
Agreed Order	Agreed Order No. DE 10630
ARL	Analytical Resources, LLC
ASTM	ASTM International
BMP	Best Management Practice
CMP	Compliance Monitoring Plan
CFR	Code of Federal Regulations
COC	chain-of-custody
cPAH	carcinogenic polycyclic aromatic hydrocarbons
DCAP	Draft Cleanup Action Plan
DMMP	Dredged Material Management Program
DQO	data quality objective
Ecology	Washington State Department of Ecology
EDD	electronic data deliverable
EIM	Environmental Information Management system
EPA	United States Environmental Protection Agency
FS	feasibility study
GeoEngineers	GeoEngineers, Inc.
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HPAH	high molecular polycyclic aromatic hydrocarbon
IAWP	Interim Action Work Plan
KM	Kaplan-Meier
LCS	laboratory control sample
LCSD	laboratory control sample duplicate
LPAH	low molecular polycyclic aromatic hydrocarbon
LOQ	limit of quantification
MDL	method detection limit
MLLW	mean lower low water
MRL	method reporting limit
MS	matrix spike
MSD	matrix spike duplicate
MTCA	Model Toxics Control Act

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NAD83	North American Datum of 1983
OSHA	Occupational Safety and Health Administration
PAH	polycyclic aromatic hydrocarbon
PARCC	Precision, Accuracy, Representativeness, Completeness, and Comparability
PCB	polychlorinated biphenyl
Port	Port of Anacortes
PPE	personal protective equipment
ppb	parts per billion
ppm	parts per million
PQL	practical quantitation limit
PRDI	Pre-Remedial Design Investigation
QA	quality assurance
QAPP	Quality Assurance Project Plan
QC	quality control
RCW	Revised Code of Washington
RI	remedial investigation
RL	reporting limit
RPD	relative percent difference
Site	Anacortes Port Log Yard
SL	screening level
SMS	Sediment Management Standards
SOP	standard operating procedure
SVOC	semi-volatile organic compound
TAT	turn-around-time
TBT	tributyltin
TEF	toxicity equivalency factor
TEQ	toxicity equivalent (refers to concentration basis)
TOC	total organic carbon
TRL	target reporting limit
VOC	volatile organic compound
WAC	Washington Administrative Code
WISHA	Washington Industrial Safety and Health Act

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1.0 Introduction

This Compliance Monitoring and Quality Assurance Project Plan (CMP/QAPP) is prepared as an attachment (Attachment 2) to the Interim Action Work Plan (IAWP; GeoEngineers 2026) for the Anacortes Port Log Yard site (Site). The Site is situated along southern shoreline of Guemes Channel at the northern terminus of T Avenue in the nearshore area northwest of 718 4th Street in Anacortes, Washington. Pursuant to Agreed Order No. DE 10630 (Agreed Order) issued by the Washington State Department of Ecology (Ecology) and in accordance with Model Toxics Control Act (MTCA) cleanup regulations (Chapter 173-204 and 173-340 Washington Administrative Code [WAC]), the Interim Action will expedite part of the environmental cleanup at the Site addressing previously identified sediment contamination within the current and planned future operational area encompassing Pier 61 and commercial boat ramp facility (Wyman's Ramp) as well as the area containing elevated levels of wood waste resulting from historical log haul out operations (i.e., Former Log Haul Out). A detailed description of the Site including background, development history, stratigraphy, contaminant nature and extent, and planned Interim Action activities are presented in the IAWP.

The purpose of this plan is to describe monitoring activities that will be completed and present quality assurance (QA) and quality control (QC) requirements applicable to Interim Action. Specifically, this CMP/QAPP presents the objectives, procedures, organization, functions, activities, and specific QA/QC activities designed to achieve the data quality objectives (DQOs) established for the project. Environmental measurements will be taken to produce data that are scientifically valid, of known and acceptable quality, and meet established objectives. QA/QC procedures will be implemented so that the precision, accuracy, representativeness, completeness, and comparability (PARCC) of the data generated meet the specified DQOs to the maximum extent possible.

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2.0 Compliance Monitoring

In accordance with WAC 173-340-410, compliance monitoring for a cleanup action includes the following elements:

- **Protection Monitoring** confirms that human health and the environment are adequately protected during the cleanup action.
- **Performance Monitoring** confirms that the cleanup action has been completed in areas exceeding screening levels established by the IAWP and meets other performance standards, such as permit requirements.
- **Confirmation Monitoring** confirms the long-term effectiveness of the cleanup action once proposed cleanup levels and other performance standards have been reached. As indicated below, physical and biological monitoring may be required to support habitat mitigation and that chemical monitoring will be performed as part of the final cleanup for the Site.

For this Interim Action, protection and performance monitoring will be conducted during construction. Confirmation monitoring will be conducted after the final cleanup action has been implemented at the Site. Compliance monitoring for the Interim Action is described in the following sections.

2.1 PROTECTION MONITORING

Protection monitoring will be completed to confirm that human health and the environment are adequately protected during Interim Action construction.

2.1.1 Worker Health and Safety

Interim Action construction activities will be performed in accordance with health and safety regulations and that on-site workers be appropriately trained in hazardous waste operations as well as follow a site-specific Health and Safety Plan (HASP) prepared specifically for the Interim Action project. Interim Action construction activities will be performed in accordance with the requirements of the Washington Industrial Safety and Health Act (WISHA; Revised Code of Washington [RCW] 49.17) and the Federal Occupational Safety and Health Act (OSHA; 29 Code of Federal Regulations [CFR] 1910, 1926). Personnel engaged in work that involves hazardous material dredging and handling shall comply with the provisions of WAC 173-340-810 (MTCA Cleanup Regulation, Worker Safety and Health) and will be Hazardous Waste Operations and Emergency Response (HAZWOPER) certified.

GeoEngineers, Inc. (GeoEngineers) personnel performing observation of Interim Action construction activities for the Port will adhere to the requirements of the HASP included as Appendix A. The Port of Anacortes' (Port) construction contractor (Contractor) will be required to prepare and submit a separate HASP for use by the Contractor's personnel.

2.1.2 Environmental Protection

Environmental protection measures consisting of Best Management Practices (BMPs) for stormwater, sediment, drainage, and erosion control; dust and noise control; spill prevention and pollution control; and all other controls needed to protect environmental quality will be implemented. Environmental protection measures including installation, inspection and maintenance necessary for stormwater management, control of surface water runoff, and temporary erosion and sediment control measures will be described by the Contractor prior to commencing construction activities. The minimum anticipated standards for environmental protection measures that will be implemented are described in the IAWP. If the Port or Ecology determines that the contractor's environmental protection measures are inadequate to meet the intent of applicable regulations, the Contractor will be required to implement additional prevention and control measures to address the deficiencies.

2.2 PERFORMANCE MONITORING

Performance monitoring during the Interim Action will include the following:

- Review of contractor submittals required by the contract documents, including, but not limited to, construction work plans, proposed source material documentation, health and safety plans, material handling and disposal plans, erosion and sediment control plans, and other project-specific plans as required by the contract documents.
- Inspection of the sources of armoring and fill material, gradation and chemical analytical results representative of the quarry source(s). Upon initiation of the Interim Action, the Contractor will identify the upland quarry that is to be the source of armoring and aggregate to be used as backfill material. In selecting the quarry source, consideration will be given to the current and historical land uses and activities at and surrounding the quarry that could represent potential sources of per- and

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polyfluoroalkyl substances (PFAS) or other contaminants, including the use or storage of aqueous film-forming foam (AFFF), firefighting activities, industrial operations, waste disposal, or the placement of imported or recycled materials. Preference will be given to quarry sources of the armoring and backfill material that are undisturbed, native deposits that do not include any reused or recycled materials and for which available information indicates a low potential for PFAS or other contaminant impacts. The Port will review the source documentation, material gradation, and chemical analytical results to confirm that the proposed materials meet the applicable material specifications and chemical acceptance criteria established for the Interim Action. The Contractor will provide recent existing analytical data or collect new samples representative of the proposed quarry source. The analytical evaluation will include the constituents identified below and, as appropriate, PFAS to evaluate the potential for the imported materials to introduce contaminants to the Interim Action area.

- If sampling the quarry source is required, the contractor will collect a representative sample(s) and submit it for chemical analysis to demonstrate that the sand-sized and smaller component of the aggregate is free from contamination. The material will be collected using clean (i.e., decontaminated) stainless steel sampling equipment and placed in pre-cleaned, previously unused sample jars supplied by the laboratory. The sample will be labeled and placed in a cooler on ice for transport to the laboratory. Sample handling will follow appropriate chain of custody procedures from sample collection through analysis. The sample material will be analyzed for the following:
  - Metals including arsenic, cadmium, chromium, copper, lead, mercury, silver and zinc by United States Environmental Protection Agency (EPA) Method 6000/7000 series;
  - Semi-volatile organic compounds (SVOCs; including polycyclic aromatic hydrocarbons [PAHs]) by EPA Method 8270/8270-SIM/8081B;
  - PCB Congeners (209 chlorinated biphenyl congeners) by EPA Method 1668C;
  - Dioxins and furans by EPA Method 1613B; and
  - Pesticides by EPA Method 8081B.

  If review the current and historical land uses and activities at and surrounding the quarry that could represent potential sources of PFAS, samples will also be analyzed by EPA Method 1633.

- Verifying elevations and collecting confirmation sediment samples to confirm that the wood debris and sediment with chemical concentrations greater than Sediment Cleanup Objective (SCO)-based and DMMP screening criteria as determined by the remedial design have been removed to meet the cleanup action objectives (CAOs) as well as verify that the underlying native material within the navigational berth area is suitable for open-water disposal. Sampling and analysis data obtained during the Pre-Remedial Design Investigation (PRDI; described in Section 4.0 if the IAWP) will be initially used as a basis to confirm that the exposed surfaces at the design target elevations meet the SCO-based and DMMP screening criteria. Additional sampling and analysis will be completed within the proposed navigational dredge area following contaminated sediment dredging to verify its removal and quality of the underlying native sediment layer for open-water disposal prior to dredging (see Section 2.2.1). In addition, sampling and analysis will also be completed following backfill placement within the interim action area as well as outside the perimeter to evaluate the potential impact of dredge residuals (see Section 2.2.2).

- Confirmation of the placement of armor rock and fill material meets the design requirements. Placement of the armoring and fill material will be monitored by a representative of the Port to confirm that materials have been correctly placed in accordance with the design contract documents. Armor

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and fill placement will be confirmed based on comparison of hydrographic survey of the post dredge surface and survey performed after armoring and fill material has been placed. In instances where the armor rock or fill material thickness is observed to be less than the design contract document, the Contractor will be required to place additional material to achieve the desired thicknesses. The details of the procedures for armoring and fill placement confirmation will be developed as part of the project contractor bid package preparation.

2.2.1 Navigational Dredged Area Verification Sampling and Analysis

As described in Section 4.0 of the IAWP, characterization of the contaminated sediment dredged base will be conducted as part of the PRDI and will serve as the basis to initially confirm that the exposed surfaces at the design target elevations meet the SCO-based and DMMP screening criteria. The tiered analysis approach presented in the IAWP is expected to delineate the base of the contaminated sediment dredge prism by obtaining and analyzing sediment samples below the anticipated base of contamination at 1-foot increments at multiple sediment core locations distributed across the Interim Action dredge area. To verify removal of the contaminated sediment layer within the navigational dredge area, verification sediment samples will be collected in conjunction with the Interim Action dredging to evaluate the surface exposed for comparison to the SCO-based and DMMP screening to support open-water acceptance. Within the navigation dredge area, sediment samples will be collected by GeoEngineers' field personnel from four discrete and approximately equally spaced locations utilizing the dredge bucket. At each sampling location, samples will be collected from relatively undisturbed material that is not in contact with the dredge bucket using a clean pair of nitrile gloves. The collected sample will be homogenized in a stainless-steel bowl and placed in laboratory provided containers for chemical analysis. Reusable sampling equipment (if used) will be decontaminated prior to sample collection at each location. Each sample container will be securely capped, labeled, and placed in a cooler with ice immediately upon collection. The field representative will visually classify the sediments in accordance with ASTM International (ASTM) Method D 2488 (Standard Practice for Description and Identification of Soils [Visual Manual Procedure]) and record sediment descriptions and other relevant field screening details (e.g., staining, debris, odors, etc.) in the field log. Field screening, decontamination, sample container, labeling, and handling procedures are described in Section 5.0.

Chemical analysis will be performed at an Ecology accredited laboratory—Analytical Resources, LLC (ARL) of Tukwila, Washington. Chain-of-custody forms will be used to document the transfer of samples during transport and submittal of the samples to the laboratory. Post-dredge verification sediment samples within the navigation dredge area will be submitted for the following analysis:

- Conventional analysis including total solids (TS), total volatile solids (TVS) and total organic carbon (TOC);
- Tributyltin (TBT);
- DMMP metals including antimony, arsenic, cadmium, chromium, copper, lead, mercury, selenium, silver and zinc;
- DMMP SVOCs:
- DMMP pesticides; and
- PCB Aroclors.

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Table 1 summarizes the analytical methods, sample size, containers, preservation and holding times for above listed laboratory analysis. The navigational dredged area verification samples will be analyzed at an expedited (2 to 5 day) turn-around-time (TAT). Due to the extended turnaround time, analysis for dioxins and furans are not proposed as part of the verification sampling and analysis of the navigational dredged area. Although not proposed, a review of the previous sediment data collected as part of the Agreed Order remedial investigation (RI) indicates that dioxins and furans exceedances of the SCO-based/DMMP screening criteria only occur when other Site contaminants of concern (COCs) exceed the screening criteria (see Table 2 of the PRDI Sampling and Analysis Plan presented in Attachment 1). Therefore, removal of these contaminants will also result in the removal of dioxin and furan contaminated sediment. The Port will coordinate these results with the DMMP to verify open-water disposal acceptance prior to dredging of the navigational area.

2.2.2 Post-Backfill and Interim Action Perimeter Sampling and Analysis

To evaluate the potential impacts of dredge residuals and for incorporation into the final cleanup action alternatives, sampling and analysis will be completed within the backfill area following placement as well as outside the perimeter of the Interim Action. Four discrete sediment sampling locations within the backfill placement area and an additional five discrete sediment sampling locations of the perimeter area are proposed for comparison to the SCO-based screening levels for evaluating dredged residuals and sediment conditions as part of the final cleanup action. Sediment sample locations within the backfill placement area will generally be positioned to provide equal aerial coverage with an approximate spacing of 150 feet (similar to the sample spacing of the Agreed Order RI). Parameter sample locations will be positioned to co-locate previous sampling locations LY-14, LY-15, LY-16, LY-21 and LY-25 (see Figure 4 of the IAWP). At each sampling location, samples will be collected using a using a grab-type sampler from relatively undisturbed material that is not in contact with the sampler using a clean pair of nitrile gloves. The collected sample will be homogenized in a stainless-steel bowl and placed in laboratory provided containers for chemical analysis. Reusable sampling equipment (if used) will be decontaminated prior to sample collection at each location. Each sample container will be securely capped, labeled, and placed in a cooler with ice immediately upon collection. The field representative will visually classify the sediments in accordance with ASTM International Method D and record sediment descriptions and other relevant field screening details (e.g., staining, debris, odors, etc.) in the field log. Field screening, decontamination, sample container, labeling, and handling procedures are described in Section 5.0.

Chemical analysis will be performed at an Ecology accredited laboratory—ARL of Tukwila, Washington. Chain-of-custody forms will be used to document the transfer of samples during transport and submittal of the samples to the laboratory. Post-backfill and perimeter sediment samples will be submitted for analysis of Site COCs, including:

- Metals including copper and zinc.
- SVOCs including LPAHs, HPAHs, cPAHs, phthalates and phenols;
- PCB Congeners; and
- Dioxins and furans.

Because sediment results will be compared to benthic SCO screening levels, samples will also be analyzed for TOC by SM5310B/EPA 9060A. Table 1 summarizes the analytical methods, sample size, containers, preservation and holding times for above listed laboratory analysis. The result of the post-backfill and

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perimeter sampling and analysis will be compared to the SCO-based screening levels established by the IAWP and incorporated into the Remedial Investigation/Feasibility Study (RI/FS) Report for evaluating cleanup action alternatives. Data validation will be completed as described in Section 6.0. The results will be submitted to Ecology's EIM database following data validation.

2.3 CONFIRMATIONAL (POST-CONSTRUCTION) MONITORING

2.3.1 Physical and Biological Monitoring

Monitoring requirements for habitat mitigation, including physical and biological monitoring, will be further evaluated as part of the project permitting process. If habitat mitigation is completed as a permit requirement for the Interim Action, a Habitat Mitigation Monitoring Plan will be developed to describe the approach and procedures that will be used to evaluate the physical performance and stability of the constructed habitat features (Physical Monitoring) and the establishment, function, and overall ecological quality of the subtidal habitat areas (Biological Monitoring).

- **Physical Monitoring** may include inspections of habitat grading, slope stability, erosion, scour, sediment deposition, bathymetric conditions, substrate composition, and the condition and stability of placed habitat materials such as sand, gravel, cobble, Monitoring may also include evaluation of the stability and performance of habitat benches, transitional slopes, and armored areas to confirm that the constructed habitat features remain stable and continue to support the intended habitat functions under site-specific hydraulic and tidal conditions.
- **Biological Monitoring** may include assessment of benthic habitat development, macroinvertebrate colonization, aquatic vegetation establishment (if applicable), invasive species presence, and observations of fish and wildlife habitat usage within the subtidal habitat areas. Habitat conditions will be evaluated relative to project performance standards, mitigation objectives, and permit requirements.

Physical and biological monitoring frequency, performance criteria, adaptive management measures, corrective actions, and reporting requirements will be established in coordination with the applicable regulatory agencies and incorporated into the final Habitat Mitigation Monitoring Plan.

2.3.2 Chemical Monitoring

Confirmational monitoring will be performed as part of the final cleanup for the Site. Any additional remedial actions identified at the Site, including the Interim Acton area, will be specified in the RI/FS Report and Draft Cleanup Action Plan (DCAP).

3.0 Project Management and Organization

The project management and organization elements for the Interim Action including the key personnel, roles and responsibilities of the participants and special training/certification are presented in the following sections.

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3.1 PROJECT ORGANIZATION AND RESPONSIBILITIES

Key individuals and positions providing QA and QC are summarized in the following table. A description of the responsibilities, lines of authority and communication for the key individuals and positions providing QA and QC is presented below.

KEY PROJECT PERSONNEL

PROJECT ROLE	NAME AND ORGANIZATION	CONTACT INFORMATION
Project Coordinator	Jenkins Dossen Port of Anacortes	360.661.2163 (c) 360.299.1814 (o) Jenkins.Dossen@portofanacortes.com 100 Commercial Ave Anacortes, WA 98221
Technical Project Manager	Robert Trahan GeoEngineers	206.240.2300 (c) 206.239.3253 (o) rtrahan@geoengineers.com 2101 4th Avenue, Suite 950 Seattle, Washington 98121
Task Manager	Jeff Pratt GeoEngineers	425.248.3944 (c) jpratt@geoengineers.com 5820 S Kelly Ave Suite B Portland, Oregon 97239
Field Coordinator/Field Personnel	Nathan Solomon GeoEngineers	206.518.5141 (c) nsolomon@geoengineers.com 2101 4th Avenue, Suite 950 Seattle, Washington 98121
Health and Safety Manger	Chad Kean GeoEngineers	425.515.5340 (c) 425.284.7256 (o) ckean@geoengineers.com 2101 4th Avenue, Suite 950 Seattle, Washington 98121
Data Quality Assurance Leader	Denell Warren GeoEngineers	253.389.3985 (c) 253.722.2792 (o) dwarren@geoengineers.com 1145 Broadway Tacoma, Washington 98402
Laboratory Project Manager	Sue Dunnihoo Analytical Resources Inc.	206.695.6200 (o) limsadmin@arilabs.com 4611 S. 134th Place Suite 100 Tukwila, Washington 98168

3.1.1 Port of Anacortes Project Coordinator

The Port's project coordinator duties consist of implementing the project approach and tasks, overseeing the project team members during performance of project tasks.

3.1.2 Technical Project Manager

The technical project manager is responsible for fulfilling contractual and administrative control of the project. The technical project manager's duties include defining the project approach and tasks, selecting project team members and establishing budgets and schedules.

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The technical project manager's duties also include implementing the project approach and tasks, overseeing project team members during performance of project tasks, adhering to and communicating the status of budgets and schedules to the Port project manager, providing technical oversight, and providing overall production and review of project deliverables.

3.1.3 Task Manager

The task manager is responsible for the daily management of project tasks including providing technical direction to the field staff, produces task specific documents and supporting documents, develops schedules and allocates resources for field tasks, coordinates data collection activities to be consistent with information requirements, supervises the compilation of field data and laboratory analytical results, assures that data are correctly and completely reported, implements and oversees field sampling in accordance with project plan and supervises field personnel. Additionally, the task manger coordinates work with on-site subcontractors, verifies that appropriate sampling, testing, and measurement procedures are followed, coordinates the transfer of field data, sample tracking forms, and log books to the technical project manager for data reduction and validation, and participates in QA corrective actions as required.

3.1.4 Field Coordinator

The field coordinator will lead the field sampling effort for the project, serving as the direct point of contact between the task manager, analytical laboratory and subcontractors; and ensures that the appropriate sampling containers, chain-of-custody (COC) forms and field sampling gear including personal protective equipment (PPE) are available. The field coordinator ensures that data collection activities are consistent with information requirements and to verify that field information is correctly and completely reported for the entire duration of the project. The field coordinator will also coordinate appropriate sampling, testing, and measurement procedures and schedule sample delivery/shipment with the analytical laboratory. The field coordinator will transfer field data and sample tracking forms to the project file and data reduction and validation and participate in QA corrective actions as required.

3.1.5 Field Personnel

Field personnel have the primary responsibility for duties involving field data collection and documentation. Technical/field staff are responsible for:

- Understanding and following the IAWP, CMP/QAPP and HASP.
- Checking all equipment and supplies in advance of field operations.
- Ensuring that samples are properly collected, preserved, labeled, packaged, and shipped.
- Ensuring that all field data are carefully recorded in accordance with the IAWP and supporting documents.
- Following COC procedures and SOPs when they are required.

3.1.6 Health and Safety Manager

The health and safety manager will oversee implementation of health and safety programs and verify that work on the project proceeds in accordance with the site-specific HASP.

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3.1.7 Quality Assurance Leader

The quality assurance leader will provide oversight required for the completion of sample analyses for the project and verify, in conjunction with the laboratory manager, that the analytical work is proceeding in accordance with internal laboratory standard practices and the QA/QC guidelines for the project. This person will also oversee completion of data validation activities completed for this project. The quality assurance leader maintains independence from the individual(s) generating the data.

3.1.8 Laboratory Project Manager

The laboratory project manager will fulfill the analytical requirements of this project including being responsible for sample analyses using appropriate analytical laboratory methods. The specific procedures to be used for COC transfer, internal calibrations, laboratory analyses, reporting, preventive instrument maintenance, and corrective action will follow standard protocols.

3.2 SPECIAL TRAINING REQUIREMENTS/CERTIFICATION

The Superfund Amendments and Reauthorization Act of 1986 required the Secretary of Labor to issue regulations providing health and safety standards and guidelines for workers engaged in hazardous waste operations. OSHA regulations (29 CFR 1910.120) require training to provide employees with the knowledge and skills necessary to enable them to perform their jobs safely and with minimum risk to their personal health. All sampling personnel will have completed the 40-hour HAZWOPER training course and 8-hour refresher courses, as necessary, to meet OSHA regulations.

4.0 Data Quality Objectives

The primary DQOs for this Interim Action is to collect environmental sampling data of known, acceptable, and documentable quality. The specific objectives established for the project are:

- Implement the procedures outlined herein for field sampling, sample custody, equipment operation and calibration, laboratory analysis, and data reporting to ensure consistency and thoroughness of data generated.
- Achieve the level of QA/QC required to produce scientifically valid analytical data of known and documented quality. This will be accomplished by establishing criteria for data precision, accuracy, representativeness, completeness, and comparability, and by evaluating project data against these criteria.

4.1 CHEMICAL QUALITY CONTROL OBJECTIVES

The sampling design, field procedures, useable laboratory procedures, and QC procedures established for this project were developed to provide defensible data. Specific factors that may affect data usability include quantitative factors (precision, bias, accuracy, completeness, and reporting limits) and qualitative factors such as representativeness and comparability. The specific DQOs associated with these data quality factors are discussed below. Method-specific DQOs for chemical laboratory analyses are presented in Tables 2 through 8.

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4.1.1 Analytical Detection Limits

Analytical methods have quantitative limitations at a given statistical level of confidence that are often expressed as the method detection limit (MDL). Although results reported near the MDL provide insight to site conditions, quality assurance dictates that analytical methods achieve a consistently reliable level of detection known as the limit of quantification (LOQ) or practical quantification limit (PQL), which is typically demonstrated with the lowest point of a linear calibration. The contract laboratory will provide numerical results for all analytes and report them as detected above the PQL or undetected at the PQL. Ideally, the reporting limits (i.e., LOQ or PQL) for all chemicals will be below the Sediment Management Standards (SMS) and DMMP screening levels (SLs). In cases where the PQL is observed to be above the SMS and DMMP SL, the laboratory will report the compound as either detected between the MDL and PQL (with a J qualifier) or not detected at the MDL level.

The reporting limits presented in Table 9 are the laboratory PQLs that are considered target reporting limits (TRLs) because several factors may influence final reporting limits. First, moisture and other physical conditions of sediment affect detection limits. Second, analytical procedures may require sample dilutions or other practices to accurately quantify a particular analyte at concentrations above the range of the instrument. This includes the following:

- Non-detected results will be accompanied by a "U" qualifier. Laboratory will report both the reporting limit and the sample detection limit for any chemical concentration that is accompanied by a "U" flag.
- Laboratory will report estimated concentrations that fall between the sample detection limit and reporting limit. Such estimated concentrations will be accompanied by a "J" qualifier.
- For mixtures of chemicals, such as total PCBs, the reported values of detected constituents, including "J" values falling between the sample detection limit and the reporting limit, will be summed. In the event that all constituents are undetected, the single highest constituent's detection limit will be used as the value for the mixture in a given sample and will be accompanied by a "U" qualifier.

4.1.2 Precision

Precision is the measure of mutual agreement among replicate or duplicate measurements of an analyte from the same sample and applies to field duplicates (i.e., split samples), replicate analyses, and duplicate spiked environmental samples (matrix spike duplicates). The closer the measured values are to each other, the more precise the measurement process. Precision error may affect data usefulness. Good precision is indicative of relative consistency and comparability between different samples. Precision will be expressed as the relative percent difference (RPD) for spike sample and field duplicate comparisons of various matrices. The RPD is calculated as:

$$RPD\,(\%) = \frac{|D_1 - D_2|}{(D_1 + D_2)/2} X\ 100,$$

Where:

D_1 = Concentration of analyte in primary sample.

D_2 = Concentration of analyte in duplicate sample.

The calculation applies to split samples, replicate analyses, duplicate spiked environmental samples (matrix spike duplicates), and laboratory control duplicates. The RPD will be calculated for samples and compared to the applicable criteria. Precision can also be expressed as the percent difference (%D)

between replicate analyses. Project RPD goals for all analyses are 50 percent for sediment samples, unless the primary and duplicate sample results are less than 5 times the method reporting limit (MRL), in which case RPD goals will not apply for data quality assessment purposes.

4.1.3 Accuracy

Accuracy is a measure of bias in the analytical process. The closer the measurement value is to the true value, the greater the accuracy. Accuracy is typically evaluated by adding a known spike concentration of a target or surrogate compound to a sample prior to analysis. The detected concentration or percent recovery (%R) of the spiked compound reported in the sample provides a quantitative measure of analytical accuracy. Since most environmental data collected represent single points spatially and temporally rather than an average of values, accuracy is generally more important than precision in assessing the data. In general, if %R values are low, non-detect results may be reported for compounds of interest when in fact these compounds are present (i.e., false negative results), and results for detected compounds may be biased low. The reverse is true when %R values are high. In this case, non-detect values are considered accurate, whereas detected values may be higher than true values.

For this project, accuracy will be expressed as the %R of a known surrogate spike, matrix spike, or laboratory control sample (blank spike), concentration:

$$Recovery\,(\%R) = \frac{Spiked\ Result - Unspiked\ Result}{Known\ Spike\ Concentration}\ X\ 100$$

Accuracy (%R) criteria for surrogate spikes, matrix spikes, and laboratory control samples (blank spikes) are presented in Tables 2 through 8.

4.1.4 Representativeness

Representativeness expresses the degree to which data accurately and precisely represent the actual site conditions. The determination of the representativeness of the data will be performed by completing the following:

- Comparing actual sampling procedures to those specified in this document.
- Comparing analytical results of field duplicates to determine the variations in the analytical results.
- Invalidating non-representative data or identifying data to be classified as questionable or qualitative.

Only representative data will be used in subsequent data reduction, validation and reporting activities.

4.1.5 Completeness

Completeness establishes whether a sufficient number of valid measurements were obtained to meet project objectives. The number of samples and results expected establishes a comparative basis for completeness. Completeness goals are 95 percent usable data for samples/analyses planned. If the completeness goal is not achieved an evaluation will be made to determine if the data are adequate to meet study objectives.

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$$Completeness = \frac{number\ of\ valid\ measurements}{total\ number\ of\ data\ points\ planned} x\ 100$$

4.1.6 Comparability

Comparability expresses the confidence with which one set of data can be compared to another. Although numeric goals do not exist for comparability, a statement on comparability will be prepared to determine overall usefulness of data sets, following the determination of both precision and accuracy.

4.1.7 Holding Times

Holding times are defined as the time between sample collection and extraction, sample collection and analysis, or sample extraction and analysis. Some analytical methods specify a holding time for analysis only. For many methods, holding times may be extended by sample preservation techniques in the field. If a sample exceeds a holding time, then the results may be biased low. For example, if the extraction holding time for volatile analysis is exceeded, then the possibility exists that some of the organic constituents may have volatilized from the sample or degraded. Results for that analysis would be qualified as estimated to indicate that the reported results may be lower than actual site conditions. Holding times are presented in Table 1.

4.1.8 Quality Control Blank Samples

According to the National Functional Guidelines for Organic Data Review (EPA 2008), "The purpose of laboratory (or field) blank analysis is to assess the existence and magnitude of contamination resulting from laboratory (or field) activities. The criteria for evaluation of blanks apply to any blank associated with the samples (e.g., method blanks, instrument blanks, trip blanks, and equipment blanks)." Trip blanks are placed with samples during shipment; method blanks are created during sample preparation and follow samples throughout the analysis process.

Analytical results for laboratory method or prep blanks will be evaluated in general accordance with EPA National Functional Guidelines for Inorganic Data Review (EPA 2020a), National Functional Guidelines for Organic Data Review (EPA 2020b) and National Functional Guidelines for High Resolution Data Review (EPA 2020c) and professional judgment. QC blank samples are discussed further in Section 5.8.2.

5.0 Data Generation and Acquisition

The data generation and acquisition elements for the CMP/QAPP (as detailed below) address aspects of the project design and implementation including the appropriate methods for measurement and analysis, data collection or generation, data handling, and how QC activities are employed and properly documented. Sampling methods including field documentation, sampling, and decontamination procedures are also discussed below.

5.1 SURVEYING

Surveying at the site will be performed referencing vertical datum – Mean Lower Low Water (MLLW) and horizontal datum – North American Datum of 1983 (NAD83). The contractor will provide a post-construction

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as-built survey to document the dredge prism limits and post-construction site conditions following fill placement.

5.2 FIELD SCREENING PROCEDURES

If confirmation sampling is required, the potential presence of contamination in sediment samples will be evaluated using field screening techniques. Field screening results will be recorded on the field logs and the results will be used as a general guideline to delineate areas of possible contamination. In addition, screening results may be used as a basis for selecting sediment samples for chemical analysis. The following screening methods will be used: (1) visual screening and (2) water sheen screening.

5.2.1 Visual Screening

The soil will be observed for unusual color and stains and/or odor indicative of possible contamination.

5.2.2 Water Sheen Screening

This is a qualitative field screening method that can help identify the presence or absence of petroleum hydrocarbons. A portion of the soil sample will be placed in a pan containing distilled water. The water surface will be observed for signs of sheen. The following sheen classifications will be used:

CLASSIFICATION	IDENTIFIER	DESCRIPTION
No Sheen	(NS)	No visible sheen on the water surface
Slight Sheen	(SS)	Light, colorless, dull sheen; spread is irregular, no rapid; sheen dissipates rapidly
Moderate Sheen	(MS)	Light to heavy sheen; may have some color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface
Heavy Sheen	(HS)	Heavy sheen with color/iridescence; spread is irregular to flowing, may be rapid; few remaining areas of no sheen on the water surface

5.3 DECONTAMINATION PROCEDURES

As verification sampling is required, sediment samples will be collected using excavation equipment (i.e., dredged bucket), grab-type samples, hand tools including stainless steel spoons, and/or directly from the excavation limits using clean pair of nitrile gloves.

Reusable sampling equipment that comes in contact with the samples will be decontaminated before each use. Decontamination procedures for this equipment will consist of the following:

1. Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
2. Rinsing with distilled water; and
3. Wrapping or covering the decontaminated equipment with aluminum foil. Field personnel will limit cross-contamination by changing gloves between sampling locations.

Wash water used to decontaminate equipment will be collected and stored on-site in 55-gallon drums.

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5.4 SAMPLE CONTAINERS, LABELING, HANDLING AND CUSTODY

5.4.1 Sample Containers and Labeling

The Field Coordinator will establish field protocol to manage field sample collection, handling and documentation. Samples will be placed in appropriate laboratory-prepared containers. Sample containers and preservatives are listed in Table 1.

Sample containers will be labeled with the following information at the time of sample collection:

- Project name and number
- Type of sample preservative used (where applicable)
- Sample name, which will include a reference to date and sampling depth (if applicable)
- Date and time of collection

The sample collection activities will be noted in the field log books. The Field Coordinator will monitor consistency between sample containers/labels, field log books and COC forms.

5.4.2 Sample Storage

Samples will be placed in a cooler with ice after they are collected. The objective of the cold storage will be to attain a sample temperature of 2 to 6 degrees Celsius. Holding times (Table 1) will be observed during sample storage.

5.4.3 Sample Shipment

Samples will be transported and delivered to the analytical laboratory in the sample coolers. The samples will either be transported by field personnel, laboratory personnel or by courier service. The Field Coordinator will ensure that the cooler has been properly secured using clear plastic tape and custody seals.

5.4.4 Chain-of-Custody Records

Field personnel are responsible for the security of samples from the time the samples are collected until the samples have been received by the courier service or laboratory personnel. A COC form will be completed for each group of samples being shipped to the laboratory. Information to be included on the COC form includes:

- Project name and number;
- Sample identification numbers;
- Date and time of sampling;
- Sample matrix (soil and groundwater), preservative, and number of containers for each sample;
- Analyses to be performed;
- Names of sampling personnel;
- Project manager name and contact information including phone number; and

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- Shipping information including shipping container number, if applicable.

The original COC form will be signed by a member of the field team. Field personnel will retain copies and place the original and remaining copies in a plastic bag. The plastic bag containing the COC form will be placed in the cooler before sealing the cooler for transport to the laboratory.

5.4.5 Laboratory Custody Procedures

The laboratory will follow their standard operating procedures (SOPs) to document sample handling from time of receipt (sample log-in) to reporting. Documentation will include, at a minimum, the analyst's name or initials, time and date.

5.5 DISPOSAL OF INVESTIGATION-DERIVED MATERIALS

5.5.1 Sediment Generated During Verification Sampling

Excess sediment in not anticipated to be generated during confirmation sampling, if required.

5.5.2 Disposition of Incidental Waste

Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

5.6 FIELD DOCUMENTATION

The field staff will be responsible for documenting field activities including sampling in an all-weather (e.g. "Rite-in-the-Rain") field notebook and/or on field logs, and by producing a draft technical field report at the end of each day of sampling. The field staff will also be responsible for implementing field QA/QC procedures in accordance with the methods outlined in this document and general good practice sampling protocols. These procedures include recording and documenting relevant and appropriate information regarding project activities, sampling methods and data collected during performance of field activities at each sample location.

The following general guidelines should be followed in documenting fieldwork:

- Documentation will be maintained in a dedicated field notebook and on field forms, as applicable.
- Notebook documentation will be completed in waterproof ink or permanent marker and written errors will be crossed out with a single line.

Field notebooks will include records of pertinent activities completed on site including sampling. Field notebooks will be bound books with sequentially numbered pages. The books will remain in the custody of the Field Coordinator/Personnel until project completion, after which, the books will be kept in the project files. The field notebook and forms will be maintained on a real-time basis and will include, where applicable and appropriate, the following information:

- Date, time of specific activities and weather conditions.
- Names of all personnel on the site, including visitors.

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- Specific details regarding sampling activities, including sampling locations, type of sampling, depth, and sample numbers.
- Specific problems and resolutions.
- Identification numbers of monitoring instruments used that day.
- Chain-of-custody details, including sample identification numbers.

A draft field report will be prepared upon completion of field activities each day. Field data that was recorded in the notebooks and field forms will be used to complete the field report. The field report will be used to document construction, sampling, and monitoring activities, sampling and Site personnel, and weather conditions, as well as decisions, corrective actions, and/or modifications to the project plans and procedures discussed in this report. The draft field report will be finalized following review by the Task Manager and/or Technical Project Manager and kept in the project files.

5.7 ANALYTICAL METHODS

Samples and QC samples shall be analyzed following the analytical methods listed in Table 1 using laboratory instruments prescribed in the methods. The analytical methods must meet the technical acceptance criteria specified by the method prior to the analysis of environmental samples. Samples that are not analyzed initially (i.e., placed on "hold") will be stored at the laboratory for at least 6 months, and will be disposed of by the laboratory following this period. Samples to be analyzed initially will be analyzed within proper holding times, which are listed in Table 1.

The laboratory is required to comply with their current written SOPs. All laboratory personnel will be responsible for reporting problems that may compromise the quality of the data to the laboratory project manager. A narrative describing the anomaly, the steps taken to identify and correct it and the treatment of the relevant sample batch (i.e., recalculation, reanalysis, re-extraction) will be submitted with the data package.

5.8 QUALITY CONTROL

Quality control activities that will be implemented for each sampling, analysis or measurement technique are summarized in Tables 2 through 8. Formulas for calculating QC statistics are provided in Section 4.1.

The laboratory will maintain and implement documented QA/QC procedures. The laboratory QA/QC program will provide the following:

- Procedures that must be followed for certifying the precision and accuracy of the analytical data generated by the laboratory.
- Documentation of each phase of sample handling, data acquisition, data transfer, report preparation, and report review.
- Accurate and secure storage and retrieval of samples and data.
- Detailed instructions for performing analyses and other activities affecting the quality of analytical data generated by the laboratory.

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- Appropriate management-level review and approval of procedures, revisions to procedures, and control of procedures in such a way so that laboratory personnel that require specific procedures have access to them.

5.8.1 Field Quality Control

Field QC samples serve as a control and check mechanism to monitor the consistency of sampling methods and the potential influence of off-Site factors on project samples.

5.8.1.1 FIELD DUPLICATES

In addition to replicate analyses performed in the laboratory, field duplicates also serve as measures for precision. Field duplicates measure the precision and consistency of laboratory analytical procedures and methods, as well as the consistency of the sampling techniques used by field personnel. Under ideal field conditions, field duplicates are created by thoroughly mixing a volume of the sample matrix, placing aliquots of the mixed sample in separate containers, and identifying one of the aliquots as the primary sample and the other as the duplicate sample.

5.8.1.2 TRIP BLANKS

Trip blanks consist of samples of reagent water that accompany samples to be analyzed for volatile organic compounds (VOCs) during sample storage in coolers and transport to the laboratory. They are used to assess potential contamination of samples during collection and transport due to the presence of VOCs in ambient air. Trip blanks are analyzed on a one per cooler basis containing sediment sample for VOC analysis.

VOCs are not Site COCs or expected to be analyzed for the confirmational sampling, therefore, trip blanks are not expected to be utilized as part of the CMP.

5.8.2 Laboratory Quality Control

Laboratory QC procedures will be evaluated through a formal data quality assessment process. The analytical laboratory will follow standard analytical method procedures that include specified QC monitoring requirements. These requirements will vary by method, but generally include:

- Method blanks.
- Internal standards.
- Instrument calibrations.
- Matrix spike/matrix spike duplicates (MS/MSD).
- Laboratory control samples/laboratory control sample duplicates (LCS/LCSD).
- Laboratory replicates or duplicates.
- Surrogate spikes.

5.8.2.1 LABORATORY BLANKS

Laboratory procedures utilize several types of blanks, but the most commonly used blanks for QC monitoring are method blanks. Method blanks are laboratory QC samples that consist of either a soil-like material having undergone a contaminant destruction process, or reagent (contaminant-free) water.

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Method blanks are extracted and analyzed with each batch of environmental samples undergoing analysis. If a substance is detected in a method blank, then one (or more) of the following occurred:

- Sample containers, measurement equipment, and/or analytical instruments were not properly cleaned and contained contaminants.
- Reagents used in the process were contaminated with a substance(s) of interest.

It is difficult to determine which of the above scenarios took place if blank contamination occurs. However, it is assumed that the conditions that affected the blanks also likely affected the project samples. If target analytes are detected in method blanks, data validation guidelines assist in determining which substances in project samples are considered "real," and which ones are attributable to the analytical process. Furthermore, the guidelines state, "…there may be instances where little or no contamination was present in the associated blank, but qualification of the sample is deemed necessary. Contamination introduced through dilution water is one example".

5.8.2.2 CALIBRATIONS

Several types of instrument calibrations are used, depending on the analytical method, to assess the linearity of the calibration curve and assure that the sample results reflect accurate and precise measurements. The main calibrations used are initial calibrations, daily calibrations, and continuing calibration verification.

5.8.2.3 MATRIX SPIKE/MATRIX SPIKE DUPLICATES

MS/MSD samples are used to assess influences or interferences caused by the physical or chemical properties of the sample itself. For example, extreme pH can affect the results for SVOCs. Or, the presence of a particular compound may interfere with accurate quantitation of another analyte. MS/MSD data is reviewed in combination with other QC monitoring data to determine matrix effects. In some cases, matrix effects cannot be determined due to dilution and/or high levels of related substances in the sample. A matrix spike is evaluated by spiking a project sample with a known amount of one or more of the target analytes, ideally at a concentration that is 5 to 10 times higher than the sample result. A percent recovery is then calculated by subtracting the un-spiked sample result from the spiked sample result, dividing by the known concentration of the spike, and multiplying by 100.

MS/MSD samples will be analyzed at a frequency of one MS/MSD per sample set or batch. The samples for the MS/MSD analyses should be collected from a sampling location that is believed to have only low-level contamination. A sample from an area of low-level contamination is needed because the objective of MS/MSD analyses is to determine the presence of matrix interferences, which can best be achieved with low levels of contaminants. Additional sample volume will be collected for the MS/MSD analyses as required by the laboratory.

5.8.2.4 LABORATORY CONTROL SAMPLE/ LABORATORY CONTROL SAMPLE DUPLICATES

Also known as blank spikes, LCSs are similar to MS samples in that a known amount of one or more of the target analytes are spiked into a prepared sample medium, and a percent recovery of the spiked substances is calculated. The primary difference between LCS and MS samples is that the LCS uses a contaminant-free sample medium. For example, reagent water is typically used for LCS water analyses. The

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purpose of an LCS is to help assess the overall accuracy and precision of the analytical process including sample preparation, instrument performance, and analyst performance.

5.8.2.5 LABORATORY REPLICATES/DUPLICATES

Laboratories utilize MS/MSDs, LCS/LCSDs, and/or replicates to assess precision. Replicates are a second analysis of a field-collected environmental sample. Replicates can be split at varying stages of the sample preparation and analysis process; they most commonly consist of a second analysis on the extracted media.

5.8.2.6 SURROGATE SPIKES

Surrogate spikes are used to verify proper extraction procedures and the accuracy of the analytical instrument. Surrogates are substances with characteristics similar to the target analytes. A known concentration of surrogate is added to the project sample and passed through the instrument, and percent recovery is calculated. Each surrogate used has acceptance limits (i.e., an acceptable range) for percent recovery. If a surrogate recovery is low, sample results may be biased low and depending on the recovery value, a possibility of false negatives may exist. Conversely, when recoveries are above the specified acceptance limits, a possibility of false positives exist, although non-detect results are considered accurate.

5.9 INSTRUMENT/EQUIPMENT TESTING, INSPECTION, AND MAINTENANCE

5.9.1 Field Instrumentation

If field instruments are used, calibration and calibration checks will be performed to facilitate accurate and reliable field measurements. The calibration of the instruments will be checked and adjusted as necessary in general accordance with manufacturers' recommendations. Methods and frequency of calibration checks and instrument maintenance will be based on the type of instrument, stability characteristics, required accuracy, intended use, and environmental conditions.

5.9.2 Laboratory Instrumentation

For chemical analytical testing, calibration procedures will be performed in general accordance with the analytical methods used and the laboratory's SOPs. Calibration documentation will be retained at the laboratory for a period of 6 months.

5.10 LABORATORY DATA REPORTING AND DELIVERABLES

Laboratories will report data in formatted hardcopy and electronic form to the technical project manager, task manager and QA leader. Upon completion of analyses, the laboratory will prepare electronic deliverables for data packages in accordance with the specifications in the agreed-upon *Special Conditions for Lab Analysis* document. The laboratory will provide electronic data deliverables (EDDs) within 2 business days after GeoEngineers' receipt of printed-copy analytical results, including the appropriate QC documentation. GeoEngineers will establish EDD requirements with the contract laboratory.

Analytical laboratory measurements will be recorded in standard formats that display, at a minimum, the client/field sample identification, the laboratory sample identification, reporting units, analytical methods, analytes tested, analytical results, extraction and analysis dates, quantitation limits, and data qualifiers. Each sample delivery group will be accompanied by sample receipt forms and a case narrative identifying data quality issues.

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6.0 Data Reduction and Assessment Procedures

The process for generating and checking data, as well as the process for producing reports for field and analytical laboratory data, are summarized in the following sections.

6.1 DATA REDUCTION

Data reduction involves the conversion or transcription of field and analytical data to a useable format. The laboratory personnel will reduce the analytical data for review by the QA leader, task manager and technical project manager. This will involve both hard-copy forms and EDDs. Both forms of data will be compared with each other to verify that the data is reliable and error-free.

6.2 REVIEW OF FIELD DOCUMENTATION AND LABORATORY RECEIPT INFORMATION

Documentation of field sampling data will be reviewed periodically for conformance with project QC requirements described in this document. At a minimum, field documentation will be checked for proper documentation of the following:

- Sample collection information (date, time, location, matrices, etc.);
- Field instruments used and calibration data;
- Sample collection protocol;
- Sample containers, preservation, and volume;
- Field QC samples collected at the frequency specified;
- Chain-of-custody protocols; and
- Sample shipment information.

Sample receipt forms provided by the laboratory will be reviewed for QC exceptions. The final laboratory data package will describe (in the case narrative) the effects that any identified QC exceptions have on data quality. The laboratory will review transcribed sample collection and receipt information for correctness prior to delivering the final data package.

6.3 DATA VERIFICATION/VALIDATION

Project decisions, conclusions, and recommendations will be based upon verified (validated) data. The purpose of data verification is to ensure that data used for subsequent evaluations and calculations are scientifically valid, of known and documented quality, and legally defensible. Field data verification will be used to eliminate data not collected or documented in accordance with the protocols specified in the IAWP and this document. Laboratory data verification will be used to eliminate data not obtained using prescribed laboratory procedures.

The QA leader will validate data collected during the supplemental investigation to ensure that the data are valid and usable. At a minimum, a Stage 2B validation will be performed on the Interim Action data in general conformance with EPA functional guidelines for data validation (EPA 2004; and EPA 2008). At a minimum, the following items will be reviewed to verify the data as applicable:

- Documentation that a final review of the data was completed by the laboratory QA coordinator;

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- Documentation of analytical and QC methodology;
- Documentation of sample preservation and transport;
- Sample receipt forms and case narratives; and
- The following QC parameters:
  - Holding times and sample preservation.
  - Method blanks.
  - MS/MSDs.
  - LCS/LCSDs.
  - Surrogate spikes.
  - Duplicates/replicates.

When sample analytical data are received from the analytical laboratory, they will undergo a QC review by the QA leader. The accuracy and precision achieved will be compared to the laboratory's analytical control limits. Calculations of RPDs will follow standard statistical conventions and formulas as presented in in this document. Additional specifications and professional judgment by the QA leader may be incorporated when appropriate data from specific matrixes and field samples are available.

A data quality assessment will be prepared to document the overall quality of the data relative to the DQOs. The major components of the data quality assessment are as follows:

- **Data Validation Summary** – Summarizes the data validation results for all sample delivery groups by analytical method. The summary identifies any systematic problems, data generation trends, general conditions of the data, and reasons for any data qualification.
- **QC Sample Evaluation** – Evaluates the results of QC sample analyses, and presents conclusions based on these results regarding the validity of the project data.
- **Assessment of DQOs** – An assessment of the quality of data measured and generated in terms of accuracy, precision, and completeness relative to objectives established for the project.
- **Summary of Data Usability** – Summarizes the usability of data, based on the assessment performed in the three preceding steps.

The data quality assessment will help to achieve an acceptable level of confidence in the decisions that are to be made based upon the project data. The project analytical data will be submitted to Ecology's EIM system after the data quality assessment is completed.

6.4 CALCULATING CHEMICAL SUMS

The following guidelines will be used to calculate chemical sums:

- **Total LPAH** represents the sum of the concentrations of the following LPAHs: acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, and phenanthrene. Note that 2-Methylnaphthalene is not included in the sum.

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- **Total HPAH** represents the sum of the concentrations of the following HPAHs: benz[a]anthracene, benzo[a]pyrene, benzo[g,h,i]perylene, chrysene, dibenzo[a,h]anthracene, fluoranthene, indeno[1,2,3-c,d]pyrene, pyrene, and total benzofluoranthenes.
- **Total benzofluoranthenes** represents the sum of concentrations of the b, j, and k isomers of benzofluoranthenes. Note that some laboratories report the total benzofluoranthenes concentration rather than concentrations of individual compounds since they may not be able to resolve all three isomers.
- **Total PCB Aroclors** represents the sum of the following Aroclors 1016, 1221, 1232, 1242, 1248, 1254, and 1260. If present, Aroclor-1262 and 1268 will be reported but not included in the summation.
- **Organic Carbon Normalization** – To normalize to total organic carbon, the dry weight concentration for each contaminant of concern is divided by the decimal fraction representing the percent total organic carbon content (e.g., 0.01 means 1 percent) of the sediment sample per equation:

$$OC = \frac{Dry\ Weight\ Concentrtaion}{Percent\ TOC\ x\ 1000}$$

Where:

OC = Organic Carbon Normalized Concentration in parts per million (ppm)

Dry Weight Concentration is in parts per billion (ppb)

TOC is in decimal form

1000 is used as a unit conversion from ppb to ppm

For the summation of chemical totals, any "U" qualified data, which may be data reported at the PQL, the MDL, or the reporting limit (RL), represent non-detects. For the calculations, no distinction is made between these different types of detection limits, and any "U" qualified data are treated as "non-detects". The following guidelines will be used for reporting and summing non-detects for LPAHs, HPAHs, benzofluoranthenes and PCB Aroclors:

- When all chemicals in a group are non-detect, only the single highest individual chemical quantitation limit in a group will be reported and appropriately qualified.
- If some concentrations were detected and others are not, only the detected concentrations are included in the sum.

Estimated values between the method detection limit and the laboratory reporting limit (i.e. "J" qualified results) will be included in the summation at face value and the sum will also be qualified as estimated with a "J" qualifier. Results that are qualified as estimates with "J" qualifiers through data validation, will also be handled in the same manner.

For calculating total cPAH TEQ, dioxin-like PCBs and dioxin and furan toxicity equivalent (TEQ), the sum will be calculated using a substitution at one-half the detection limit (i.e., n=1/2). However, using this alternative may result in generated sums that are estimates with unknown bias and precision. Therefore, these estimates will be bounded by reporting sums using a substitution of the detection limit at n=0 and n=1. When non-detects are present in a dataset, Ecology recommends the Kaplan-Meier (KM) method for

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estimating the TEQ sums when < 50 percent of individual analytes are not detected within a sample. Table 10 presents the toxicity equivalency factors (TEFs) for cPAHs, dioxin and furans, and dioxin-like PCBs.

7.0 Limitations

We have prepared this Compliance Monitoring and Quality Assurance Project Plan (CMP/QAPP) for use by the Port of Anacortes during the Interim Action at the Anacortes Port Log Yard located in Anacortes, Washington. Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood.

Any electronic form, facsimile or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

8.0 References

GeoEngineers Inc. (GeoEngineers), 2026. Draft Interim Action Work Plan, Anacortes Port Log Yard Site, Anacortes, Washington, Ecology Agreed Order No. DE 10630. Prepared for the Washington State Department of Ecology on behalf of the Port of Anacortes. August 20.

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U.S. Environmental Protection Agency (EPA), 2020b. National Functional Guidelines for Organic Superfund Methods Data Review. OLEM 9240.0-51, EPA 540-R-20-005. November 2020.

U.S. Environmental Protection Agency (EPA), 2020c. National Functional Guidelines for High Resolution Superfund Methods Data Review. OLEM 9240.1-65, EPA 542-R-20-007. November 2020.

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Tables

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Table 1

Sample Test Methods, Sample Size, Containers, Preservation and Holding Times

Anacortes Port Log Yard
Anacortes, Washington

Parameter	Preparation Method	Analytical Method	Minimum Sample Size (dry weight)	Container Size and Type	Sample Preservation Technique	Holding Time for Indicated Preservation Technique[1]
Total Solids (TS)	PSEP 1986	SM 2540G	125 g	8-oz Glass or HDPE	4 ± 2°C	14 days
					-18 ± 2°C	6 months
Total Volatile Solids (TVS)	PSEP 1986	SM 2540G			4 ± 2°C	14 days
					-18 ± 2°C	6 months
Total Organic Carbon (TOC)	PSEP 1986	SM 5310B/EPA 9060A			4 ± 2°C	14 days
					-18 ± 2°C	6 months
Total Sulfides	PSEP 1986	PSEP 1986/ SM 4500-S2	50 g	4-oz Glass	4 ± 2°C with 5mL of Normal Zinc Acetate per 30 g sediment	7 days
Total Ammonia	Plumb 1981	Plumb 1981/ SM-4500-NH3	25 g	4-oz Glass	4 ± 2°C	7 days
Total Metals (Sb, As, Cd, Cr, Cu, Pb, Se, Ag and Zn)	EPA 3050B/3051A	EPA 6010D/6020B	50 g	4-oz Glass	4 ± 2°C	6 months
					-18 ± 2°C	2 years
Mercury	EPA 7471	EPA 7471			≤6°C	28 days
					-18 ± 2°C	1 year
Tributyltin Ion in Bulk Sediment	Krone 1989	Krone 1989	50 g	4-oz Glass	-18 ± 2°C	6 months
SVOCs (including PAHs)/ Pesticides/PCB Aroclors	EPA 3550-mod[2,3]/ 3540C[4,5]	EPA 8270E-SIM/8151A/ 8081B/8082A	150 g	(2) 8-oz WM-Glass or 16 oz Glass	4 ± 2°C	14 days until extraction
					4 ± 2°C	40 days after extraction
					-18 ± 2°C	1 year until extraction
PCB Congeners	EPA 1668C	EPA 1668C	100 g	8-oz WM-Glass	Freeze -18°C	1 year until extraction
Dioxins and Furans	EPA 8290A/1613B	EPA 8290A/1613B	50 g	4-oz Amber Glass	4 ± 2°C	14 days until extraction
					-18 ± 2°C	1 year until extraction
Bioassay	PSEP 1995	PSEP 1995	5 L	5 x 1L Glass or Polyethylene containers/bags	4 ± 2°C with nitrogen atmosphere or no head space	8 weeks
Archive	NA	NA	1 L	Min. 16 oz glass	-18 ± 2°C	Variable

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Notes:

[1] Due to the duration of the sediment core collection field effort and the complexity of completing the sample compositing in the laboratory, the DMMP agencies will allow holding time exceedances for analytical methods with holding times of 7 or 14 days except for analysis of total sulfides. Total sulfides will be collected discretely as described in the Sampling and Analysis Plan and analyzed

[2] EPA Method 3550 is modified to add matrix spikes before the dehydration step (Ecology 2025).

[3] 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. (Ecology 2025).

[4] 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 total organic carbon levels elevate detection limits above ecological criteria levels. See PSEP organics chapter, Appendix B, Guidance for Selected Ion Monitoring (1997b).

[5] All polychlorinated biphenyl extracts should be subjected to sulfuric acid/permanganate cleanup as specified by EPA SW-846 Method 3665A.

[2] Please refer to Table 7-2 in the DMMP User Manual (USACE, 2021).

ASTM = ASTM International

EPA = United States Environmental Protection Agency

g = gram

HDPE = High-density polyethylene

L = liter

NA = not applicable

oz =ounce

PAHs = Polycyclic Aromatic Hydrocarbons

PCBs = Polychlorinated Biphenyls

PSEP = Puget Sound Estuary Program

SVOC = Semi-Volatile Organic Compound

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Table 2

Quality Control Procedures and Acceptance Criteria for Conventional Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Analyte	Initial Calibration	Continuing Calibration	Calibration Blanks	Laboratory Control Samples	Matrix Spikes	Laboratory Duplicates	Method Blank
Grain Size	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20% RSD	Not applicable
Total Solids (TS)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20% RSD	Analyte concentration ≤PQL
Total Volatile Solids (TVS)	Not applicable	Not applicable	Not applicable	Not applicable	Not applicable	20% RSD	Analyte concentration ≤PQL
Total Organic Carbon (TOC)	Correlation coefficient ≥ 0.995	90-110% recovery	Analyte concentration ≤ PQL	80-120% recovery	75-125% recovery	20% RSD	Analyte concentration ≤ PQL
Total Sulfides	Correlation coefficient ≥ 0.990	85 -115% recovery	Not applicable	65 -135% recovery	65 -135% recovery	20% RSD	Analyte concentration ≤ PQL
Total Ammonia	Correlation coefficient ≥0.995	90 -110% recovery	Analyte concentration ≤ PQL	80 -120% recovery	75 -125% recovery	20% RSD	Analyte concentration ≤ PQL

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Notes:

[1] The control limits provided above are suggested limits only. They are based on EPA control limits for metals analyses, and an attempt has been made to take into consideration the expected analytical accuracy using PSEP methodology. The corrective action indicated for metals in Table 12 will be applied to the conventional analytes using professional judgment.

[2] As applicable, the QA/QC procedures indicated in this table will be completed at the same frequency as for metals analyses (see Table 12).

[3] QA/QC procedures for DMMP conventionals are presented in Table 17.

PQL = Practical Quantification Limit

RSD - Relative Standard Deviation

DMMP = Dredged Material Management Program

PSEP = Puget Sound Estruary Program

QA/QC = Quality Assurance/Quality Control

EPA = United States Environmental Protection Agency

Table 3

Quality Control Procedures and Acceptance Criteria for Tributyltin Analysis

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Acceptance Criteria	Corrective Action
Laboratory Control Sample (LCS)[1]	One per sample batch or every 20 samples, whichever is more frequent.	Recovery 50 – 150%	1. Check calculations 2. Reanalyze (matrix or injection problems) 3. If still out, re-extract and reanalyze LCS and associated samples (if available); If not available flag data.
Matrix spike (MS) and matrix spike duplicate (MSD)[1]	One MS/MSD pair per analytical batch or every 20 samples, whichever is more frequent.	Recovery 50 – 150% and relative percent difference (RPD) ≤ 30%	1. Evaluate for supportable matrix effect. 2. If no interference, re- extract and reanalyze MS/MSD once (if available). 3. If still out, report both sets of data.
Surrogate spike[1] (Tripentyltin recommended)	One per sample.	Recovery 50 – 150%	1. Check calculations. 2. Evaluate for supportable matrix effect 3. If no interference is evident, re-extract and reanalyze affected sample(s) (if available) and flag any outliers.
Method blank[2]	One per sample batch or every 20 samples, whichever is more frequent.	Target analyte < 3x the reporting limit (RL)	1. Flag if target > 3x RL but less than 0.075 ppb.[3] 2. Rerun batch and ID contamination source if target >0.075 ppb.

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Notes:

[1] All QC samples should be run using the same sample handling as is used on the environmental samples.

[2] Method blank can include centrifugation step or, alternatively a centrifugation blank can be run separately from the analytical method blank.

[3] 0.075 ppb tributyltin (TBT) is used here as a benchmark for evaluating blank performance because it represents a concentration that is one-half the interstitial water screening level (0.15 ppb) that is being used by the DMMP agencies to determine the need for bioaccumulation testing.

Table 4

Quality Control Procedures and Acceptance Criteria for Metals Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Daily.	Correlation coefficient ≥0.995.	Laboratory to optimize and recalibrate the instrument and reanalyze any affected samples.
Initial Calibration Verification	Immediately after initial calibration.	90-110% recovery for ICP-AES, ICP-MS and GFAA (80-120% for Mercury), or method based.	Laboratory to resolve discrepancy prior to sample analysis.
Continuing Calibration Verification	After every 10 samples or every 2 hours, whichever is more frequent, and after the last sample.	90-110% recovery for ICP-AES and GFAA, 85-115% for ICP-MS (80-120% for mercury).	Laboratory to recalibrate and reanalyze affected samples.
Initial and Continuing Calibration Blanks	Immediately after initial calibration, then 10% of samples or every 2 hours, whichever is more frequent, and after the last sample.	Analyte concentration ≤ PQL.	Laboratory to recalibrate and reanalyze affected samples
ICP Interelement Interference Check Samples	At the beginning and end of each analytical sequence or twice per 8- hour shift, whichever is more frequent.	80-120% of the true value.	Laboratory to correct problem, recalibrate, and reanalyze affected samples.
Method Quality Assurance/Quality Control			
Holding Times	All samples.	See Table 9.	Laboratory to qualify results if holding times are exceeded. Data validator will use professional judgment to qualify results as estimated or reject data.
Method Detection Limits (MDL)	Update method detection limit studies annually.	See reference method(s) in Table 9.	Revise detection limits.
Method Blanks	With every sample batch or every 20 samples, whichever is more frequent.	Analyte concentration ≤ PQL. Control limits are not applicable if sample concentrations are < MDL	Laboratory to re-digest and reanalyze samples.
Analytical (Laboratory) Duplicates or Matrix Spike Duplicates	One duplicate analysis with every sample batch or every 20 samples, whichever is more frequent; Use analytical replicates when samples are expected to contain target analytes. Use matrix spike replicates when samples are not expected to contain target analytes.	Analyte and matrix specific. Use intra-laboratory control chart limits if sufficient data are available to generate control charts; otherwise use analytical method default criteria.	Laboratory to re-digest and reanalyze samples if analytical problems are suspected, or to qualify the data if sample homogeneity problems are suspected and the project manager is consulted.
Matrix Spikes	With every sample batch or every 20 samples, whichever is more frequent.	75-125% recovery applied when the sample concentration is ≤4 times the spiked concentration for a particular analyte.	Laboratory may be able to correct or minimize problem, or qualify and accept data.
Certified or Standard Reference Material	Project specific requirement or at project manager's discretion. See Table 17 for DMMP requirements.	Compound specific, recovery should be within accepted control or advisory limits.	Laboratory to re-extract and reanalyze samples if analytical problems suspected, or to qualify the data after consultation.
Field Quality Assurance/Quality Control			
Field Duplicates	One per every ten sediment samples	Project, matrix, and compound specific	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion	Analyte concentration ≤ PQL	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

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Notes:

[1] Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

[2] Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

[3] Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

DMMP = Dredged Material Management Program

GFAA = Graphite Furnace Atomic Absorption

ICP-AES - Inductively Coupled Plasma/Atomic Emission Spectrometry

ICP-MS = Inductively Coupled Plasma/Mass Spectrometry

MDL = Method Detection Limit

PQL = Practical Quantification Limit

Table 5

Quality Control Procedures and Acceptance Criteria for Organic Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Control Limit	Corrective Action
Instrument Quality Assurance/Quality Control			
Initial Calibration	Before sample analysis and when continuing calibration does not meet method requirements. See reference method(s) in Table 9.	See reference method(s) in Table 9.	Laboratory to recalibrate and reanalyze affect samples.
Continuing Calibration	Method-specific. See reference method(s) in Table 9.	Method–specific. See reference method(s) in Table 9.	Laboratory to recalibrate if correlation coefficient or response factor does not meet requirements.
Method Quality Assurance/Quality Control			
Holding Times	All samples.	See reference method(s) in Table 9.	Laboratory to qualify results if holding times are exceeded. Data validator will use professional judgment to qualify results as estimated or reject data.
Method Detection Limits (MDL)	Update method detection limit studies annually.	See reference method(s) in Table 9.	Revise detection limits.
Method Blanks	One per sample batch or every 20 samples, whichever is more frequent, or when there is a change in reagents.	Analyte concentration ≤ PQL. Control limits are not applicable if sample concentrations are < MDL.	Laboratory to eliminate or greatly reduce laboratory contamination due to glassware, or reagents, or analytical system. Re-digest and reanalyze affected samples.
Analytical Laboratory Duplicates and Matrix Spike Duplicates	One duplicate analysis with every sample batch or every 20 samples, whichever is more frequent. Use analytical replicates when samples are expected to contain target analytes. Use matrix spike duplicates when samples are not expected to contain target analytes.	Compound and matrix specific. Use intra-laboratory control chart results if sufficient data are available to generate control charts. Otherwise use analytical method default criteria.	Laboratory to re-digest and reanalyze samples if analytical problems are suspected, or to qualify the data if sample homogeneity problems are suspected and the project manager is consulted.
Matrix Spikes	One per sample batch or every 20 samples, whichever is more frequent. Spiked with the same analytes at the same concentration as the laboratory control sample.	Compound and matrix specific, recovery should not exceed method or performance - based intra- laboratory control chart limits.	Laboratory to re-digest and reanalyze samples if analytical problems suspected. Matrix interferences should be assessed and explained in case narrative accompanying the data package.
Surrogate Spikes	Added to every organics sample as specified in analytical protocol.	Compound specific, recovery should not exceed the control limits specified in the method or performance-based intra-laboratory control limits.	Follow corrective actions specified in analytical method.
Laboratory Control Samples	One per analytical batch or every 20 samples, whichever is more frequent.	Compound specific, recovery should not exceed performance- based intra-laboratory control limits.	Laboratory to correct problem to verify the analysis can be performed in a clean matrix with acceptable precision and recovery; then re-extract and reanalyze affected samples.
Certified or Standard Reference Material	Project specific requirement or at project manager's discretion.	Compound specific, recovery should be within accepted control or advisory limits.	Laboratory to re-extract and reanalyze samples if analytical problems suspected, or to qualify the data after consultation.
Field Quality Assurance/Quality Control			
Field Duplicates	One per every ten sediment samples.	Project, matrix, and compound specific.	Modify field sample homogenization procedures.
Field Blanks	At project manager's discretion.	Analyte concentration ≤ PQL.	Compare to method blank results to rule out laboratory contamination. Modify sample collection and equipment decontamination procedures. Qualify associated data.

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Notes:

[1] Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

[2] Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

[3] Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

DMMP = Dredged Material Management Program

MDL = Method Detection Limit

PQL = Practical Quantification Limit

Table 6

Quality Control Procedures and Acceptance Criteria for PCDD/PCDF Analysis[1,2,3]

Anacortes Port Log Yard
Anacortes, Washington

Quality Control Procedure	Frequency	Acceptance Criteria	Laboratory Corrective Action
Ongoing Precision and Recovery	One per sample batch or every 20 samples, whichever is more frequent.	Recovery within limits presented in Table 7.	1. Check calculation. 2. Re-extract and reanalyze batch.
Stable-isotope labeled compounds	Spiked into each sample for every target analyte	Recovery within limits presented in Table 7. Ion abundance ratios must be within the criteria specified by the method.	1. Check calculations. 2. Qualify all associated results as estimated. 3. Alternatively, use of secondary ions that meet appropriate theoretical criteria is allowed if interferences are suspect. This alternative must be agency approved.
Sample target analyte ion abundance ratios	All detected analytes for all samples.	Ion abundance ratios must be within the criteria specified by the method.	1. Reanalyze specific samples. 2. Reject all affected results outside the criteria. 3. Alternatively, use of secondary ions that meet appropriate theoretical criteria is allowed if interferences are suspect. This alternative must be agency approved.
Method blank	One per sample batch or every 20 samples, whichever is more frequent.	Detection ≤ minimum level as specified by the method.	1. If the method blank results are greater than the reporting limit, halt analysis, find the source of contamination, and reanalyze batch. 2. Report project samples as non- detected for results ≤ to the reported method blank values.
GC/MS Tune	At the beginning of each 12 hour shift; must start and end each analytical sequence	>10,000 resolving power at m/z304.9825. Exact mass of 380.9760 within 5 ppm of theoretical values.	1. Re-analyze affected samples. 2. Reject all data not meeting method 1613B requirements.
Initial Calibration	Initially and when continuing calibration fails	Five point curve for all analytes. RSD must meet Table 7 requirements for all target compounds and labeled compounds. Signal to noise ratio (S/N)>10. Ion abundance (IA) ratios within method specified limits.	
Window Defining/Column Performance Mix	Before every initial and continuing calibration	Valley < 25% for all peaks near 2,3,7,8-TCDD/F peaks.	
Continuing Calibration	Must start and end each analytical sequence.	%Difference must use the limits for target compounds & labeled compounds as specified by the method. S/N>10. IA ratios within method specified limits.	
Confirmation of 2,3,7,8-TCDF	For all primary column detections of 2,3,7,8-TCDF.	Confirmation presence of 2,3,7,8-TCDF in accordance with method 1613B requirements.	Failure to verify presence of 2,3,7,8-TCDF by second column confirmation or use of an alternative primary column that meets resolution criteria requires qualification of associated 2,3,7,8-TCDF results as non-detected at the associated value
Sample data not achieving target reporting limits or method performance in presence of possibly interfering compounds	Not applicable	Not applicable	Rather than simply diluting an extract to reduce interferences, the lab should perform additional cleanup techniques identified in the method to insure minimal matrix effects and background interference. Thereafter, the lab can dilute the extract. If reanalysis is required, the laboratory shall report both initial and re-analysis results.
Sediment Reference Material	One per analytical project.	Results must be within 20% of the 95% confidence interval.	1. Extraction and analysis should be evaluated by the lab and re-analysis performed of the entire sample batch once performance criteria can be met. 2. If analysis accompanies several batches with acceptable RM results, then the laboratory can narrate possible reason for RM outliers.

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Notes:

[1] Instrument and method QA/QC to monitor the performance of the instrument and sample preparation procedures are the responsibility of the analytical laboratory. When an instrument or method control limit is exceeded, the laboratory is responsible for correcting the problem and reanalyzing the samples.

[2] Instrument and method QA/QC results reported in the final data package should always meet control limits with a very small number of exceptions that apply to difficult analytes as specified by EPA CLP. If instrument and method QA/QC procedures meet control limits, laboratory procedures are deemed to be adequate.

[3] Matrix and field QA/QC procedures monitor matrix effects, field procedures, and variability. Although poor analytical procedures may also result in poor spike recovery or duplicate results, the laboratory is not held responsible for meeting control limits for these QA/QC samples.

ppm = Part Per Million
IA = Ion abundance
MDL = method detection limit
PCDD = Polychlorinated dibenzodioxins
PCDF = Polychlorinated dibenzofurans
PQL = practical quantification limit
RM = Reference Material
S/N = Signal to Noise Ratio
TCDD = Tetrachlorodibenzodioxin
TCDF = Tetrachlorodibenzofuran

Table 7

Quality Control Acceptance Criteria for PCDD/PCDF

Anacortes Port Log Yard
Anacortes, Washington

Compound	Test Concentration[1] (ng/mL)	IPR[2] RSD (%)	IPR[2] Recovery	OPR[3] (%)	I-CAL (%)	CAL/VER[4] (%) (Coeff. of Variation)	Labeled Compound % Recovery in Sample: Warning Limit	Labeled Compound % Recovery in Sample: Control Limit
Native Compound								
2,3,7,8-TCDD	10	28	83-129	70-130	20	78-129	-	-
2,3,7,8-TCDF	10	20	87-137	75-130	20	84-120	-	-
1,2,3,7,8-PeCDD	50	15	76-132	70-130	20	78-130	-	-
1,2,3,7,8-PeCDF	50	15	86-124	80-130	20	82-120	-	-
2,3,4,7,8-PeCDF	50	17	72-150	70-130	20	82-122	-	-
1,2,3,4,7,8-HxCDD	50	19	78-152	70-130	20	78-128	-	-
1,2,3,6,7,8-HxCDD	50	15	84-124	76-130	20	78-128	-	-
1,2,3,7,8,9-HXCDD	50	22	74-142	70-130	35	82-122	-	-
1,2,3,4,7,8-HxCDF	50	17	82-108	72-130	20	90-112	-	-
1,2,3,6,7,8-HxCDF	50	13	92-120	84-130	20	88-114	-	-
1,2,3,7,8,9-HxCDF	50	13	84-122	78-130	20	90-112	-	-
2,3,4,6,7,8-HxCDF	50	15	74-158	70-130	20	88-114	-	-
1,2,3,4,6,7,8-HpCDD	50	15	76-130	70-130	20	86-116	-	-
1,2,3,4,6,7,8-HpCDF	50	13	90-112	82-122	20	90-110	-	-
1,2,3,4,7,8,9-HpCDF	50	16	86-126	78-130	20	86-116	-	-
OCDD	100	19	86-126	78-130	20	79-126	-	-
OCDF	100	27	74-146	70-130	35	70-130	-	-
Labeled Compounds								
13C12-2,3,7,8-TCDD	100	37	28-134	25-130	35	82-121	40-120	25-130
13C12-2,3,7,8-TCDF	100	35	31-113	25-130	35	71-130	40-120	24-130
13C12-1,2,3,7,8-PeCDD	100	39	27-184	25-150	35	70-130	40-120	25-130
13C12-1,2,3,7,8-PeCDF	100	34	27-156	25-130	35	76-130	40-120	24-130
13C12-2,3,4,7,8-PeCDF	100	38	16-279	25-130	35	77-130	40-120	21-130
13C12-1,2,3,4,7,8-HxCDD	100	41	29-147	25-130	35	85-117	40-120	32-130
13C12-1,2,3,6,7,8-HxCDD	100	38	34-122	25-130	35	85-118	40-120	28-130
13C12-1,2,3,4,7,8-HxCDF	100	43	27-152	25-130	35	76-130	40-120	26-130
13C12-1,2,3,6,7,8-HxCDF	100	35	30-122	25-130	35	70-130	40-120	26-123
13C12-1,2,3,7,8,9-HxCDF	100	40	24-157	25-130	35	74-130	40-120	29-130
13C12-2,3,4,6,7,8-HxCDF	100	37	29-136	25-130	35	73-130	40-120	28-130
13C12-1,2,3,4,6,7,8-HpCDD	100	35	34-129	25-130	35	72-130	40-120	23-130
13C12-1,2,3,4,6,7,8-HpCDF	100	41	32-110	25-130	35	78-129	40-120	28-130
13C12-1,2,3,4,7,8,9-HpCDF	100	40	28-141	25-130	35	77-129	40-120	26-130
13C12-OCDD	200	48	20-138	25-130	35	70-130	25-120	17-130
Cleanup Standard								
37Cl4-2,3,7,8-TCDD	10	36	39-154	31-130	35	79-127	40-120	35-130

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Notes:

[1] Quality control acceptance criteria for IPR, OPR and samples based on a 20 µL extract final volume.

[2] Initial Precision and Recovery (IPR) demonstration

[3] Ongoing Precision and Recovery (OPR) test run with every batch of samples.

[4] Calibration Verification (CAL/VER) test run at least every 12 hours.

µL = microliter

I-Cal = Interinal Calibration

ng/mL = nanogram per mililiter

RSD = Relative Standard Diviation

Table 8

Quality Control Acceptance Criteria for PCB Congeners

Anacortes Port Log Yard
Anacortes, Washington

Compound	Test Concentration[1,2,3] (ng/ml)	Calibration Verification (%)	Initial Precision and Recovery		Ongoing Precision and Recovery (%)	Surrogate Standard (% Recovery in Sample)
			RSD (%)	Recovery (%)		
Native Compound						
PCB-1	50	72-125	25	70-130	60-135	-
PCB-3	50	72-125	25	70-130	60-135	-
PCB-4	50	72-125	25	70-130	60-135	-
PCB-15	50	72-125	25	70-130	60-135	-
PCB-19	50	72-125	25	70-130	60-135	-
PCB-37	50	72-125	25	70-130	60-135	-
PCB-54	50	72-125	25	70-130	60-135	-
PCB-77	50	72-125	25	70-130	60-135	-
PCB-81	50	72-125	25	70-130	60-135	-
PCB-104	50	72-125	25	70-130	60-135	-
PCB-105	50	72-125	25	70-130	60-135	-
PCB-114	50	72-125	25	70-130	60-135	-
PCB-118	50	72-125	25	70-130	60-135	-
PCB-123	50	72-125	25	70-130	60-135	-
PCB-126	50	72-125	25	70-130	60-135	-
PCB-155	50	72-125	25	70-130	60-135	-
PCB-156	50	72-125	25	70-130	60-135	-
PCB-157	50	72-125	25	70-130	60-135	-
PCB-167	50	72-125	25	70-130	60-135	-
PCB-169	50	72-125	25	70-130	60-135	-
PCB-188	50	72-125	25	70-130	60-135	-
PCB-189	50	72-125	25	70-130	60-135	-
PCB-202	50	72-125	25	70-130	60-135	-
PCB-205	50	72-125	25	70-130	60-135	-
PCB-206	50	72-125	25	70-130	60-135	-
PCB-208	50	72-125	25	70-130	60-135	-
PCB-209	50	72-125	25	70-130	60-135	-
Surrogate Compounds						
13C-PCB-1	100	50-145	70	20-135	15-145	5-145
13C-PCB-3	100	50-145	70	20-135	15-145	5-145
13C-PCB-4	100	50-145	70	20-135	15-145	5-145
13C-PCB-15	100	50-145	70	20-135	15-145	5-145
13C-PCB-19	100	50-145	70	20-135	15-145	5-145
13C-PCB-28	100	50-145	70	20-135	15-145	5-145
13C-PCB-37	100	50-145	70	20-135	15-145	5-145
13C-PCB-54	100	50-145	70	20-135	15-145	5-145
13C-PCB-77	100	50-145	50	45-135	40-145	10-145
13C-PCB-81	100	50-145	50	45-135	40-145	10-145
13C-PCB-104	100	50-145	50	45-135	40-145	10-145
13C-PCB-105	100	50-145	50	45-135	40-145	10-145
13C-PCB-111	100	50-145	50	45-135	40-145	10-145
13C-PCB-114	100	50-145	50	45-135	40-145	10-145
13C-PCB-118	100	50-145	50	45-135	40-145	10-145
13C-PCB-123	100	50-145	50	45-135	40-145	10-145
13C-PCB-126	100	50-145	50	45-135	40-145	10-145
13C-PCB-155	100	50-145	50	45-135	40-145	10-145
13C-PCB-156	100	50-145	50	45-135	40-145	10-145
13C-PCB-157	100	50-145	50	45-135	40-145	10-145
13C-PCB-167	100	50-145	50	45-135	40-145	10-145
13C-PCB-169	100	50-145	50	45-135	40-145	10-145
13C-PCB-178	100	50-145	50	45-135	40-145	10-145
13C-PCB-188	100	50-145	50	45-135	40-145	10-145
13C-PCB-189	100	50-145	50	45-135	40-145	10-145
13C-PCB-202	100	50-145	50	45-135	40-145	10-145
13C-PCB-205	100	50-145	50	45-135	40-145	10-145
13C-PCB-206	100	50-145	50	45-135	40-145	10-145
13C-PCB-208	100	50-145	50	45-135	40-145	10-145
13C-PCB-209	100	50-145	50	45-135	40-145	10-145
Cleanup Surrogate Compounds						
13C-PCB-28	100	65-135	70	20-135	15-145	5-145
13C-PCB-111	100	75-125	50	45-135	40-145	10-145
13C-PCB-178	100	75-125	50	45-135	40-145	10-145

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Notes:

[1] Concentration of Congeners and Surrogates in Calibration Verification Standard #3 (CS3)

[2] Concentration of Congeners and Surrogates in final extract of IPR and OPR

[3] Concentration of Surrogates in all final extracts

-- indicates that the measurement quality objective is not applicable for the laboratory method.

ng/ml = nanogram per milliliter

PCBs = Polychlorinated biphenyls

RSD = Relative Standard Deviation

Table 9

Target Reporting Limits

Anacortes Port Log Yard
Anacortes, Washington

Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
Conventionals				
Total Organic Carbon (TOC)	%	n/a	EPA 9060A	0.02
Total Volatile Solids (TVS)	%	n/a	PSEP	0.04
Total Solids (TS)	%	n/a	PSEP	0.04
Total Ammonia	mg-N/kg	n/a	SM 4500NH3	0.40
Total Sulfide	mg/kg	n/a	SM 4500S2	1.00
Grain Size				
Gravel	%	n/a	PSEP	0.01
Very Coarse Sand	%	n/a	PSEP	0.01
Coarse Sand	%	n/a	PSEP	0.01
Medium Sand	%	n/a	PSEP	0.01
Fine Sand	%	n/a	PSEP	0.01
Very Fine Sand	%	n/a	PSEP	0.01
Coarse Silt	%	n/a	PSEP	0.01
Medium Silt	%	n/a	PSEP	0.01
Fine Silt	%	n/a	PSEP	0.01
Very Fine Silt	%	n/a	PSEP	0.01
Clay	%	n/a	PSEP	0.01
Metals				
Antimony	mg/kg	7440-36-0	EPA 6020B	0.20
Arsenic	mg/kg	7440-38-2	EPA 6020B	0.20
Cadmium	mg/kg	7440-43-9	EPA 6020B	0.10
Copper	mg/kg	7440-50-8	EPA 6020B	0.50
Lead	mg/kg	7439-92-1	EPA 6020B	0.10
Mercury	mg/kg	7439-97-6	EPA 7471B	0.025
Selenium	mg/kg	7782-49-2	EPA 6020B	1.0
Silver	mg/kg	7440-22-4	EPA 6020B	0.20
Zinc	mg/kg	7440-66-6	EPA 6020B	6.0
Organometallic Compounds				
Tributyltin Ion (Bulk Sediment)	µg/kg	56-35-9	EPA 8270E/SIM	3.9
Low Molecular Weight Polycyclic Aromatic Hydrocarbons (LPAHs)				
2-Methylnaphthalene	µg/kg	91-57-6	EPA 8270E/SIM	20.0
Acenaphthene	µg/kg	83-32-9	EPA 8270E/SIM	20.0
Acenaphthylene	µg/kg	208-96-8	EPA 8270E/SIM	20.0
Anthracene	µg/kg	120-12-7	EPA 8270E/SIM	20.0
Fluorene	µg/kg	86-73-7	EPA 8270E/SIM	20.0
Naphthalene	µg/kg	91-20-3	EPA 8270E/SIM	20.0
Phenanthrene	µg/kg	85-01-8	EPA 8270E/SIM	20.0
High Molecular Weight Polycyclic Aromatic Hydrocarbons (HPAHs)				
Benzo(a)anthracene	µg/kg	56-55-3	EPA 8270E/SIM	20.0
Benzo(a)pyrene	µg/kg	50-32-8	EPA 8270E/SIM	20.0
Benzofluoranthenes[6] (Total)	µg/kg	n/a	EPA 8270E/SIM	40.0
Benzo(g,h,i)perylene	µg/kg	191-24-2	EPA 8270E/SIM	20.0
Chrysene	µg/kg	218-01-9	EPA 8270E/SIM	20.0
Dibenzo(a,h)anthracene	µg/kg	53-70-3	EPA 8270E/SIM	5.0
Fluoranthene	µg/kg	206-44-0	EPA 8270E/SIM	20.0
Indeno(1,2,3-c,d)pyrene	µg/kg	193-39-5	EPA 8270E/SIM	20.0
Pyrene	µg/kg	129-00-0	EPA 8270E/SIM	20.0
Chlorinated Hydrocarbons				
1,2,4-Trichlorobenzene	µg/kg	120-82-1	EPA 8270E/SIM	5.0
1,2-Dichlorobenzene (o-Dichlorobenzene)	µg/kg	95-50-1	EPA 8270E/SIM	5.0
1,4-Dichlorobenzene (p-Dichlorobenzene)	µg/kg	106-46-7	EPA 8270E/SIM	5.0
Hexachlorobenzene	µg/kg	118-74-1	EPA 8081B	0.5
Phthalates				
Bis(2-Ethylhexyl) Phthalate	µg/kg	117-81-7	EPA 8270E/SIM	50.0
Butyl benzyl Phthalate	µg/kg	85-68-7	EPA 8270E/SIM	5.0
Dibutyl Phthalate	µg/kg	84-74-2	EPA 8270E/SIM	20.0
Diethyl Phthalate	µg/kg	84-66-2	EPA 8270E/SIM	20.0
Dimethyl Phthalate	µg/kg	131-11-3	EPA 8270E/SIM	5.0
Di-N-Octyl Phthalate	µg/kg	117-84-0	EPA 8270E/SIM	20.0
Phenols				
2,4-Dimethylphenol	µg/kg	105-67-9	EPA 8270E/SIM	20.0
2-methylphenol (o-Cresol)	µg/kg	95-48-7	EPA 8270E/SIM	5.0
4-methylphenol (p-Cresol)	µg/kg	106-44-5	EPA 8270E/SIM	5.0
Pentachlorophenol	µg/kg	87-86-5	EPA 8270E/SIM	20.0
Phenol	µg/kg	108-95-2	EPA 8270E/SIM	5.0

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Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
Miscellaneous Extractables				
Dibenzofuran	µg/kg	132-64-9	EPA 8270E/SIM	20.0
Hexachlorobutadiene	µg/kg	87-68-3	EPA 8081B	0.5
N-Nitrosodiphenylamine (as diphenylamine)	µg/kg	86-30-6	EPA 8270E/SIM	5.0
Benzoic Acid	µg/kg	65-85-0	EPA 8270E/SIM	100
Benzyl Alcohol	µg/kg	100-51-6	EPA 8270E/SIM	20.0
Pesticides				
4,4'-DDD	µg/kg	72-54-8	EPA 8081B	1.0
4,4'-DDE	µg/kg	72-55-9	EPA 8081B	1.0
4,4'-DDT	µg/kg	50-29-3	EPA 8081B	1.0
Aldrin	µg/kg	309-00-2	EPA 8081B	0.5
cis-Chlordane	µg/kg	5103-71-9	EPA 8081B	0.5
trans-Chlordane	µg/kg	5103-74-2	EPA 8081B	0.5
cis-Nonachlor	µg/kg	5103-73-1	EPA 8081B	1.0
trans-Nonachlor	µg/kg	39765-80-5	EPA 8081B	1.0
Oxychlordane	µg/kg	27304-13-8	EPA 8081B	1.0
Dieldrin	µg/kg	60-57-1	EPA 8081B	1.0
Heptachlor	µg/kg	76-44-8	EPA 8081B	0.5
Polychlorinated Biphenyls (PCBs)				
Aroclor 1016	µg/kg	12674-11-2	EPA 8082A	4.0
Aroclor 1221	µg/kg	11104-28-2	EPA 8082A	4.0
Aroclor 1232	µg/kg	11141-16-5	EPA 8082A	4.0
Aroclor 1242	µg/kg	53469-21-9	EPA 8082A	4.0
Aroclor 1248	µg/kg	12672-29-6	EPA 8082A	4.0
Aroclor 1254	µg/kg	52663-62-4	EPA 8082A	4.0
Aroclor 1260	µg/kg	11096-82-5	EPA 8082A	4.0
Aroclor 1262	µg/kg	37324-23-5	EPA 8082A	4.0
Aroclor 1268	µg/kg	11100-14-4	EPA 8082A	4.0
Polychlorinated Biphenyl (PCB) Congeners				
PCB-1	µg/kg	2051-60-7	EPA 1668C	0.4
PCB-2	µg/kg	2051-61-8	EPA 1668C	0.4
PCB-3	µg/kg	2051-62-9	EPA 1668C	0.4
PCB-4/PCB-10	µg/kg	13029-08-8	EPA 1668C	0.4
PCB-5/PCB-8	µg/kg	16605-91-7	EPA 1668C	0.4
PCB-6	µg/kg	25569-80-6	EPA 1668C	0.4
PCB-7/PCB-9	µg/kg	33284-50-3	EPA 1668C	0.4
PCB-11	µg/kg	2050-67-1	EPA 1668C	0.4
PCB-12/PCB-13	µg/kg	2974-92-7	EPA 1668C	0.4
PCB-14	µg/kg	34883-41-5	EPA 1668C	0.4
PCB-15	µg/kg	2050-68-2	EPA 1668C	0.4
PCB-16/PCB-32	µg/kg	38444-78-9	EPA 1668C	0.4
PCB-17	µg/kg	37680-66-3	EPA 1668C	0.4
PCB-18	µg/kg	37680-65-2	EPA 1668C	0.4
PCB-19	µg/kg	38444-73-4	EPA 1668C	0.4
PCB-20/PCB-21/PCB-33	µg/kg	38444-84-7	EPA 1668C	0.4
PCB-22	µg/kg	38444-85-8	EPA 1668C	0.4
PCB-23	µg/kg	55720-44-0	EPA 1668C	0.4
PCB-24/PCB-27	µg/kg	55702-45-9	EPA 1668C	0.4
PCB-25	µg/kg	55712-37-3	EPA 1668C	0.4
PCB-26	µg/kg	38444-81-4	EPA 1668C	0.4
PCB-28	µg/kg	7012-37-5	EPA 1668C	0.4
PCB-29	µg/kg	15862-07-4	EPA 1668C	0.4
PCB-30	µg/kg	35693-92-6	EPA 1668C	0.4
PCB-31	µg/kg	16606-02-3	EPA 1668C	0.4
PCB-34	µg/kg	37680-68-5	EPA 1668C	0.4
PCB-35	µg/kg	37680-69-6	EPA 1668C	0.4
PCB-36	µg/kg	38444-87-0	EPA 1668C	0.4
PCB-37	µg/kg	38444-90-5	EPA 1668C	0.4
PCB-38	µg/kg	53555-66-1	EPA 1668C	0.4
PCB-39	µg/kg	38444-88-1	EPA 1668C	0.4
PCB-40	µg/kg	38444-93-8	EPA 1668C	0.4
PCB-41/64/71/72	µg/kg	52663-59-9	EPA 1668C	0.4
PCB-42/59	µg/kg	36559-22-5	EPA 1668C	0.4
PCB-43/49	µg/kg	70362-46-8	EPA 1668C	0.4
PCB-44	µg/kg	41464-39-5	EPA 1668C	0.4
PCB-45	µg/kg	70362-45-7	EPA 1668C	0.4
PCB-46	µg/kg	41464-47-5	EPA 1668C	0.4
PCB-47	µg/kg	2437-79-8	EPA 1668C	0.4
PCB-48/75	µg/kg	70362-47-9	EPA 1668C	0.4
PCB-50	µg/kg	62796-65-0	EPA 1668C	0.4
PCB-51	µg/kg	68194-04-7	EPA 1668C	0.4
PCB-52/69	µg/kg	35693-99-3	EPA 1668C	0.4
PCB-53	µg/kg	41464-41-9	EPA 1668C	0.4
PCB-54	µg/kg	15968-05-5	EPA 1668C	0.4
PCB-55	µg/kg	74338-24-2	EPA 1668C	0.4
PCB-56/60	µg/kg	41464-43-1	EPA 1668C	0.4

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Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
PCB-57	µg/kg	70424-67-8	EPA 1668C	0.4
PCB-58	µg/kg	41464-49-7	EPA 1668C	0.4
PCB-61/70	µg/kg	33284-53-6	EPA 1668C	0.4
PCB-62	µg/kg	54230-22-7	EPA 1668C	0.4
PCB-63	µg/kg	74472-34-7	EPA 1668C	0.4
PCB-65	µg/kg	33284-54-7	EPA 1668C	0.4
PCB-67	µg/kg	73575-53-8	EPA 1668C	0.4
PCB-68	µg/kg	73575-52-7	EPA 1668C	0.4
PCB-73	µg/kg	74338-23-1	EPA 1668C	0.4
PCB-74	µg/kg	32690-93-0	EPA 1668C	0.4
PCB-76/66	µg/kg	70362-48-0	EPA 1668C	0.4
PCB-77	µg/kg	32598-13-3	EPA 1668C	0.4
PCB-78	µg/kg	70362-49-1	EPA 1668C	0.4
PCB-79	µg/kg	41464-48-6	EPA 1668C	0.4
PCB-80	µg/kg	33284-52-5	EPA 1668C	0.4
PCB-81	µg/kg	70362-50-4	EPA 1668C	0.4
PCB-82	µg/kg	52663-62-4	EPA 1668C	0.4
PCB-83	µg/kg	60145-20-2	EPA 1668C	0.4
PCB-84/92	µg/kg	52663-60-2	EPA 1668C	0.4
PCB-85/116	µg/kg	65510-45-4	EPA 1668C	0.4
PCB-86	µg/kg	55312-69-1	EPA 1668C	0.4
PCB-87/117/125	µg/kg	38380-02-8	EPA 1668C	0.4
PCB-88/91	µg/kg	55215-17-3	EPA 1668C	0.4
PCB-89	µg/kg	73575-57-2	EPA 1668C	0.4
PCB-90/101	µg/kg	68194-07-0	EPA 1668C	0.4
PCB-93	µg/kg	73575-56-1	EPA 1668C	0.4
PCB-94	µg/kg	73575-55-0	EPA 1668C	0.4
PCB-95/98/102	µg/kg	38379-99-6	EPA 1668C	0.4
PCB-96	µg/kg	73575-54-9	EPA 1668C	0.4
PCB-97	µg/kg	41464-51-1	EPA 1668C	0.4
PCB-99	µg/kg	38380-01-7	EPA 1668C	0.4
PCB-100	µg/kg	39485-83-1	EPA 1668C	0.4
PCB-103	µg/kg	60145-21-3	EPA 1668C	0.4
PCB-104	µg/kg	56558-16-8	EPA 1668C	0.4
PCB-105	µg/kg	32598-14-4	EPA 1668C	0.4
PCB-106/118	µg/kg	70424-69-0	EPA 1668C	0.4
PCB-107/109	µg/kg	70424-68-9	EPA 1668C	0.4
PCB-108/112	µg/kg	70362-41-3	EPA 1668C	0.4
PCB-110	µg/kg	38380-03-9	EPA 1668C	0.4
PCB-111/115	µg/kg	39635-32-0	EPA 1668C	0.4
PCB-113	µg/kg	68194-10-5	EPA 1668C	0.4
PCB-114	µg/kg	74472-37-0	EPA 1668C	0.4
PCB-119	µg/kg	56558-17-9	EPA 1668C	0.4
PCB-120	µg/kg	68194-12-7	EPA 1668C	0.4
PCB-121	µg/kg	56558-18-0	EPA 1668C	0.4
PCB-122	µg/kg	76842-07-4	EPA 1668C	0.4
PCB-123	µg/kg	65510-44-3	EPA 1668C	0.4
PCB-124	µg/kg	70424-70-3	EPA 1668C	0.4
PCB-126	µg/kg	57465-28-8	EPA 1668C	0.4
PCB-127	µg/kg	39635-33-1	EPA 1668C	0.4
PCB-128/162	µg/kg	38380-07-3	EPA 1668C	0.4
PCB-129	µg/kg	55215-18-4	EPA 1668C	0.4
PCB-130	µg/kg	52663-66-8	EPA 1668C	0.4
PCB-131/133	µg/kg	61798-70-7	EPA 1668C	0.4
PCB-132/161	µg/kg	38380-05-1	EPA 1668C	0.4
PCB-134/143	µg/kg	52704-70-8	EPA 1668C	0.4
PCB-135	µg/kg	52744-13-5	EPA 1668C	0.4
PCB-136	µg/kg	38411-22-2	EPA 1668C	0.4
PCB-137	µg/kg	35694-06-5	EPA 1668C	0.4
PCB-138/163/164	µg/kg	35065-28-2	EPA 1668C	0.4
PCB-139/149	µg/kg	56030-56-9	EPA 1668C	0.4
PCB-140	µg/kg	59291-64-4	EPA 1668C	0.4
PCB-141	µg/kg	52712-04-6	EPA 1668C	0.4
PCB-142	µg/kg	41411-61-4	EPA 1668C	0.4
PCB-144	µg/kg	68194-14-9	EPA 1668C	0.4
PCB-145	µg/kg	74472-40-5	EPA 1668C	0.4
PCB-146/165	µg/kg	51908-16-8	EPA 1668C	0.4
PCB-147	µg/kg	68194-13-8	EPA 1668C	0.4
PCB-148	µg/kg	74472-41-6	EPA 1668C	0.4
PCB-150	µg/kg	68194-08-1	EPA 1668C	0.4
PCB-151	µg/kg	52663-63-5	EPA 1668C	0.4
PCB-152	µg/kg	68194-09-2	EPA 1668C	0.4
PCB-153	µg/kg	35065-27-1	EPA 1668C	0.4
PCB-154	µg/kg	60145-22-4	EPA 1668C	0.4

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Analyte Group	Units	CAS Number[1]	Analytical Method	Target Reporting Limit (PQL[2])
PCB-155	µg/kg	33979-03-2	EPA 1668C	0.4
PCB-156	µg/kg	38380-08-4	EPA 1668C	0.4
PCB-157	µg/kg	69782-90-7	EPA 1668C	0.4
PCB-158/160	µg/kg	74472-42-7	EPA 1668C	0.4
PCB-159	µg/kg	39635-35-3	EPA 1668C	0.4
PCB-166	µg/kg	41411-63-6	EPA 1668C	0.4
PCB-167	µg/kg	52663-72-6	EPA 1668C	0.4
PCB-168	µg/kg	59291-65-5	EPA 1668C	0.4
PCB-169	µg/kg	32774-16-6	EPA 1668C	0.4
PCB-170	µg/kg	35065-30-6	EPA 1668C	0.4
PCB-171	µg/kg	52663-71-5	EPA 1668C	0.4
PCB-172	µg/kg	52663-74-8	EPA 1668C	0.4
PCB-173	µg/kg	68194-16-1	EPA 1668C	0.4
PCB-174	µg/kg	38411-25-5	EPA 1668C	0.4
PCB-175	µg/kg	40186-70-7	EPA 1668C	0.4
PCB-176	µg/kg	52663-65-7	EPA 1668C	0.4
PCB-177	µg/kg	52663-70-4	EPA 1668C	0.4
PCB-178	µg/kg	52663-67-9	EPA 1668C	0.4
PCB-179	µg/kg	52663-64-6	EPA 1668C	0.4
PCB-180	µg/kg	35065-29-3	EPA 1668C	0.4
PCB-181	µg/kg	74472-47-2	EPA 1668C	0.4
PCB-182/187	µg/kg	60145-23-5	EPA 1668C	0.4
PCB-183	µg/kg	52663-69-1	EPA 1668C	0.4
PCB-184	µg/kg	74472-48-3	EPA 1668C	0.4
PCB-185	µg/kg	52712-05-7	EPA 1668C	0.4
PCB-186	µg/kg	74472-49-4	EPA 1668C	0.4
PCB-188	µg/kg	74487-85-7	EPA 1668C	0.4
PCB-189	µg/kg	39635-31-9	EPA 1668C	0.4
PCB-190	µg/kg	41411-64-7	EPA 1668C	0.4
PCB-191	µg/kg	74472-50-7	EPA 1668C	0.4
PCB-192	µg/kg	74472-51-8	EPA 1668C	0.4
PCB-193	µg/kg	69782-91-8	EPA 1668C	0.4
PCB-194	µg/kg	35694-08-7	EPA 1668C	0.4
PCB-195	µg/kg	52663-78-2	EPA 1668C	0.4
PCB-196/203	µg/kg	42740-50-1	EPA 1668C	0.4
PCB-197	µg/kg	33091-17-7	EPA 1668C	0.4
PCB-198	µg/kg	68194-17-2	EPA 1668C	0.4
PCB-199	µg/kg	52663-75-9	EPA 1668C	0.4
PCB-200	µg/kg	52663-73-7	EPA 1668C	0.4
PCB-201	µg/kg	40186-71-8	EPA 1668C	0.4
PCB-202	µg/kg	2136-99-4	EPA 1668C	0.4
PCB-204	µg/kg	74472-52-9	EPA 1668C	0.4
PCB-205	µg/kg	74472-53-0	EPA 1668C	0.4
PCB-206	µg/kg	40186-72-9	EPA 1668C	0.4
PCB-207	µg/kg	52663-79-3	EPA 1668C	0.4
PCB-208	µg/kg	52663-77-1	EPA 1668C	0.4
PCB-209	µg/kg	2051-24-3	EPA 1668C	0.4
Dioxins and Furans				
2,3,7,8-TCDD	ng/kg	9014-42-0	EPA 1613B	1.0
1,2,3,7,8-PeCDD	ng/kg	40321-76-4	EPA 1613B	1.0
1,2,3,4,7,8-HxCDD	ng/kg	39227-28-6	EPA 1613B	1.0
1,2,3,6,7,8-HxCDD	ng/kg	57653-85-7	EPA 1613B	1.0
1,2,3,7,8,9-HxCDD	ng/kg	19408-74-3	EPA 1613B	1.0
1,2,3,4,6,7,8-HxCDD	ng/kg	39227-28-6	EPA 1613B	2.5
OCDD	ng/kg	3268-87-9	EPA 1613B	10.0
2,3,7,8-TCDF	ng/kg	51207-31-9	EPA 1613B	1.0
1,2,3,7,8-PeCDF	ng/kg	57117-41-6	EPA 1613B	1.0
2,3,4,7,8-HxCDF	ng/kg	70648-26-9	EPA 1613B	1.0
1,2,3,4,7,8-HxCDF	ng/kg	70648-26-9	EPA 1613B	1.0
1,2,3,6,7,8-HxCDF	ng/kg	57117-44-9	EPA 1613B	1.0
1,2,3,7,8,9-HxCDF	ng/kg	72918-21-9	EPA 1613B	1.0
2,3,4,6,7,8-HxCDF	ng/kg	60851-34-5	EPA 1613B	1.0
1,2,3,4,5,6,8-HpCDF	ng/kg	67562-39-4	EPA 1613B	1.0
1,2,3,4,7,8,9-HPCDF	ng/kg	55673-89-7	EPA 1613B	1.0
OCDF	ng/kg	39001-02-0	EPA 1613B	2.5

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Notes:

[1] Chemical abstract service registry number.

[2] Practical Quantitation Limit (PQL) values from Analytical Resources LLC (ARL) of Tukwila, Washington.

% = Percent

µg/kg = Micrograms per kilogram

mg/kg = Milligram per kilogram

mg-N/kg = Milligram nitrogen per kilogram

n/a = not available

ng/kg = Nanogram per kilogram

Table 10

Toxicity Equivalency Factors

Anacortes Port Log Yard
Anacortes, Washington

Analyte Group	CAS Number[1]	TEF[2]
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)		
Benzo[a]pyrene	50-32-8	1.0
Benzo[a]anthracene	56-55-3	0.1
Benzo[b]fluoranthene	205-99-2	0.1
Benzo[k]fluoranthene	207-08-9	0.1
Chrysene	218-01-9	0.01
Dibenz[a,h]anthracene	53-70-3	0.1
Indeno[1,2,3-cd]pyrene	193-39-5	0.1
Dioxin Congeners		
2,3,7,8-Tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD)	1746-01-6	1.0
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (1,2,3,7,8-PeCDD)	40321-76-4	1.0
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,4,7,8-HxCDD)	39227-28-6	0.1
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (1,2,3,6,7,8-HxCDD)	57653-85-7	0.1
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (1,2,3,7,8,9-HxCDD)	19408-74-3	0.1
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (1,2,3,4,6,7,8-HpCDD)	35822-46-9	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (1,2,3,4,6,7,8,9-OCDD)	3268-87-9	0.0003
Furan Congeners		
2,3,7,8-Tetrachlorodibenzofuran (2,3,7,8-TCDF)	51207-31-9	0.1
1,2,3,7,8-Pentachlorodibenzofuran (1,2,3,7,8-PeCDF)	57117-41-6	0.03
2,3,4,7,8-Pentachlorodibenzofuran (2,3,4,7,8- PeCDF)	57117-31-4	0.3
1,2,3,4,7,8-Hexachlorodibenzofuran (1,2,3,4,7,8-HxCDF)	70648-26-9	0.1
1,2,3,6,7,8-Hexachlorodibenzofuran (1,2,3,6,7,8- HxCDF)	57117-44-9	0.1
1,2,3,7,8,9-Hexachlorodibenzofuran (1,2,3,7,8,9- HxCDF)	72918-21-9	0.1
2,3,4,6,7,8-Hexachlorodibenzofuran (2,3,4,6,7,8-HxCDF)	60851-34-5	0.1
1,2,3,4,6,7,8-Heptachlorodibenzofuran (1,2,3,4,6,7,8-HpCDF)	67562-39-4	0.01
1,2,3,4,7,8,9-Heptachlorodibenzofuran (1,2,3,4,7,8,9-HpCDF)	55673-89-7	0.01
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (1,2,3,4,6,7,8,9-OCDF)	39001-02-0	0.0003
Dioxin-Like Polychlorinated Biphenyls (PCBs)		
3,3',4,4'-Tetrachlorobiphenyl (PCB 77)	32598-13-3	0.0001
3,4,4',5- Tetrachlorobiphenyl (PCB 81)	70362-50-4	0.0003
2,3,3',4,4'-Pentachlorobiphenyl (PCB 105)	32598-14-4	0.00003
2,3,4,4',5-Pentachlorobiphenyl (PCB 114)	74472-37-0	0.00003
2,3',4,4',5-Pentachlorobiphenyl (PCB 118)	31508-00-6	0.00003
2',3,4,4',5-Pentachlorobiphenyl (PCB 123)	65510-44-3	0.00003
3,3',4,4',5-Pentachlorobiphenyl (PCB 126)	57465-28-8	0.1
2,3,3',4,4',5-Hexachlorobiphenyl (PCB 156)	38380-08-4	0.00003
2,3,3',4,4',5'-Hexachlorobiphenyl (PCB 157)	69782-90-7	0.00003
2,3',4,4',5,5'-Hexachlorobiphenyl (PCB 167)	52663-72-6	0.00003
3,3',4,4',5,5'-Hexachlorobiphenyl (PCB 169)	32774-16-6	0.03
2,3,3',4,4',5,5'-Heptachlorobiphenyl (PCB 189)	39635-31-9	0.00003

Notes:

[1] Chemical abstract service registry number.

[2] Toxicity equivalency factors (TEFs) referenced from Tables 6-1 through 6-3 of Ecology's Sediment Cleanup Users Manual (SCUM; Ecology 2025).

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Appendices

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Appendix A

Compliance Monitoring Health And Safety Plan

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Compliance Monitoring Site Health & Safety Plan

Anacortes Port Log Yard
Anacortes, Washington
Facility Site No. 21898438
Cleanup Site No. 3604
Ecology Agreed Order No. DE 10630

October 5, 2026

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2101 4th Avenue, Suite 950
Seattle, Washington 98101
206.278.2674

GeoEngineers

Compliance Monitoring Health and Safety Plan

Anacortes Port Log Yard
Anacortes, Washington

File No. 5147-016-15
October 5, 2026

Approved By:

Signature: _____ Date: October 5, 2026

Robert S. Trahan, LG, Associate Environmental Geologist, GeoEngineers

Signature: _____ Date: October 5, 2026

Jeff Pratt, Project Scientist, GeoEngineers

Signature: _____ Date: October 5, 2026

Chad Kean, Health and Safety Manager, GeoEngineers

JP:PC:RST:leh

Disclaimer: Any electronic form, facsimile, or hard copy of the original document (email, text, table, and/or figure), if provided, and any attachments are only a copy of the original document. The original document is stored by GeoEngineers, Inc. and will serve as the official document of record.

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Employee Acknowledgment
Anacortes Port Log Yard
GEI File No. 5147-016-15

I hereby verify that a copy of the Health and Safety Plan has been provided by GeoEngineers, Inc., for my review and personal use. I have read the document completely and acknowledge an understanding of the safety procedures and protocol for my responsibilities on site. I agree to comply with all required specified safety regulations and procedures.

Print Name	Signature	Date

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Subcontractor Acknowledgment
Anacortes Port Log Yard
GEI File No. 5147-016-15

I verify that a copy of the Health and Safety Plan has been provided by GeoEngineers, Inc. to inform us of the potential hazards, and procedures and protocols that will be used.

Print Name	Signature	Firm	Date

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1.0 Introduction

This Health and Safety Plan (HASP) has been prepared for use at the Anacortes Port Log Yard Site (Site) during field investigation activities to collect environmental data to evaluate cleanup action alternatives to address Site contamination resulting from historical land use. **This Health and Safety Plan (HASP) is to be used in conjunction with current standards and policies outlined in the GeoEngineers Inc. (GeoEngineers) Health and Safety Programs.** Together, the written GeoEngineers' safety programs and this HASP constitute the site safety plan for this subject site. This HASP is required by the Hazardous Waste Operations and Emergency Response (HAZWOPER) regulation (29 CFR 1910.120) when preforming mandatory or voluntary clean-up operations and initial investigations conducted to determine the presence or absence of hazardous substances unless the employer can demonstrate that the work does not involve employee exposure to safety and health hazards from hazardous substances at the site. This HASP is to be used by GeoEngineers personnel. A copy of this HASP must be available on site.

GENERAL PROJECT INFORMATION

PROJECT NAME	Anacortes Port Log Yard
PROJECT NUMBER	5147-016-15
TYPE OF PROJECT	Interim Action Construction
START/COMPLETION	Summer/Fall 2028
SUBCONTRACTORS	Analytical Resources LLC
CLIENT	Port of Anacortes

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Liability Clause: If requested by subcontractors, this site HASP may be provided for informational purposes only. In this case, the Subcontractor Acknowledgment shall be signed, and a copy of this record retained by GeoEngineers. Please be advised that this site-specific HASP is intended for use by GeoEngineers employees only. Nothing herein shall be construed as granting rights to GeoEngineers' subcontractors or any other contractors working on this site to use or legally rely on this HASP. GeoEngineers specifically disclaims any responsibility for the health and safety of any person not employed by the company.

2.0 Background

Detailed information regarding background information, including Site location, physical description, use history, summary of previous environmental investigations and identification of preliminary hazardous substances are presented in GeoEngineers' Interim Action Work Plan dated October 5, 2026, and are summarized below.

2.5 PROBLEM DEFINITION

Following the closure of log handling operations in 2004, the Port of Anacortes (Port) began working with Ecology to characterize sediment conditions at the Site due to evidence of degraded habitat resulting from wood debris. Initial investigations identified up to 75 percent wood waste by volume in shallow intertidal sediment. In addition to wood waste, the initial investigations identified levels of organic carbon and volatile solids above recommended levels. Sediment investigations completed between 2008 and 2010 found that

sediment samples exceeded Ecology's Sediment Cleanup Objective (SCO) and Cleanup Screening Level (CSL) criteria for benthic invertebrate community health.

Based on the results of the initial and follow-up investigations, the Port entered into Agreed Order No. DE 10630 (Agreed Order) with Ecology on November 3, 2014, pursuant to the Model Toxics Control Act (MTCA). Pursuant to the Agreed Order, an Interim Action to expedite cleanup in a portion of the Site is planned. The Interim Action will focus on implementing a partial cleanup of the Site to address sediment contamination within the current and planned future operational area and within areas containing elevated levels of wood waste resulting from historical log haul out operations (i.e., Former Log Haul Out).

2.6 LOCATION AND DESCRIPTION

The Site comprises the intertidal and subtidal marine areas within an embayment along Guemes Channel at the northern terminus of T Avenue in the nearshore area northwest of 718 4th Street. The Site is bounded to the west by Pier 2, which is an earth fill structure and pile-supported wharf along the northernmost portion of the facility. The shoreline south and east of the Site includes a mixture of riprap, remnant structures, rock outcroppings, and beaches comprised of sand and gravel. A wooden dock (Pier 61) used for commercial transient vessels extends into the marine area from the southern shoreline. Public access to the Port's Pier 2 facility, including the beach area south of the Site between Pier 2 and Pier 61 (referred to as the former log handling area), is currently restricted by fencing and signage.

2.7 HISTORICAL LAND USE

Historically, the Site and surrounding area was used for lumber and wood milling and ship building operations from the early 1900s to 1965. In 1965, the Port purchased the Site and adjacent uplands (the "Property"). Between 1965 and 2004, the Port leased the Property to multiple tenants for log handling and loading operations. Log handling operations ceased after 2004 and the Site has remained largely unchanged since that time.

Currently, Pier 61 used for commercial transient vessels extending into the Site marine area from the southern shoreline. Additionally, a commercial launch (Wyman's Ramp), pocket beach (Robinson Cove) and former full-service restaurant (Secret Cove) are situated along the shoreline south of the Site. The northern part of the Pier 2 Terminal facility is a deep-water moorage terminal used for berthing and product loading and offloading, including petroleum coke and prilled sulfur. Other portions of the Pier 2 Terminal facility are leased to various tenants for equipment laydown and storage.

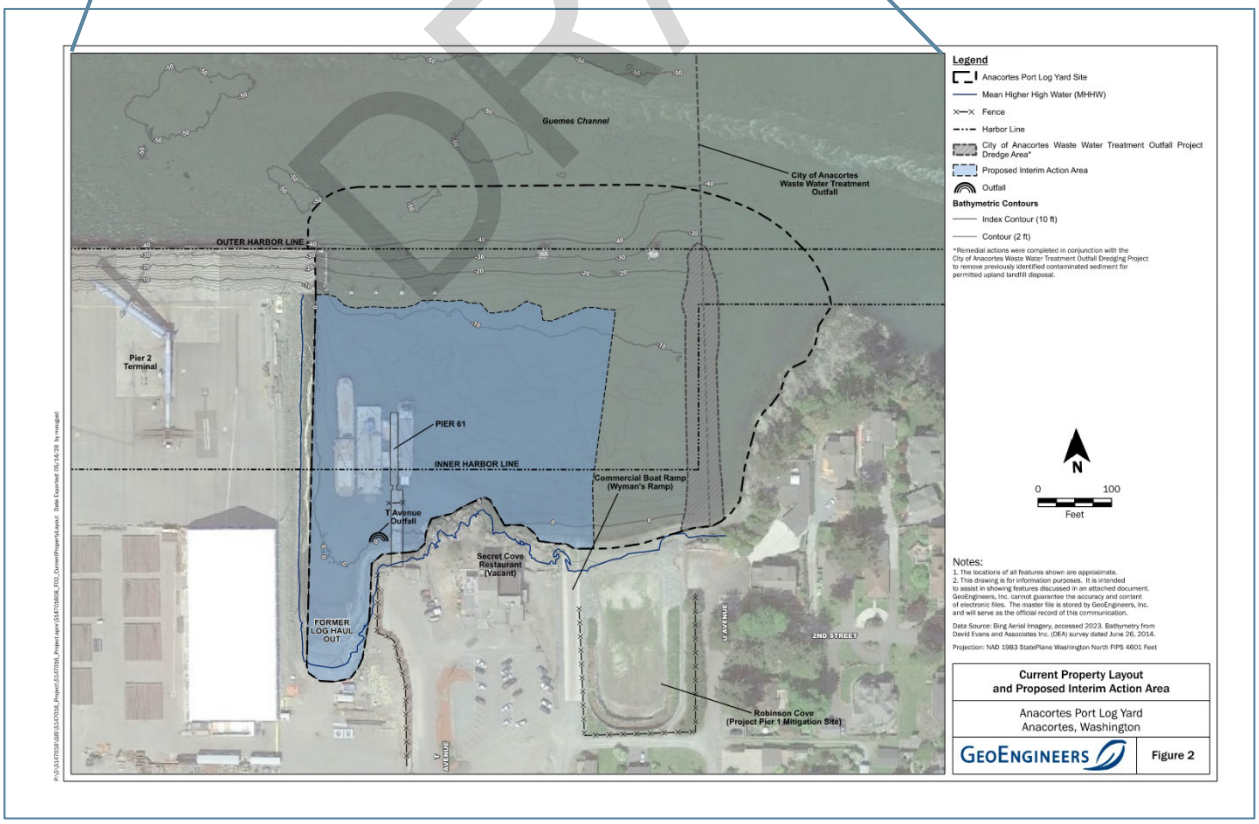
2.8 PROJECT DESCRIPTION

In accordance with the Interim Action Work Plan, remedial dredging followed by backfill placement and restoration will expedite part of the environmental cleanup at the Site addressing previously identified sediment contamination within the current and planned future operational area encompassing Pier 61 and Wyman's Ramp, as well as the Former Log Haul Out area containing elevated levels of wood waste resulting from former log haul out operations.

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2.9 SITE MAP





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3.0 Work Plan

The oversight to support the planned Interim Action include the following:

- Observe and document the demolition of existing marine structures (i.e., Pier 61).
- Observe remedial dredging activities within the Interim Action area. Dredging will be completed using barge-based clamshell and/or fixed-arm excavation equipment as required to effectively remove the contaminated sediment and wood debris as well as dredging of the navigational materials required to deepen the Pier 61/Wyman's Ramp operational area.
- Collection of confirmation samples to document the condition of the exposed sediment surface at the final dredge limits to:
  - Determine whether the cleanup action objectives have been met.
  - Support open-water disposal acceptance by the Dredged Material Management Office (DMMO) of the subsurface Dredged Material Management Unit (DMMU) within the future navigational dredge area.
  - Evaluate post-dredge sediment conditions in other portions of the Site for changes in contaminant concentration resulting from dredged residuals.
- Observe the placement of backfill materials to meet design grades.

Anticipated field activities and GeoEngineers personnel are summarized below.

ANTICIPATED FIELD ACTIVITIES

FIELD ACTIVITIES (CHECK ALL ANTICIPATED FIELD ACTIVITIES TO BE COMPLETED)	
☒ Site Reconnaissance	☐ Product Sample collection
☒ Surveying	☐ Recovery of Free Product
☐ Soil Sampling	☐ Remedial Excavation
☐ Groundwater Sampling	☐ Monitoring Well Installation
☒ Sediment Sampling	☐ Groundwater Depth and Free Product Measurement
☐ Vapor Sampling	☒ Other: Over-Water Work
☐ Test Pit Exploration	☒ Other: Sample Transport and Delivery
☐ Direct Push Exploration	☐ Other:
☐ Hollow-Stem Auger Exploration	☐ Other: Click here to enter text.
☐ Construction Monitoring	☐ Other: Click here to enter text.
☐ UST Site Check/Site Assessment	☐ Other: Click here to enter text.
☐ UST Removal Observation	☐ Other: Click here to enter text.

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GEOENGINEERS FIELD PERSONNEL QUALIFICATIONS AND READINESS STATUS

NAME OF EMPLOYEE ON SITE	LEVEL OF HAZWOPER TRAINING (24-HR/40-HR)	DATE OF LAST 8-HR REFRESHER TRAINING	LAST FIRST AID/ CPR TRAINING DATE	SITE SPECIFIC TRAINING OR LICENSE REQUIREMENT	HAZWOPER MEDICAL SURVEILLANCE REQUIRED?
Nathan Solomon	40-Hr	March-2025	Oct-2025	n/a	n/a
Micheal Ysaguirre	40-Hr	February-2026	February-2025	n/a	n/a
Max Henry Nelson	40-Hr	March-2026	May-2024	n/a	n/a
Olivia M. Holgate	40-Hr	March-2026	August-2026	n/a	n/a

GEOENGINEERS FIELD PERSONNEL REQUIRING RESPIRATOR USE ON THIS PROJECT

NAME OF EMPLOYEE REQUIRING A RESPIRATOR	RESPIRATOR FIT TEST DATE	MEDICAL EVALUATION DATE	RESPIRATOR CLEARANCE DATE	DATE OF ANNUAL REFRESHER TRAINING	APPROVED RESPIRATOR TYPE

Site safety meetings ("tailgate meeting") must be completed at the beginning of each day of site activity and/or at a minimum, weekly for similar activities performed during consecutive days. The site safety meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities. Personnel attending the Site Safety Meeting shall complete the **Site Safety Meeting Record** (Appendix A).

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4.0 Chain of Command

The chain of the command for the Site investigation has been established to provide the **hierarchical structure** in which field personnel reports potential issues or concerns if working conditions change that may affect on-site and off-site health and safety. The project chain of command and functional responsibility for key individuals are presented below.

PROJECT CHAIN OF COMMAND AND CONTACT INFORMATION

CHAIN OF COMMAND	TITLE	NAME	TELEPHONE NUMBERS
1	Current Owner	Jenkins Dossen	360.661.2163 (c) 360.299.1814 (O)
2	Associate In Charge	Robert Trahan	206.240.2300 (c) 206.239.3253 (o)
3	Health and Safety Program Manager	Chad Kean	425.515.5340 (c) 425.284.7256 (o)

CHAIN OF COMMAND	TITLE	NAME	TELEPHONE NUMBERS
4	Project Manager	Jeff Pratt	425.248.3944 (c) 503.603.6683 (o)
5	Client Assigned Site Supervisor/Contractor	n/a	n/a
6	Site Safety Officer	Nathan Solomon	206.437.6819 (c)
7	Field Engineer/Geologist	Nathan Solomon	206.437.6819 (c)
8	Analytical Resources LLC	Sue Dunahue	206.695.6200 (o)

The **Functional Responsibility** of individual roles within GeoEngineers health and safety program are described in Appendix B.

5.0 Hazard Analysis

A hazard analysis has been completed as part of preparation of this HASP. The hazard analysis was performed taking into account the known and potential hazards at the site and surrounding areas, as well as the planned work activities. The results of the hazard analysis are presented in this section. The hazard assessment will be evaluated each day before beginning work. Updates will be made as necessary to this HASP if new or previous unidentified hazards are encountered. Procedures for reporting incidents involving work-related injuries, illnesses, property damage, or near-miss events and guidelines for investigating and implementing corrective measures to prevent reoccurrence is presented in GeoEngineers **Incident Reporting and Investigation Program** (Appendix C).

Known and/or anticipated hazards are discussed in the following sections.

5.1 JOB HAZARD ANALYSIS

The following presents potential job hazards and mitigation procedures/steps should be followed prior to leaving to the job site, while enroute to the job site and following arrival to the job site to reduce/eliminate these hazards. Prior to departure:

- Use only vehicles appropriate for the work needs and the driving conditions expected.
- Inspect the work vehicle, including:
  - Check for tire cuts, fluid leaks, flat tires, body damage, windshield cracks, and other damage.
  - Check lights, wipers, fluid levels, and seat belts.
  - Check for vehicle warning indicators.
  - Check for current vehicle registration and insurance.
  - Ensure the vehicle has fuel to get to and from your destinations.
  - Ensure the vehicle has a complete and current first aid kit and fire extinguisher.
- Study the area maps, photos, driving routes.
- Be familiar with GPS use and compass skills (if remote work location).

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- Identify the safest spot to park field vehicles.
- Place heavy objects behind a secure safety cage if they must be carried in a passenger compartment.

Discuss potential job, biological, physical, chemical, and ergonomic hazards with Project Manager prior to departure.

ANTICIPATED JOB HAZARDS

JOB HAZARDS (CHECK ALL ANTICIPATED HAZARDS)	
☒ Highway Driving	☐ Unfamiliar Project Location
☐ Driving on Unimproved Roads	☐ Unfamiliar Task
☒ Poor/Inclement Weather Conditions	☐ Unfamiliar Tools or Sampling Equipment
☐ Traveling on Foot	☐ Other: Click here to enter text.
☐ Remote Location/Project Site	☐ Other: Click here to enter text.
☒ Communication	☐ Other: Click here to enter text.
☒ Unfamiliar Project Crew	☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated job hazards including the following:

- **Highway Driving** – Potential hazards include unfamiliar roads, mechanical failure, flat tires, vehicle fire, vehicle collision.
  - ☐ Inform your Project Manager of your destination and estimated time of return.
  - ☐ Carry extra food, water, and clothing.
  - ☐ Drive defensively.
  - ☐ Inspect vehicle prior to departure (see Pre-Job Activities)
- **Unfamiliar Crew and Tasks** – Potential hazards include crew does not notify site owner/manager, unaware of the job site hazards and steps to prevent injury, appropriate personnel protective equipment not worn.
  - ☐ Conduct a tailgate safety meeting discussing the jobs, the hazards and actions that will be taken to prevent injury.
  - ☐ Discuss "Stop Work Authority" as it applies to each site member.
  - ☐ Discuss appropriate Personal Protection Equipment (PPE) including high visibility clothing such as reflective vest.
  - ☐ Notify attendant and/or site owner/manager of work activities and location.
  - ☐ Discuss appropriate PPE including high visibility clothing such as reflective vest.
  - ☐ Set up exclusion zone surrounding work area.
- **Communication** – Potential hazards include lack of cell phone coverage, use heavy equipment, large job site without clear address or entrance for emergency crews.
  - ☐ Verify cell phone is working.
  - ☐ Maintain communication with Project Manager throughout job task.
  - ☐ Maintain communication and line of sight with heavy equipment operators.

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- ☐ Verify location and contact numbers for emergency medical assistance or 911.
- ☐ Verify designated job site entrance/exit and job site emergency procedures.
- ☐ Review job site health and safety plan.

ELEVATED RISK ACTIVITIES

Does this project have Elevated Risk Activities? Yes ☒ or No ☐

ELEVATED RISK ACTIVITIES	ASSOCIATED PRIMARY FIELD TASK(S)	SEPARATE ERA JHA COMPLETED?
Heat/Cold Injury Risk	Sediment Sampling	See Section 5.1.1 and 5.1.2
Work Over/Near Water	Sediment Sampling	See Section 5.1.3
Choose an item.		

5.1.1 Cold Stress Prevention

Working in cold environments presents many hazards to Site personnel and can result in frost nip (superficial freezing of the skin), frost bite (deep tissue freezing) or hypothermia (lowering of the core body temperature). The combination of wind and cold temperatures increases the degree of cold stress experienced by Site personnel. Site personnel shall be trained in the signs and symptoms of cold-related illnesses, how the human body adapts to cold environments, and how to prevent the onset of cold-related illnesses. Heated break areas and warm beverages shall be provided during periods of cold weather.

Additional details of GeoEngineers' **Cold Stress Prevention Program** are presented in Appendix D.

5.1.2 Heat Stress Prevention

State and federal OSHA regulations provide specific requirements for handling employee exposure to heat stress. GeoEngineers' program complies with these requirements and will be implemented in all areas where heat stress is identified as a potential health issue.

Site personnel shall be trained in the signs and symptoms of heat-related illnesses, how the human body adapts to hot environments, and how to prevent the onset of heat-related illnesses. When employee exposure is at or above an applicable temperature listed in the Heat Stress table below, Project Managers will ensure that:

- A sufficient quantity of drinking water is readily accessible to employees at all times; and
- All employees have the opportunity to drink at least one quart of drinking water per hour.
- A cooled, shaded rest area should be available to workers.

HEAT STRESS

TYPE OF CLOTHING	OUTDOOR TEMPERATURE ACTION LEVELS
Nonbreathing clothes including vapor barrier clothing or PPE such as chemical resistant suits	52°
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°
All other clothing	89°

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Additional details of GeoEngineers' **Heat Stress Prevention Program** are presented in Appendix E.

5.1.3 Boat, Over Water and Near Water Safety Program

Use of a boat for work requires safe boating practices, good equipment, and training. These procedures are not meant to replace the safety manuals that are provided by the U.S. Coast Guard. Instead, they should highlight some of the areas of concern and address specific GeoEngineers, Inc. work procedures. While working near water over waist deep or while on a boat, using a Coast Guard approved flotation device should be used. Remember that being submerged in water increases the chance of hypothermia. It is recommended to have a dry set of clothes and work with a buddy if you are working around water. If an employee is required to work in the water, they should wear appropriate gear including a wet suit or dry suit if necessary for safe accomplishment of the task.

Additional details of GeoEngineers' **Working Over Water Safety Program** are presented in Appendix F.

5.2 PHYSICAL HAZARDS

Physical hazards potentially at the Site and mitigation measures and/or procedures for addressing potential physical hazards are summarized below.

ANTICIPATED PHYSICAL HAZARDS

PHYSICAL HAZARDS (CHECK ALL ANTICIPATED HAZARDS)	
☐ Drill Rig and Support Truck	☐ Overhead Hazards/Power Lines
☐ Backhoe	☒ Tripping/Puncture/Pinch Hazards
☐ Trackhoe	☐ Unusual Traffic Hazard
☐ Crane	☒ Noise
☐ Front End Loader	☒ Other: Over-Water Work
☐ Excavations/Trenching (1:1 Slopes for Type B soil)	☒ Other: Barge based excavator and support vessel
☐ Shored/Braced Excavation (Greater than 4' Deep)	☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated physical hazards including the following:

- High-visibility vests and life jackets will be worn by on-site personnel to ensure they can be seen by equipment operators. Use proper lighting in the work areas.
- Field personnel will be aware at all times of the location and motion of equipment in the area of work to ensure a safe distance between personnel and the equipment. Personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus. Personnel will approach operating equipment only when they are certain, the operator has indicated that it is safe to do so through hand signal or other acceptable means.
- Personnel will avoid tripping hazards and other hazardous encumbrances.

5.3 BIOLOGICAL HAZARDS

Biological hazards potentially at the Site and mitigation measures and/or procedures for addressing potential biological hazards are summarized below.

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ANTICIPATED BIOLOGICAL HAZARDS

BIOLOGICAL HAZARDS (CHECK THE HAZARDS ANTICIPATED FOR THE PROJECT)
☒ Wildlife (insects, snakes, etc.)
☐ Human Waste
☒ Animal Waste
☐ Hypodermic needles or other infectious hazards
☐ Poison Ivy or other vegetation
☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated biological hazards including the following:

- Animal/Wildlife Hazards:
  - Use insect repellant as necessary.
  - If employee has bee sting allergy, carry epi-pen.
  - Stay alert and safe distance away from any other biological hazards (e.g. otters, seals, hunters).
  - Wear appropriate PPE including gloves, long sleeves and pants, mosquito hats and waders if probability of encountering biting or stinging insects.

5.4 ERGONOMIC HAZARDS

Ergonomic hazards potentially at the Site and mitigation measures and/or procedures for addressing potential ergonomic hazards are summarized below.

ANTICIPATED ERGONOMIC HAZARDS

ERGONOMIC HAZARDS (CHECK THE HAZARDS ANTICIPATED FOR THE PROJECT)
☒ Heavy Lifting
☒ Repetitive Motion
☐ Force
☐ Awkward Positioning Held for a Long Time
☐ Contact Stress
☐ Vibration
☐ Other:
☐ Other: Click here to enter text.

Measures to mitigate potential/anticipated ergonomic hazards including the following:

- Minimize reaching by keeping frequently used items within arm's reach, moving your whole body as close as possible to the object.
- Avoid overextending by standing up when retrieving objects on shelves.
- Keep your back in shape with regular stretching exercises.

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- Get help from a coworker or use a hand truck if the load is too heavy or bulky to lift alone.
- Proper Lifting Techniques:
  - Face the load; don't twist your body. Stand in a wide stance with your feet close to the object.
  - Bend at the knees, keeping your back straight. Wrap your arms around the object.
  - Let your legs do the lifting.
  - Hold the object close to your body as you stand up straight. To set the load down, bend at the knees, not from the waist.

5.5 CHEMICAL HAZARDS

The following tables presents a summary of the chemicals known to be historically or currently present at the Site of regulatory concern and their range of detected concentrations based on previous investigations and their associated occupational exposure limits (OEL). GeoEngineers typically uses the most conservative (lowest) of the limits published for the protection of its' workers. Note that additional contaminants of concern in addition to those listed may be present. Additional information regarding the listed chemical compounds is presented in Appendix G. Associated occupational exposure limits (OEL) for listed chemical compounds are presented in Appendix H.

ANTICIPATED CHEMICAL HAZARDS, EXPOSURE ROUTES AND SYMPTOMS

CHEMICAL COMPOUND	MAXIMUM DETECTED CONCENTRATION	UNIT	MEDIA OF CONCERN	EXPOSURE ROUTES	SYMPTOMS OF EXPOSURE
Arsenic	14	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	Ulceration of nasal septum, dermatitis, gastrointestinal disturbances, peripheral neuropathy, respiratory irritation, hyperpigmentation of skin. Target organs: liver, kidneys, skin, lungs, lymphatic system (lung and lymphatic cancer)
Cadmium	2	mg/kg	Sediment	inhalation, ingestion, skin and/or eye contact	Pulmonary edema, dyspnea (breathing difficulty), cough, chest tightness, substernal (occurring beneath the sternum) pain; headache; chills, muscle aches; nausea, vomiting, diarrhea; anosmia (loss of the sense of smell), emphysema, proteinuria, mild anemia; [potential occupational carcinogen]
Chromium	124	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	Chromium III is an essential nutrient, Chromium VI can cause irritation to nose, skin ulcers, linked to cancer.

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CHEMICAL COMPOUND	MAXIMUM DETECTED CONCENTRATION	UNIT	MEDIA OF CONCERN	EXPOSURE ROUTES	SYMPTOMS OF EXPOSURE
Copper	248	mg/kg	Sediment	Inhalation, ingestion, skin and eye contact	Irritated eyes, nose, pharynx; nasal septum perforation; metallic taste; dermatitis
Lead	23	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia, facial pallor, anorexia, weight loss, malnutrition, constipation, abdominal pain, colic, anemia, gingival lead line, tremor, wrist and ankle paralysis, encephalopathy, kidney disease, irritated eyes, hypotension
Mercury	0.5	mg/kg	Sediment	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritated eyes and skin, coughing, chest pain, difficulty breathing, bronchitis, pneumonitis, tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion), stomatitis, salivation, gastrointestinal disturbance, anorexia, weight loss, proteinuria
Zinc	784	mg/kg	Sediment	Inhalation, ingestion, skin and/or eye contact	sensitization dermatitis, allergic asthma, pneumonitis; [potential occupational carcinogen]
Tributyltin	382	µg/kg	Sediment	See Below	See Below
cPAHs	1,174	µg/kg	Sediment	Ingestion, inhalation, skin and/or eye contact	Dermatitis, bronchitis, potential carcinogen
PCBs	160	µg/kg	Sediment	Skin absorption, ingestion, inhalation	Immunological (Immune System), Neurological (Nervous System), Skin, thyroid, stomach and liver damage, EPA: Probable human carcinogen
Dioxin/ Furans	11.26	ng/kg	Sediment	See Below	See Below

Notes:
mg/kg = milligram per kilogram
µg/kg = microgram per kilogram
ng/kg = nanogram per kilogram

5.5.1 Tributyltin

Organotins are tin-based compounds historically used in marine antifouling paints, PVC stabilizers, pesticides, and industrial processes. The most significant environmental source is legacy contamination from antifouling paints containing Tributyltin (TBT) and Tributyltin (TBT), which leached into waterways and

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now persist in sediments, particularly around marinas and shipyards. Additional sources include leaching from Polyvinyl chloride (PVC) products and historical agricultural uses.

Organotins are highly toxic and act as endocrine disruptors, affecting hormone systems, reproduction, and metabolism in both humans and wildlife. They can suppress immune function, impact neurological development, and bioaccumulate in aquatic organisms. Ecologically, they are best known for causing "imposex" in marine snails and broader toxicity to aquatic life, making them a long-term concern in contaminated sediments even after regulatory bans.

Organotins can affect people primarily through ingestion (contaminated seafood), skin contact, or inhalation in occupational settings. Health concerns include endocrine disruption (hormone interference), immune suppression, neurological effects, and potential impacts on metabolism and reproduction. Exposure to organotins such as TBT can cause a range of symptoms depending on dose and duration. Short-term exposure may lead to skin and eye irritation, headaches, dizziness, nausea, and respiratory irritation, while long-term exposure is associated with endocrine disruption, weakened immune function, neurological effects like difficulty concentrating, and potential reproductive impacts. Symptoms are uncommon at typical environmental levels but are more likely in occupational settings or with direct contact with contaminated materials.

To prevent exposure, the most effective measures are avoiding direct contact with contaminated sediments or materials, using appropriate personal protective equipment (gloves, protective clothing) in occupational settings, and following good hygiene practices (washing hands, preventing ingestion of soil/sediment).

5.5.2 Dioxins/Furans

Dioxins and furans are persistent organic pollutants that enter marine sediments primarily through combustion and industrial processes. Key sources include waste incineration (especially incomplete combustion of chlorinated materials), historical pulp and paper bleaching, metal smelting, chlorine-based chemical manufacturing, and burning of treated wood or fuels containing chlorine compounds. These compounds—often grouped as "dioxins" (e.g., 2,3,7,8-TCDD) and "furans"—are transported through the air and deposited onto land and water surfaces, where they strongly bind to organic matter and accumulate in sediments, particularly in low-energy marine environments like harbors, slips, and industrial shorelines.

For site workers, exposure routes include direct skin contact with contaminated sediment or dredged material, incidental ingestion from hand-to-mouth contact, and inhalation of contaminated dust or aerosols during activities like dredging, excavation, or sediment handling. Because these compounds are highly lipophilic, dermal absorption can also contribute over time if proper controls are not used.

Health effects from significant or repeated exposure include skin conditions such as chloracne (a hallmark effect), liver enzyme changes, immune system suppression, endocrine disruption, and potential developmental and reproductive toxicity. Long-term exposure is also associated with increased cancer risk. In most modern work environments, risk is managed through controls such as protective clothing, respiratory protection when dust is generated, hygiene measures (handwashing and avoiding ingestion), and dust suppression during sediment disturbance.

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6.0 Personal Protective Equipment

The appropriate personal protective equipment (PPE) will be selected on a daily or task-specific basis. These PPE selections will be communicated to field personnel during the pre-work briefing, **before** the start of site operations. PPE ensemble shall be selected daily or before each separate task to provide protection against known or anticipated hazards. To obtain maximum performance from PPE, site personnel shall be trained in the proper use and inspection of PPE.

- Inspect PPE before and during use for imperfect seams, non-uniform coatings, tears, poorly functioning closures or other defects. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Inspect PPE during use for visible signs of chemical permeation such as swelling, discoloration, stiffness, brittleness, cracks, tears or other signs of punctures. If the integrity of the PPE is compromised in any manner, proceed to the contamination reduction zone and replace the PPE.
- Disposable PPE should not be reused after breaks unless it has been properly decontaminated.

ANTICIPATED PERSONAL PROTECTIVE EQUIPMENT FOR USE

ANTICIPATED PPE FOR THE PROJECT (CHECK ALL THAT APPLY)	
Head Protection	**Eye & Face Protection**
☒ Hard Hat	☒ Safety Glasses
☐ Climbing Helmut	☐ Face Shield
☐ Sunhat	☐ Goggles
☐ Other: Click here to enter text.	☒ Sunglasses
Ear & Hearing Protection	**Hand Protection**
☒ Ear Plugs	☒ Nitrile
☒ Ear Muffs	☐ Latex
☐ Flanges	☐ Leather
☐ Other: Click here to enter text.	☐ Cut Resistant/Kevlar/Leather
Feet Protection	**Protective Clothing**
☒ Leather Boot (steel toe)	☒ High-vis Vest
☒ Rubber Boot (steel toe)	☐ Tyvek (if dry conditions are encountered, Tyvek is sufficient) (modified Level D or Level C)
☐ Hiking Boot	☐ Saranex (personnel shall use Saranex if liquids are handled or splash may be an issue) (modified Level D or Level C)
☒ Hip Wader	☐ Snake Chaps
☒ Chest Wader	☐ Fire Retardant Clothing
☐ Other: Click here to enter text.	☒ Rain gear (as needed)
☐ Other: Click here to enter text.	☒ Long Sleeve Shirt
☐ Other: Click here to enter text.	☒ Layered warm clothing (as needed)
☐ Other: Click here to enter text.	☒ Other: Life Jacket

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Additional details of GeoEngineers' **Personal Protective Equipment Program** are presented in Appendix I.

7.0 Personnel Medical Surveillance

Field personnel on this job site are ☐; are not ☒ entered in a GeoEngineers provided medical surveillance program.

GeoEngineers employees are required to be in a medical surveillance program when they fall into the category of "Employees Covered" in OSHA 1910.120(f)(2) (or Chapter 296-842 WAC). This includes:

- All employees who are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or, if there is no permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year.
- All employees who wear a respirator for 30 days or more a year or as required by state and federal regulations.
- All employees who are injured, become ill or develop signs or symptoms due to possible overexposure involving hazardous substances or health hazards from an emergency response or hazardous waste operation.
- Members of HAZMAT teams.

8.0 Air Monitoring Plan

Air monitoring for personal exposures will ☐, will not ☒ be implemented as part of this HASP.

Due to the nature of the media of concern (i.e., sediment) and sampling methodology (i.e., grab samples), inhalation of volatiles and/or dust particulates is not expected as sampling activities will be performed under saturated conditions. Other potential exposure routes (skin absorption, ingestion, and eye contact) will be mitigated through the use of PPE and safe work practices.

9.0 Site Control Plan

9.1 TRAFFIC OR VEHICLE ACCESS CONTROL PLAN

Traffic or Vehicle Access Control Plan will ☐, will not ☒ be implemented as part of this HASP.

Sampling equipment utilized for implementation of the field activities requires the use of a research vessel. Therefore, a Traffic/Vehicle Access Control Plan has **not** been developed as part of this HASP.

9.2 SITE WORK ZONES

The work zone for the project is considered to be all working areas within the Interim Action area. Employees should work upwind of the machinery if possible. To the extent practicable, use the buddy system. Do not approach heavy equipment unless you are sure the operator sees you and has indicated it is safe to approach. For this project, the following are established:

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- **Exclusion Zone** – An exclusion zone will be established as all working spaces within the Interim Action area. Only people with the appropriate training will enter this perimeter while work is being conducted in these exclusion zones. Drinking, eating and smoking are not allowed.
- **Reduction Zone** – The reduction zone is established as the at which personnel exit the working area. Used PPE (gloves, rags, etc.) must be placed in a garbage bag prior to exiting the reduction zone. Personnel should wash hands before eating or leaving the reduction zone. Drinking, eating, and smoking are not allowed.
  - ☐ Decontamination, at a minimum, should include removing and disposing of PPE when exiting the exclusion zone and washing your hands. Decontamination may also consist of removing outer protective gloves and washing soiled boots and gloves using buckets and brushes provided on site in the contamination reduction zone. If needed, inner gloves will then be removed, and hands and face will be washed in either a portable wash station or a bathroom facility at the site. Employees will perform decontamination procedures and wash before eating, drinking or leaving the site.
  - ☐ Reusable equipment decontamination will include:
    - Seawater rinse over equipment to dislodge and remove any sediment (deionized water will be used for the samples collected on land);
    - Washing with a brush and non-phosphate detergent solution (e.g., Liqui-Nox and distilled water);
    - Deionized water rinse.
- **Support Zone** – The support zone is established as the shoreline or dock areas. Drinking, eating, smoking and using phone are allowed.

9.3 BUDDY SYSTEM

Personnel on site should use the buddy system (pairs), particularly whenever communication is restricted. If only one GeoEngineers employee is on site, a buddy system can be arranged with subcontractor/ contractor personnel.

- Positive communications (within sight and hearing distance or via radio) should be maintained between workers on site, with the pair remaining in proximity to assist each other in case of emergencies. The field team should prearrange other emergency signals for communication when voice communication becomes impaired (including cases of dropped cell phone or radio breakdown) and an agreed upon location for an emergency assembly area.
- All personnel from GeoEngineers and subcontractor(s) should be made aware of safety features during safety tailgate meetings (drill rig shutoff switch, location of fire extinguishers, cell phone numbers, etc.).
- On-site personnel will be visible to the operator at all times and will remain out of the swing and/or direction of the equipment apparatus only when they are certain the operator has indicated it is safe to do so. (“Show My Hands Technic” or another agreed sign language).

9.4 SPILL CONTAINMENT PLANS

Will spill containment contingencies be needed on this project? Yes ☐ or No ☒

The remediation contractor will be responsible for developing spill containment plans and implementing best management practices during construction as required by the contract documents.

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9.5 SAMPLING, MANAGING AND HANDLING DRUMS AND CONTAINERS

There will be drums or sealed containers on site during this project? Yes ☐ or No ☒

Drums or containers and suitable quantities of proper absorbent shall be kept available and used where spills, leaks or rupturing may occur. Where major spills may occur, a spill containment program shall be implemented to contain and isolate the entire volume of the hazardous substance being transferred.

Fire extinguishing equipment shall be on hand and ready for use to control incipient fires.

INVESTIGATIVE DERIVED WASTE (IDW) DISPOSAL OR STORAGE

IDW TYPE	ACTION
PPE	Incidental waste generated during sampling activities includes items such as gloves, plastic sheeting, sample tubing, paper towels and similar expended and discarded field supplies. These materials are considered *de minimis* and will be disposed of in a local trash receptacle or county disposal facility.

9.6 SANITATION

Sanitary facilities are available at Port facilities and local restaurants/businesses.

9.7 LIGHTING

Work is anticipated to be performed during daylight hours. Work may extend slightly into the evening provided adequate lighting is used (e.g. portable flood lights).

10.0 Emergency Response Plan

EMERGENCY EVENT	RESPONSE PLAN
Medical	Call 911
High Winds	Maritime small vessel restrictions are in effect.
Heavy Rain	Use rain gear as appropriate.
Choose an item.	

10.1 GENERAL RESPONSE GUIDANCE

- If any member of the field crew experiences any adverse exposure symptoms while on site or an injury, the entire field crew should immediately halt work and act according to the instructions provided by the Site Safety Officer.
- The discovery of any condition that would suggest the existence of a situation more hazardous than anticipated should result in the evacuation of the field team, contact of the PM, and re-evaluation of the hazard and the level of protection required.

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- As soon as feasible, notify GeoEngineers' PM and follow the GeoEngineers' Incident Reporting and Investigation Program, and Health and Safety Injury Management Procedures Flowchart (see copy attached to this HASP).
- If an accident occurs, the Site Safety Officer and the injured person are to complete, within 24 hours, an Incident Report for submittal to the PM, the HSPM, and HR. The PM should ensure that follow-up action is taken to correct the situation that caused the accident or exposure.

10.2 STANDARD EMERGENCY PROCEDURES

- Get help.
  - Send another worker to phone 9-1-1 (if necessary)
  - As soon as feasible, notify the GeoEngineers' Project Manager and/or GeoEngineers HSM and follow the GeoEngineers' Incident Reporting and Investigation Program, and Health and Safety Injury Management Procedures Flowchart (see copy attached to this HASP).
- Reduce risk to injured person.
  - Turn off equipment.
  - Move person from injury location to safer area (if in life-threatening situation only)
  - Keep person warm
  - Perform CPR (if necessary)
- Transport injured person to medical treatment facility (if necessary).
  - By ambulance (if necessary) or GeoEngineers vehicle.
  - Stay with person at medical facility.
  - Keep GeoEngineers Project Manager apprised of situation and notify Human Resources Manager of situation.
  - Accidents involving injuries requiring professional medical attention must be reported as soon as feasible to the Site Safety Officer and/or Health and Safety Team.
  - First aid cases not involving professional medical attention must be reported within 24 hours after occurrence.
  - Incidents involving property damage must be reported within 24 hours of occurrence.
  - After hours illnesses must be reported within 24 hours (i.e. flu, rashes).

Emergency/Hospital Contact Information and Directions are presented in Appendix J.

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Appendices

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Appendix A
Site Safety Meeting Record

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Site Safety Meeting Record (Daily or Weekly)

Project Name:_____ Project Location:_____ File No.:_____

Site Safety meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities. Site safety meeting should be completed prior implementing site activities at a minimum in the beginning of each day and/or at a minimum weekly for similar activities performed few consecutive days.

- Use in conjunction with the HASP Hazard Review and ERA Job Hazard Analyses (JHA) Form 3 to help identify hazards with the planned activities and activities performed concurrently by others at the site in the vicinity of the working areas.

Date: _____ **Site Safety Officer (SSO):**_____

Topics: _____

_____

Attendees:

Print Name Company **Signature**

_____

_____

_____

_____

_____

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Appendix B
Functional Responsibility

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Appendix B
Functional Responsibility

HEALTH AND SAFETY MANAGER (HSM)

GeoEngineers' Health and Safety Manager (HSM) is responsible for implementing and promoting employee participation in the company Health and Safety Program. The HSM has overall responsibility for the general health and safety of GeoEngineers personnel. The HSM issues directives, advisories and information regarding health and safety to the technical staff. Additionally, the HSM has the authority to audit on-site compliance with HASPs, suspend work or modify work practices for safety reasons, and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others.

HEALTH AND SAFETY SPECIALIST (HSS)

GeoEngineers' Health and Safety Specialist (HSS) is a designated safety specialist. The HSS provides technical support to the PM and Site Safety Officer (SSO) to ensure that that GeoEngineers staff are following GeoEngineers safety program and safe work practices during site activities. The HSS works with the PM and SSO to ensure the subcontractors' crews are following the site general HASPs, the activities HASP/JHAs and safe work practices. The HSS may periodically go on-site to perform safety observations and mentor on-site personnel on safety behavior practices. Additionally, the HSS has the authority to suspend work or modify work practices for safety reasons and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others. The HSS shall keep the PM and HSM informed of the project's health- and safety-related matters, as necessary.

HEALTH AND SAFETY AUTHORIZED CONSULTANT (HSC)

GeoEngineers' Health and Safety Authorized Consultant is a GeoEngineers employee who is given written authorization to act in the role of a Consultant with regard to Health and Safety on project sites. The HSC provides technical support to the PM and Site Safety Officer (SSO) to ensure that that GeoEngineers staff follow GeoEngineers safety program and safe work practices during site activities. The HSC works with the PM and SSO to ensure the subcontractors' crews are following the site general HASPs, the activities HASP/JHAs and safe work practices. The HSC may periodically go on-site to perform safety observations and mentor on-site personnel on safety behavior practices. Additionally, the HSC has the authority to suspend work or modify site work practices for safety reasons and dismiss from the site any GeoEngineers or subcontractor employees whose conduct on the site endangers the health and safety of themselves or others. The HSC shall keep the PM, HSS, and HSM informed of the project's health- and safety-related matters, as necessary.

PROJECT MANAGER (PM)

A PM is assigned to manage the activities of various projects and is responsible to the principal-in-charge of the project. The PM has the responsibility of ensuring the safety of all GeoEngineers personnel on job sites. The PM is responsible for assessing the hazards present at a job site and incorporating the appropriate safety measures for field staff protection into the field briefing and/or Site Safety Plan. He or she is also responsible for assuring that appropriate HASPs are developed. The PM will provide a summary of chemical analysis to personnel completing the HASP. PMs shall also see that their project budgets

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consider health and safety costs. The PM shall keep the HSM and HSS or HSC informed of the project's health- and safety-related matters as necessary. The PM shall designate the project Site Safety Officer (SSO) and help the SSO implement the specifications of the HASP. The PM is responsible for communicating information in site safety plans and checklists to appropriate field personnel. Additionally, the PM and SSO shall hold a site safety briefing before any field activities begin. The PM is responsible for transmitting health and safety information to the Site Safety Officer (SSO) when appropriate.

SITE SAFETY OFFICER/HAZWOPER (SSO)

The SSO will have the on-site responsibility and authority to modify and stop work, or remove GeoEngineers personnel from the site if working conditions change that may affect on-site and off-site health and safety. The SSO will be the main contact for any on-site emergency situation. The SSO is First Aid and CPR qualified and has current Hazardous Waste Operations and Emergency Response (HAZWOPER) training when working at hazardous waste sites. The SSO is responsible for implementing and enforcing the project safety program and safe work practices during site activities. The SSO shall conduct daily safety meetings, perform air monitoring as required, conduct site safety inspections as required, coordinate emergency medical care, and ensure personnel are wearing the appropriate personal protective equipment (PPE). The SSO shall have advanced fieldwork experience and shall be familiar with health and safety requirements specific to the project. The SSO has the authority to suspend site activities if unsafe conditions are reported or observed.

Duties of the SSO include the following:

- Implementing the HASP in the field and monitoring staff compliance with its guidelines.
- Ensuring that all GeoEngineers field personnel have met the training and medical examination requirements. Advising other contractor employees of these requirements.
- Maintaining adequate and functioning safety supplies and equipment at the site.
- Setting up work zones, markers, signs and security systems, if necessary.
- Performing or supervising air quality measurements. Communicating information on these measurements to GeoEngineers field staff and subcontractor personnel.
- Lead the pre-entry briefing (at the beginning of the site activities) and the site safety meetings (daily and/or weekly), with onsite personnel. These meetings should include a discussion of emergency response, site communications and site hazards associated with the planned activities
- Communicating health and safety requirements and site hazards to field personnel, subcontractors and contractor employees, and site visitors.
- Directing personnel to wear PPE and guiding compliance with all health and safety practices in the field.
- Consulting with the PM regarding new or unanticipated site conditions, including emergency response activities. If monitoring detects concentrations of potentially hazardous substances at or above the established exposure limits, notify/consult with the PM. Consult with the PM, the HSC or HSS, and the HSM regarding new or unanticipated site conditions, including emergency response activities. If field monitoring indicates concentrations of potentially hazardous substances at or above the established exposure limits, the HSM must be notified, and corrective action taken.

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- Documenting all site accidents, injuries, illnesses and unsafe activities or conditions and/or near misses, and reporting them to the PM, HSC or HSC and the HSM as soon as practical, but no later than the end of the day.
- Directing decontamination operations of equipment and personnel.

FIELD EMPLOYEES

All employees working on site that have the potential of coming in contact with hazardous substances or chemical, biological, and/or physical hazards are responsible for participating in the health and safety program and complying with the site-specific health and safety plans. These employees are required to:

- Read, participate and be familiar with the GeoEngineers health and safety programs located in SharePoint. Attend to applicable specific safety training.
- Notify the SSO that when there is need to stop work to address an unsafe situation.
- Comply with the HASP and acknowledge understanding of the plan discussed during the health and safety pre-entry briefing
- Review applicable Job Hazard Analysis (JHAs) prior starting a new activity and follow the recommended critical actions to mitigate hazards.
- Think through potential hazards at the beginning of a new task, before changing tasks, and when conditions changes and after a near miss or incident.
- Report to the SSO, PM or HSM any unsafe conditions and all facts pertaining to near misses, incidents or accidents that could result in physical injury or exposure to hazardous materials and/or equipment damage.
- Participate in health and safety training, including initial 40-hour Hazardous Waste Operations and Emergency Response (HAZWOPER) course, annual 8-hour HAZWOPER refresher, and First Aid/cardiopulmonary resuscitation (CPR) training.
- Participate in the medical surveillance program, if applicable.
- Any field employee working on site may stop work if the employee believes the work is unsafe.

GEOENGINEERS LABORATORY MANAGER

When GeoEngineers lab use is anticipated, the Laboratory Manager will coordinate the receipt of samples for analysis with the Project Manager. The communication will include historical environmental data and/or field screening results. The Laboratory Manager will ensure all laboratory staff are following SOPs for the soils type or limited chemical constituents. SOPs will be developed and maintained under the direction of the Laboratory Manager and the HSM.

CONTRACTORS UNDER GEOENGINEERS SUPERVISION

Contractors working on the site directly for the Client will have their own Health and Safety Plans or Job Hazard Analysis. Sub-contractors working on the site under GeoEngineers supervision that have the potential of coming in contact with hazardous substances or chemical, biological and/or physical hazards shall have their own health and safety programs and safety plan that is generally consistent with the requirements of this HASP.

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Appendix C
Incident Reporting and Investigation Program

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GeoEngineers

Incident Reporting and Investigation Program

Revised September 2022

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Attachments

Attachment A. Health and Safety Injury Management Procedures Flowchart
Attachment B. Incident Report Form
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Attachment C. Return to Work Arrangements Form

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Incident Reporting and Investigation Program

Purpose

The purpose of the Incident Reporting and Investigation Program is to establish procedures for reporting incidents involving work-related injuries, illnesses, property damage, or near-miss events and guidelines for investigating and implementing corrective measures to prevent reoccurrence. GeoEngineers is committed to the prevention of jobsite engineering, personnel, and security-related incidents and correcting the cause behind any such incidents which occur through easy, safe, and effective incident reporting and investigation programs.

Scope

This program applies to all GeoEngineers employees, project and office locations, unless the Health and Safety Manager grants a variance from the requirements.

Responsibilities

Principals/Associates/Project Managers/Group Leaders/Site Supervisors—Responsible for ensuring that the provisions of this program are implemented and followed at locations in which they have oversight and influence. Including:

- Ensuring employees are aware of incident reporting procedures.
- Immediately reporting up all workplace related injuries, illnesses, and jobsite security incidents which occur in their area of responsibility. Provide written reports of all investigations and planned corrective actions to the Health and Safety Manager.
- Correct identified workplace hazards found in the risk assessment or report up deficiencies they cannot correct.
- Communicate key health and safety regulations to affected employees and ensuring they are aware of jobsite security incidents and reporting procedures.

Health and Safety Manager—GeoEngineers' Health and Safety Manager (HSM) shall monitor and evaluate the Incident Report and Investigation Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements shall be promptly addressed. Additional duties include:

- Conduct worksite evaluations in cooperation with supervisors and employees to identify potential hazards and the ways to avoid or correct them to prevent injuries.
- Establish a system for communicating with employees in readily understandable methods relevant and up to date information related to their safety and health.
- Maintain records of activities and training related to incident reporting.
- Review the effectiveness of the incident reporting system and investigation programs with supervisor and employee input at least annually.

Employees—GeoEngineers employees are responsible and accountable for complying with this program. Including:

- Attending all required training programs provided.

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- Reporting known or suspected safety hazards to their Supervisor or Safety Coordinator through incident reporting procedures, including injuries and jobsite security incidents, immediately.
- Reporting all workplace related injuries or illnesses to their supervisor.

Definitions

Occupational Safety and Health Administration (OSHA)—part of the United States Depart of Labor and is the agency assigned to enforce the regulations of the Occupational Safety and Health Act of 1970.

OSHA Recordable Incident—an injury or illness that is work related and results in one of the following:

- Death
- Days away from work
- Restricted work activity
- Transfer to another job
- Medical treatment beyond first aid
- Loss of consciousness
- Significant injury or illness diagnosed by a Licensed Health Care Provider (LHCP)

The following are generally considered first-aid treatment (e.g., one-time treatment and subsequent observation of minor injuries) and are not OSHA recordable if the work-related injury does not involve loss of consciousness or any of the case types listed above.

First Aid Treatment: (This is a limited list)

- Using non-prescription medications at non-prescription strength;
- Tetanus immunizations;
- Cleaning, flushing, or soaking surface wounds;
- Wound coverings, butterfly bandages, steri-strips;
- Hot or cold therapy;
- Non-rigid means of support;
- Temporary immobilization device used to transport accident victims;
- Drilling of fingernail or toenail, draining fluid from blister;
- Eye patches;
- Removing foreign bodies from eye using irrigation or cotton swab;
- Removing splinters or foreign material from areas other than the eye by irrigation, tweezers, cotton swabs, or other simple means;
- Finger guards;
- Massages;
- Drinking fluids for relief of heat stress;
- Visits to a Licensed Health Care Provider for observation or counseling;

If first aid, but no medical treatment was given to the injured employee, the incident is not OSHA recordable.

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Root Cause Analysis (RCA)—an investigative procedure which helps to determine the most basic cause that can reasonably be identified, that management has control to fix, and for which effective corrective actions for preventing recurrence can be generated.

General Requirements

Work related near-misses, injuries and illnesses must be reported at the time of the incident or as soon as possible afterwards (see flowchart on page 3). Fatalities must be reported within 8 hours and all other incidents within 24 hours. Timely and accurate reporting is necessary for documenting incident details, evaluating preventive and corrective actions, enabling post-incident management and to comply with OSHA recordkeeping requirements.

Whenever possible, reporting should be done online through GeoEngineers Safety Hub website so that the report will be sent out to all relevant parties and archived. Safety Hub can be reached through connect.geoengineers.com or though this link.

An incident investigation shall be conducted for all OSHA defined recordable incidents and work-related incidents resulting in property damage – with or without injuries. First aid and near-misses will also be investigated as necessary by the Health and Safety Manager, for use in sharing lessons learned with the Company. All investigation will be documented in an incident report and if necessary published.

Implementation

Incident Reporting Procedures

Work related injuries and illnesses must be reported at the time of the incident to the affected employee's supervisor, the job site supervisor, project manager, or if none of those are available the current HSM. Initial notification should be verbal, though later reports may be digital or written. If Emergency Medical Services (EMS) are required, dial 911 for an ambulance. If an ambulance is not required, the injured/ill employee should drive or be driven to the medical facility as follows:

- As soon as safe to do so incidents are reported using the Safety Hub Incident Reporting system.
- An employee with a non-emergency illness such as poison ivy or a skin rash, for example can transport him/herself to a facility that provides medical attention.
- Injuries/illness of a more serious nature may require that the employee be driven for medical treatment by another GeoEngineers employee or other available individual.
- Serious accidents (such as those involving fatal injury, staff admitted to a hospital, or excessive property damage) should also be reported to the building or property owner, the police, and the appropriate OSHA or State approved authority. The scene should be left secured and undisturbed, if possible, for the purposes of follow-up investigation.
- Attachment A. Health and Safety Injury Management Procedures Flowchart presents the process for response to an incident utilizing the Safety Hub Incident reporting system.

After an employee is involved in an incident that causes injury or a significant near miss, the employee involved must verbally report it to their Project Manager or Supervisor. The Project Manager or Supervisor shall notify the HSM within one (1) hour of the event or as soon as possible. This must be done regardless of whether there appears to be a significant injury at the time. The employee submits the Incident Report Form using the Safety Hub Incident Reporting system. The employee fills out sections of this form that they know at the time. Based on the type of incident, the employee will receive documents that will be required

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for insurance purposes: Vehicle Accidents (Enclosure 1); Property Damage (Enclosure 2); Stolen Equipment (Enclosure 3). A witness statement form is included in Enclosure 1.

Project Manager /Supervisor Immediate Response

When a Project Manager (PM) or Supervisor learns that an employee has been involved in an incident, the priority is to ensure the health and well-being of the employee involved and others on site.

The supervisor also helps to ensure that the incident scene is not disturbed to the extent possible; and that preserving the scene does not interfere with the immediate treatment of any employees. An undisturbed accident scene will provide the best answers as to the cause of the accident during the investigation phase. The scene should be marked off by cones, tape, or guards if necessary to prevent contamination or alteration. If the accident is potentially serious, the Supervisor should, after discussion with PM/HSM, discontinue work until the accident has been investigated and the cause of the accident corrected.

After the injured employee has recovered to the point that they can complete paperwork, they must complete the Employee's section of the Incident Report Form. If medical care is sought, the employee must also complete a claim form for Worker's Compensation.

If the incident caused a fatality, probable fatality, or the hospitalization of two or more persons, the PM or Supervisor shall immediately notify their supervisor, the HSM and Human Resources. The HSM must make a report to State/OSHA within eight (8) hours. In addition to the Company's own internal investigation, State/OSHA may also conduct one as well. The accident scene must be blocked off and left undisturbed until State/OSHA arrives, unless it is necessary to move something to treat the victim(s).

Incident Investigations

Injuries to people, accidents, significant near misses, unsafe conditions and unsafe practices shall be investigated by the HSM or their qualified designee. RCA process shall be used to investigate an incident and implement corrective measures to prevent reoccurrence. All members of the investigation team will be trained and competent in investigations.

Prior to the investigation beginning, all emergency response procedures must be completed, and the incident site must be safe and secure for entry and investigation. All evidence must be recorded and preserved.

An incident investigation should include a thorough review of the following areas:

- Physical conditions at the time of the incident;
- Location of the incident;
- Action of the person injured;
- A description of the injury;
- The methods/procedures in use while conducting work;
- Training of personnel involved;
- Experience level of personnel;
- Date, time, and shift on which incident occurred;
- Other person(s) involved (including subcontractors or client);
- Unusual job conditions

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- Routine/Non-routine work;
- Property damage or vehicle;
- Vehicle: To fast? Other causes?

A tool/equipment accident investigation will include a thorough review of the following physical conditions:

- Machines; Guarded? Adjusted? Maintained? Right one for the job?
- Tools: Portable equipment? Proper materials? Proper handling of equipment? Proper tool for job? Condition and correct use of the equipment?
- Environment; Lighting? Floor surface? Vapors, smoke, fumes? Layout – crowded or congested? Noise? Hot or cold?

Basic questions to ask:

- Has a Job Hazard Analysis (JHA) or Health and Safety Plan (HASP) been developed for the job?
- Was the JHA/HASP followed?
- Should changes have been made to procedures?
- Who was involved?
  - Who is the principal lead and/or PM?
  - Who was the incident victim any?
  - What subcontractor(s) were involved?
- What was the incident?
  - Any severe injuries?
  - Name of the project it happened on?
  - Who witnessed the injury?
  - What hospital was the injured person taken to?
  - Any equipment involved?
- When did the incident occur?
  - During work hours or off time?
  - Start of project, middle, or end?
  - Any new employees on site?
- Where did the incident occur?
  - What state?
  - In city or rural? Along road?
    - Traffic Safety Control Plan?
  - What work site?
- Why did the incident happen? (speculate)
  - Where conditions unusual?

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- What was the weather like?
- Has the subcontractor been used before?
- What is the safety record on site?
- Did employees receive all safety training for site?

Resources: (Found on Health and Safety Department page)

- Incident Report Form;
- Root Cause Analysis Form;
- Job Hazard Analysis (JHA);
- Safety regulations – OSHA regulations, GeoEngineers Health and Safety Program, Client policies;
- Health and safety training records (Ask Health and Safety Administrator or Office Manager).

When conducting RCA:

- Let people talk, don't ask leading questions;
- Allow for personality traits and don't assign blame;
- Be specific when questioning;
- Get all sides of the story;
- Establish specific corrective actions and dates to prevent a reoccurrence.
- Remember – a copy of the incident investigation report may be requested by external parties (e.g., regulatory agencies, clients, insurance companies, judges, lawyers, etc.). The report must be prepared professionally and must only contain incident facts, not supposition.

GeoEngineers Return to Work program will be referred to, as necessary. Attachment C, Return to Work Arrangements worksheet, is provided for use when an incident requires a doctor's visit or when other than first aid is provided.

Investigation recommendations will be given to the PM of the site of the injury and if beneficial further distributed to relevant employees for educational purposes. Corrective actions will be documented in the investigation report and implemented by the PM and site supervisors.

Training and Record Keeping

Awareness training regarding this program shall be provided during new employee orientation, a manager webinar or brown bag meeting, and periodically through other forms of electronic communication (such as feature safety articles). Additionally, employees working at client sites may need to complete client specific training pertaining to accident/injury prevention and investigation. Training will be documented in Ascent.

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Attachments

The following forms shall be used for documenting activities associated with this procedure:

- Attachment A. Health and Safety Injury Management Procedures Flowchart
- Attachment B. Incident Report Form
  - Insurance Report Enclosure 1 — Vehicle Accident
  - Insurance Report Enclosure 2 — Property Damage
  - Insurance Report Enclosure 3 – Stolen Equipment
- Attachment C. Return to Work Arrangements Form

Issued March 1, 2014
Revised August, 2018
Revised September 7, 2022

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Attachment A

Health and Safety Injury Management Procedures Flowchart

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Key Contacts

HEALTH & SAFETY TEAM

Lucas Miller, H&S Manager.....509.209.2830 (desk)
208.451.5307 (cell)

Connor Jordan, H&S Specialist 253.722.2426

OFFICE CONTACTS

OFFICE CONTACTS

Baton Rouge/Houston, Nikki Landry 225.293.2460

Bellingham, Susan Arrigoni 360.647.1510

Boise, Michelle Skow.....208.433.8098

Boston/Southborough, Dawn Tosca/Natalia Lebedeva 617.749.9220/508.283.6354

Portland/Lake Oswego, Colleen Baker.....503.624.9274

Redmond, Jackie Weber.....425.861.6000

Seattle/Tacoma, Lisa Huston 253.383.4940

Springfield, Karla Burgbacher 417.831.9700

Spokane/Kennewick, Laura McCulluch 509.363.3125

INSURANCE QUESTIONS

Emily Dahl.....206.239.3229

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Quick Guide to Incident Response & Reporting

1 Assess

– Call 911 if there is an injury that requires emergency medical treatment.
– Use a first aid kit for injuries that do not require professional medical treatment.

IN A VEHICLE ACCIDENT

Call the police if the roadway is blocked or causing a backup, there are uncooperative parties or significant property damage.

Turn your ignition off, use flashers/ leave lights on and remain in the vehicle (if it's dark).

Don't argue, accuse anyone or admit fault. Keep calm!

*Collect information about the other driver, witness(es) and responding officer (if applicable) for insurance purposes (**see Incident Report—Enclosure 1**) for what to collect.*

If the accident occurs in your personal vehicle, provide your personal contact information to the other driver

Take photos of the vehicle(s), damaged area(s) and license plate(s).

2 Notify

Call Lucas Miller, H&S Manager
509.209.2830 (desk) or 208.451.5307 (cell)
If you cannot reach Lucas, contact Connor Jordan: 253.722.2426

– Call your Group Leader and/or Supervisor if an injury requires professional medical treatment
– Call your Administrative Services Manager if you need assistance with a vehicle after an incident.

3 Document

– Fill out the Incident Report Form via Safety Hub.
– If the Incident Report was successfully submitted via Safety Hub, you should receive a confirmation email. Follow up as needed with the Health and Safety Team, Project Manager and other relevant parties.

GeoEngineers

Health and Safety Injury Management Procedures Flowchart

Assess **Notify** **Document**

Incident Report Documentation

- Incident Report Form
- Vehicle Accident Insurance Enclosure 1
- Property Damage Insurance Enclosure 2
- Stolen Equipment Insurance Enclosure 3
- Root Cause Analysis
- Return to Work Arrangements
- Incident Reporting and Investigation Program

1. Vehicle Accidents

All vehicle incidents/accidents (meaning any damage to a vehicle resulting in marking, scraping, or denting) involving GeoEngineers employees or vehicles, regardless of seriousness, vehicle weight, vehicle ownership, or fault shall be reported as soon as practical, but always within 24 hours.

Serious accidents and accidents involving commercial motor vehicles (those greater than 10,000 lbs) must be reported at the time of the accident. A "serious accident" is one that involves minor or major injuries to a GeoEngineers employee, the general public and/or causes any resultant property damage greater than $1,000.

If the employee is a technical person, report the incident to the Project Manager. The Project Manager will tell the employee's supervisor. If the employee is a non-technical person, report it to their Supervisor.

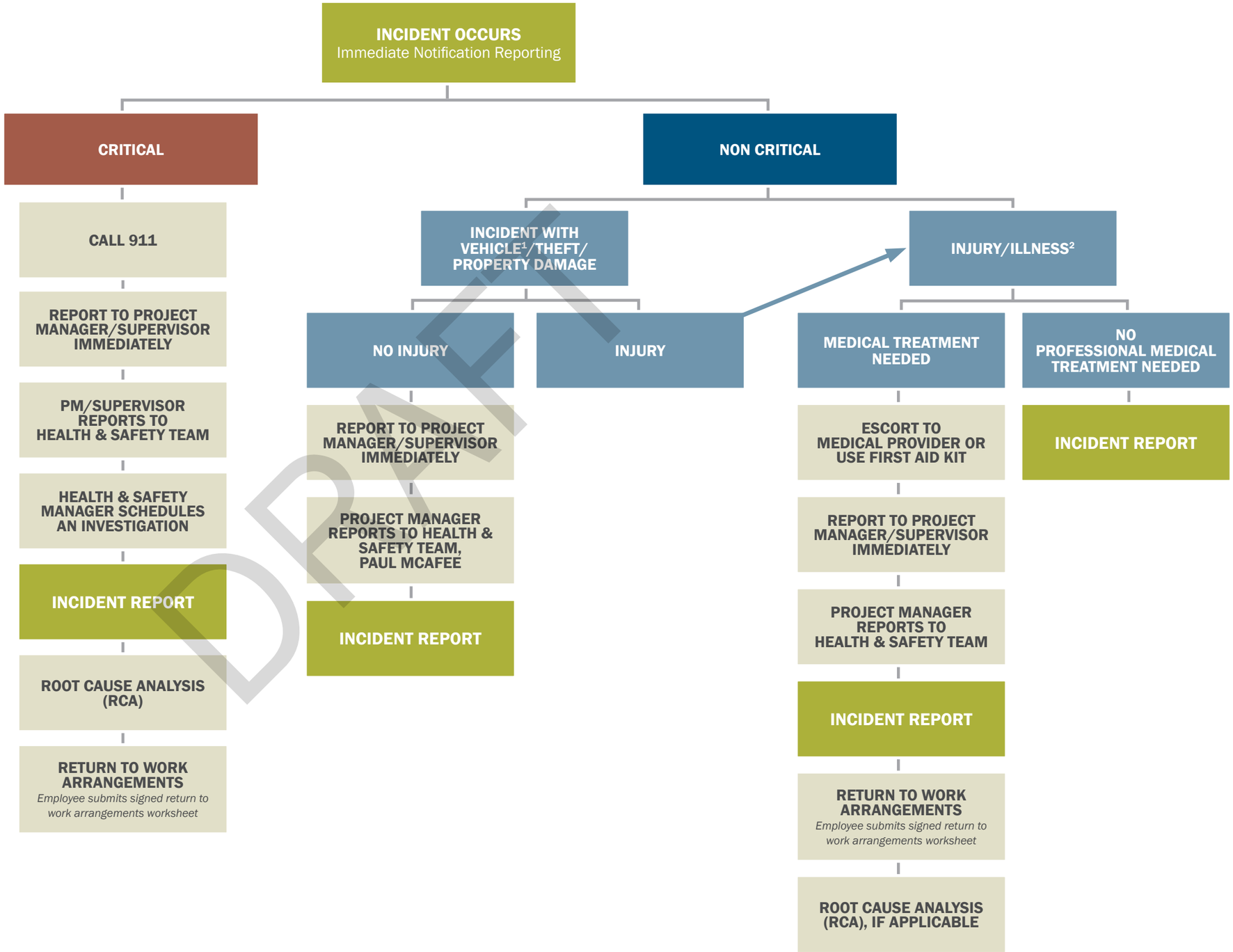
2. Incidents

If Emergency Medical Services (EMS) are required, dial 911 from a cell phone. (Do not use Skype)

If an ambulance is not required, the employee should drive or be driven to the medical facility as follows:

- An employee with a non-emergency illness, such as poison ivy or a skin rash, can transport him/herself for medical attention.
- Injuries/illnesses of a more serious nature require the employee be driven for medical treatment by another GeoEngineers employee, preferably the employee's supervisor.
- Injuries/illnesses that require modified work duties need Return to Work paperwork filled out by physician.

If the employee is a technical person, report the incident to the Project Manager. The Project Manager will tell the employee's supervisor. If the employee is a non-technical person, report it to their Supervisor.



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Attachment B
Incident Report Form

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Incident Report

INCIDENT INFORMATION

Business Unit:	☐ South ☐ West ☐ Puget Sound ☐ Pipeline ☐ Performance Based Design ☐ Corporate		
Injured/Ill Person's Name:		☐ Employee ☐ Other	
Employee Submitting Report: (if not same)			
Incident Location:		Job Number:	☐ N/A
Incident Date and Time:	☐ AM ☐ PM	Supervisor Name:	
Time Employee Started Work:	☐ AM ☐ PM	Date & Time Supervisor Notified:	☐ AM ☐ PM
Notified Project Manager/PA?	☐ YES ☐ NO ☐ N/A	PM/PA Notified:	
Client Notification Required?	☐ YES ☐ NO ☐ N/A	Person Notified:	

INCIDENT DETAILS

What happened? Describe how the incident occurred. Where the employee was located at the time of incident?			
Describe the activity as well as the tools, equipment, or material being used.			
Describe the part of the body that was affected and how. ☐ N/A			
What level of medical treatment was received?	☐ First Aid ☐ Clinic/Physician ☐ Emergency Room ☐ Refused/None		
State the primary cause and contributing factors.			
Was a JHA/HASP prepared?	☐ YES ☐ NO	Did you perform a TSA before starting work?	☐ YES ☐ NO
How do you think this type of incident could be prevented or avoided in the future?			

INSURANCE DETAILS (CHECK ALL APPLICABLE ITEMS)

Vehicular Accident ☐ (**Complete Insurance Enclosure 1**)	Property (Non-Vehicle) Damage ☐ (**Complete Insurance Enclosure 2**)	
☐ Company Owned	☐ Company (owned, leased rented)	☐ Fire
☐ Rental	☐ Client/Subcontractor	☐ Explosion
☐ Personal	☐ Other	☐ Flash
Stolen Equipment ☐ (**Complete Insurance Enclosure 3**)		

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SUPERVISOR COMMENTS

Supervisor Name:		Date:	

PROJECT MANAGER COMMENTS

Project Manager Name:		Date:	

HEALTH & SAFETY REPRESENTATIVE COMMENTS

H&S Representative Name:		Date:	

CORRECTIVE ACTION

H&S Representative Name:		Date:	

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Insurance Report Enclosure 1 — Vehicle Accident

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Insurance Report—Enclosure 1

VEHICLE ACCIDENT

Accident Information

Employee Name:			
Date of Accident:		Time:	☐ AM ☐ PM
Accident Location (City, State):			

Driver and Vehicle

Name (if not same):			
Office:		Phone Number:	
VIN:			
Vehicle Year/Make/ Model:			☐ Company Owned ☐ Rental ☐ Personal
Driver's License No.:		License Plate No.:	
Vehicle Damage:			
Estimated Level of Damage	☐ Light	☐ Moderate	☐ Severe

Witness(es) *N/A* ☐

Witness 1 Name:			
Phone (Home):		Phone (Work):	
Address:			
Where located at time of accident:			

Witness 2 Name:			
Phone (Home):		Phone (Work):	
Address:			
Where located at time of accident:			

Police *N/A* ☐

Notified or investigated?	☐ Yes ☐ No	When?	
Name of Officer:			
Station:			
Jurisdiction:			☐ Police ☐ State Patrol ☐ Sheriff
Badge #:		Case or Report #:	
Was anyone cited?	☐ Yes ☐ No	For what reason?	

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Other Vehicle and Driver N/A ☐

Name:		Age:	
Phone (Home):		Phone (Work):	
Address:			
Driver's License No.:		License Plate No.:	
Owner's Name *(if different than operator):*			
Phone (Home):		Phone (Work):	
Address:			
Vehicle insured?	☐ Yes ☐ No	By what company?	
Insurance Agent Name:		Agent Phone Number:	
Vehicle Make/Model/ Year			
Damage to other vehicle or property:			
Where can insured vehicle be seen by adjuster?			

Injured Person(s) N/A ☐

Injured Name 1:		Age:	
Phone (Home):		Phone (Work):	
Address:			
Nature of Injury:			
Which vehicle were they in?:			
Pedestrian?	☐ Yes ☐ No	Were they treated at the scene or removed by medical aid?	☐ At Scene ☐ Removed

Injured Name 2:		Age:	
Phone (Home):		Phone (Work):	
Address:			
Nature of Injury:			
Which vehicle were they in?:			
Pedestrian?	☐ Yes ☐ No	Were they treated at the scene or removed by medical aid?	☐ At Scene ☐ Removed

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Accident Description

What happened just before and at the time of the accident?	
In what direction were you proceeding?	
At what speed?	
Weather?	
Any unsafe conditions contributing to the accident (such as faulty brakes, inclement weather, road obstructions, etc.)?	
Any unsafe acts contributing to the accident (such as turning from wrong lane, speeding, failing to signal, etc.)?	
Who do you believe is at fault for this accident?	

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Witness Statement (if applicable)

Witness Name:		Employee Involved Name:	
Accident Date:		Approximate Time of Accident:	☐ AM ☐ PM
Describe the incident in as much detail as possible (attach additional pages if needed).			
Signature of Individual Providing Statement:			
Phone:		Date:	

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Insurance Report Enclosure 2— Property Damage

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Insurance Report—Enclosure 2

PROPERTY DAMAGE

Incident Information

Employee Name:			
Incident Date:		Time of Incident:	☐ AM ☐ PM
Incident Description:			
Incident Location			
Client Name *(if different than owner)*		Client Phone Number:	
Client Address:			
Contractor that repaired the property and charged for repairs:			
Name and contact information for witnesses:			
Check and attach the following documents, if available:	☐ Copy of contractor's invoice ☐ Pictures taken prior to and after the incident ☐ Copy of police report		

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Insurance Report Enclosure 3— Stolen Equipment

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Insurance Report—Enclosure 3

STOLEN EQUIPMENT

Incident Information

Employee Name:			
Incident Date:		Approximate Time of Incident:	☐ AM ☐ PM
Incident Location:			
Events leading up to the theft:			
Describe equipment or property, including model and serial number (where applicable):			
Check and attach the following documents, if available:	☐ Invoice for purchase of equipment stolen ☐ Invoice for purchase of replacement equipment ☐ Copy of police report		

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Attachment C

Return to Work Arrangements Form

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Return to Work Arrangements for GeoEngineers, Inc.

INJURED EMPLOYEE DETAILS

Employee Name:		Work Location:	
Pre-Injury Job Title:			
Pre-Injury Days/Work Hours:			

Describe the specific duties and tasks required. Include any physical and other requirements, e.g. lifting, sitting, rotation of tasks, etc. Employee check the duties that apply to your daily activities. Job Description Attached? □ YES □ NO

☐ Laboratory

- The ability to perform a wide range of physical activities and do heavy work including exerting up to 50 pounds of force occasionally.
- Ability to perform consistent work on PC.

☐ Field Duties

- The ability to perform a wide range of physical activities and do heavy work including exerting up to 50 pounds of force occasionally.
- Limited work-related driving duties.

☐ Roughneck

- Ability to perform a wide range of physical activities and perform heavy manual labor tasks,
- Ability to stand for long periods of time and exert up to 50 pounds of force repeatedly throughout the day as well as 100 pounds of force occasionally.
- Limited work-related driving duties.

☐ Office Duties

- Limited walking, bending, twisting, standing and reaching.
- Normal office environment with moderate noise levels, occasional lifting of up to 25 lbs., regular walking, sitting, bending, twisting, standing and reaching.
- Ability to perform consistent work on PC.

RETURN TO WORK ARRANGEMENTS

Are workplace supports, aids or modifications to be provided: ☐ YES ☐ NO ☐ N/A

Describe workplace supports, aids or modifications, e.g. rest breaks, buddy system, special tools, equipment, training, etc.

Are specific duties or tasks to be avoided: ☐ YES ☐ NO ☐ N/A

Describe the specific duties and tasks that are to be avoided or restricted, e.g. no loading pallets, tasks that are only to be undertaken with the assistance of another worker.

Are there medical restrictions: ☐ YES ☐ NO ☐ N/A

Describe the restrictions below. From what date or period(s) do these restrictions apply?

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List hours of work and gradual increases in hours, if restrictions are recommended.								
Week	**Mon**	**Tues**	**Wed**	**Thurs**	**Fri**	**Sat**	**Sun**	**Total Hours**
1								
2								
3								
4								

KEY PEOPLE INVOLVED

Employee

I will participate in these return to work arrangements.

Name:		Signed:	
Phone:		Date:	

Physician

These return to work arrangements are consistent with the worker's capacity.

Name:		Signed:	
Phone:		Date:	

Health & Safety Manager

I will monitor and review these return to work arrangements.

Name:		Signed:	
Phone:		Date:	

Supervisor

I will implement these return to work arrangements in the work area.

Name:		Signed:	
Phone:		Date:	

ADDITIONAL INFORMATION

Please attach any supporting documentation e.g. medical reports, position description, photos etc. that support this form.

Please return completed form to:

Lucas Miller, GeoEngineers, Inc. Health and Safety Manager

Telephone: (509) 209-2830 | Email: lmiller@geoengineers.com

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Appendix D

Cold Stress Prevention Program

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GeoEngineers

Cold Stress Prevention Program

Revised August 2020

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Cold Stress Prevention Program

Purpose

This program establishes GeoEngineers' requirements for the prevention of work-related injuries and illnesses resulting from participating in outdoor field work during cold weather conditions.

Scope

This program applies in its entirety to GeoEngineers employees and locations unless the Health and Safety Program Manager grants a variance from the requirements.

Responsibilities

Principals/Associates/Project Managers—Responsible and accountable for ensuring that the provisions of this program are implemented and followed at all projects for which the Principal/Associate or Project Manager has oversight and responsibility.

Group Leaders/Field Supervisors—Responsible and accountable for ensuring compliance with this program within their areas of responsibility and at their work sites on a daily basis. All supervisors must lead by example to promote cold stress awareness and enact practices to protect their staff in high temperature conditions. Supervisors will be trained capable of identifying cold injury symptoms.

Health and Safety Coordinators—Responsible for assisting in the implementation of activities associated with this program.

Health and Safety Program Manager—GeoEngineers' HSM shall monitor and evaluate the Cold Stress Prevention Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements will be promptly incorporated under their direction.

Employees—GeoEngineers' employees are responsible and accountable for complying with this program. Employees who will be working in high cold and high risk conditions will be trained to detect cold injury symptoms and avoidance work procedures.

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Definitions

Acclimatization—the physiological changes that take place after prolonged exposure to cold which help the body maintain a warm core temperature. Acclimatization takes place over several days, with the greatest benefit occurring during the first four to five days. However, acclimatization is reversible after cessation of exposure.

Abnormal Temperature—abnormal or extreme cold weather conditions that can expose workers to cold stress. In this condition, work performance is likely to become impaired before any clinical/observable effects are produced. Illnesses caused by exposure to temperature extremes are progressive and can be life-threatening.

Cold Stress—the condition that occurs when the rate of the body heat loss exceeds the rate of heat production. Meaning the body cannot adequately warm itself. Injuries related to cold stress include frostbite, chilblains and, when severe, hypothermia, which can result in death if not addressed.

Frostbite—the destruction of body tissues by freezing (usually exposed skin on the face, and extremities such as ears, fingers, and toes). Circulation of blood in these tissues is slowed and eventually stopped; the skin appears waxy white and becomes numb.

Hypothermia—a life-threatening condition in which the body's core temperature falls below the normal temperature of 98.6°F because of the sudden and radical lowering of body temperature or because of prolonged exposure to cold.

Chilblains—often mistaken for frostbite, chilblains is a medical condition which occurs in cold and humid conditions. The primary effects are tissue damage to the blood vessels, most often in extremities such as the fingers, nose, ears, and toes. Affected regions often appear swollen, inflamed, and red or dark blue with accompanying pain or itchy sensations.

Wind Chill— the result of the wind on still-air temperature that increases its cooling effect on exposed skin. Table 2 shows the wind chill for various still-air temperatures and wind speeds.

General Information

Staff become hypothermic from two primary sources: (1) the environmental conditions in which they work in and (2) from personal conditions including health and clothing worn.

Cold stress can occur even in temperatures one may not consider "cold". An individual's level of acclimatization affects their body's ability to handle cold conditions and how susceptible it is to cold stress injury. Employees who are acclimated to warm conditions must be given time to acclimate to cold conditions before serious exposure is risked. Acclimation can take up to two weeks for most individuals.

Signs and Symptoms of Cold-related illness

Table 1 below provides examples of cold-related illness, symptoms, and first aid measure to take to treat the illness. Project Managers and Supervisors should be familiar with these types of cold-related illnesses and the response measures to take to ensure staff safety.

Field Staff shall use the following as a guide for recognizing the signs and symptoms of cold-related illnesses to prevent the onset of cold-related injuries.

TABLE 1. COLD-RELATED DISORDERS INCLUDING SYMPTOMS, SIGNS, CAUSES AND STEPS FOR FIRST AID

Disorder	Symptoms	Signs	Causes	First Aid
Hypothermia	Chills; Pain in extremities; Fatigue or drowsiness.	Euphoria in late stages; Slow, weak pulse; Slurred speech: Collapse; Shivering; Unconsciousness; Body temperature < 95F (35C).	Excessive exposure, exhaustion or dehydration, subnormal tolerance, drug/alcohol abuse.	Move to warm area and remove wet clothing. Modest external warming (external hear packs, etc.). Drink warm, sweet fluids if conscious. Transport to hospital.

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Disorder	Symptoms	Signs	Causes	First Aid
Frostbite	Burning sensation at first. Coldness, numbness, tingling.	Skin color white or grayish yellow to reddish violet to black. Blisters. Response to touch depends on depth of freezing.	Exposure to cold, vascular disease.	Move to warm area and remove wet clothing. Give external warming (put close to heat source, use body heat etc.). Drink warm, sweet fluids if conscious. Transport to hospital.
Frostnip	Possible itching or pain.	Skin color white	Exposure to cold (above freezing) and dampness.	Similar to frostbite.
Trench Foot	Severe pain; Tingling, itching.	Edema; Blisters; Response to touch depends on depth of freezing.	Exposure to cold (above freezing) and dampness. Can occur in conditions as warm as 60°F if the affected area is constantly wet.	Similar to frostbite.
Chilblains	Burning or itching sensation; Inflammation of affected areas (usually extremities);	Skin discoloration (red or dark blue); Blisters in affected area	Exposure to cold, poor blood circulation. Can occur in conditions as warm as 60°F if the affected areas are repeatedly exposed to cold.	Similar to frostbite. Can also warm affected area in warm water. Vitamin B improves circulation and may also be effective.

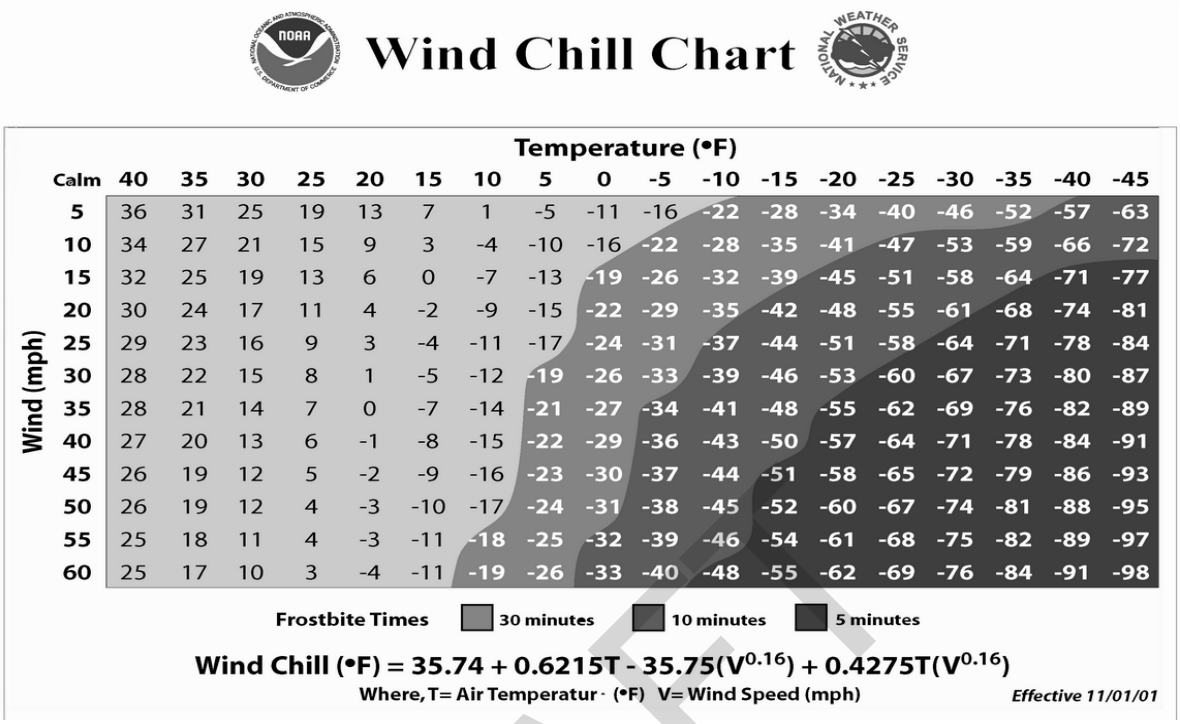
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Determining Risk: Wind Chill

The actual temperature felt by employees working in the field will vary based on environmental conditions. Primarily the weather in the operational area. Windy and wet weather can increase the stress put on the body and further decrease the temperature an exposed field worker experiences.

Table 2 below shows how wind chill affects the actual temperature felt by an average, healthy individual without protective gear on. It also shows how long on average such a person can be exposed to that temperature before they start to suffer from frostbite. Project Managers and Supervisors should be familiar with the types of cold-related illnesses and symptoms and take appropriate measures to ensure employee safety.

TABLE 2. WIND-CHILL EQUIVALENT TEMPERATURES (ºF)



Wind Chill Chart

Wind (mph) \ Temperature (°F)	Calm	40	35	30	25	20	15	10	5	0	-5	-10	-15	-20	-25	-30	-35	-40	-45
5		36	31	25	19	13	7	1	-5	-11	-16	-22	-28	-34	-40	-46	-52	-57	-63
10		34	27	21	15	9	3	-4	-10	-16	-22	-28	-35	-41	-47	-53	-59	-66	-72
15		32	25	19	13	6	0	-7	-13	-19	-26	-32	-39	-45	-51	-58	-64	-71	-77
20		30	24	17	11	4	-2	-9	-15	-22	-29	-35	-42	-48	-55	-61	-68	-74	-81
25		29	23	16	9	3	-4	-11	-17	-24	-31	-37	-44	-51	-58	-64	-71	-78	-84
30		28	22	15	8	1	-5	-12	-19	-26	-33	-39	-46	-53	-60	-67	-73	-80	-87
35		28	21	14	7	0	-7	-14	-21	-27	-34	-41	-48	-55	-62	-69	-76	-82	-89
40		27	20	13	6	-1	-8	-15	-22	-29	-36	-43	-50	-57	-64	-71	-78	-84	-91
45		26	19	12	5	-2	-9	-16	-23	-30	-37	-44	-51	-58	-65	-72	-79	-86	-93
50		26	19	12	4	-3	-10	-17	-24	-31	-38	-45	-52	-60	-67	-74	-81	-88	-95
55		25	18	11	4	-3	-11	-18	-25	-32	-39	-46	-54	-61	-68	-75	-82	-89	-97
60		25	17	10	3	-4	-11	-19	-26	-33	-40	-48	-55	-62	-69	-76	-84	-91	-98

Frostbite Times: 30 minutes | 10 minutes | 5 minutes

$$\text{Wind Chill (°F)} = 35.74 + 0.6215T - 35.75(V^{0.16}) + 0.4275T(V^{0.16})$$

Where, T= Air Temperatur · (°F) V= Wind Speed (mph)

Effective 11/01/01

National Oceanic and Atmospheric Administration and National Weather Service Wind Chill Chart.

Where acceptable temperature cannot be maintained, all outdoor work should be scheduled so as to minimize exposure to extreme temperatures. Consideration should be given to thermal conditions when new equipment or work processes are to be introduced into the workplace.

Temperature and conditions in the work area should be monitored. Job Hazard Analysis and Site Safety Plans include the following and will be discussed in the Field Briefing before the project starts and ensured in Task Safety Assessment that are a part of every jobs Job Hazard Analysis/Site Safety Plan:

- Walkways and travel ways shall be sanded, salted, or cleared of snow and ice as soon as possible.
- Cold weather supplies should be regularly inspected and restocked.
- Consider other factors that would exacerbate the situation (for example: wet clothing, wind chill).
- Employees working in cold weather conditions are under constant protective observation by a co-worker or supervisors. We work in teams of two to ensure safety.
- Warm beverages should be made available.

Employees are required to dress appropriately for the relevant working conditions, including normal weather extremes. Limiting the time of exposure and wearing protective clothing will reduce the dangers of exposure to cold. Clothing should:

- Be loose-fitting and multi-layered to trap warm air in layers;

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- Allow perspiration to escape before condensation occurs; and
- Be weatherproof/rainproof.

Monitoring

Temperature and conditions in the work area that pose a risk should be monitored by the Project Manager or Supervisory personnel to prevent employees from being overexposed (See table 2).

Personal Protective Equipment (PPE)

Personal Protective Equipment (PPE) shall be used as appropriate.

- Gloves shall be made available when air temperatures fall below 60°F for sedentary work, 40°F for light work and 20°F for moderate work. When selecting gloves, be sure to purchase cold-condition gloves which are rated for the temperatures you will be facing. A good source for cold-condition gloves is found here.
- If work is to be performed with bare hands for more than 20 minutes in an environment <40°F, then the use of warm air jets, radiant heaters or contact warm plates should be evaluated and implemented to keep workers' hands warm.
- Total body protection is required when work is to be performed in environments with temperatures <20°F. This shall consist of clothing for the trunk and extremities and shall include an insulated head liner (providing head, ear and full face coverage), heavy socks, insulated steel-toed/steel-shank boots, insulated long underwear and insulated body coverall.
- If there is potential for clothing to become wet, then the outer layer of clothing shall be water repellent/proof.
- If body clothing is insufficient in preventing the sensation of cold or frostbite, then work activities shall be terminated until more appropriate clothing is obtained or weather conditions improve.
- Cold-weather footwear should be waterproof and insulated, with deep treads to enable grip on icy or snowy surfaces. Insulated and/or wool socks are also recommended.

Other Considerations

Depending on the situation, other considerations include:

- Shield the immediate work area with vehicles or tarps to reduce the cooling effects of the wind.
- Individuals suffering from diseases or who are taking medication which interferes with normal body temperature regulation shall not be allowed to work in temperatures <30°F. Employees shall notify supervisor when these conditions exist.
- Avoid overexertion. Cold weather itself, without any physical exertion, puts an extra strain on the heart. Take caution when shoveling snow, walking fast, cleaning tanks, etc.
- The insulating properties of protective clothing are greatly reduced when that clothing becomes wet, either from contact with water or from sweating. Therefore, wet clothing shall be immediately replaced.

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- Remember to drink often to stay hydrated. The body expends extra energy to keep itself warm in cold environments, and all energy expenditures require water. An individual may not feel the need to drink in cold weather due to ambient conditions but should drink water regularly regardless. Warm water-based beverages are also acceptable.
- Icy or snowy conditions can create slip hazards for both pedestrian traffic and vehicular traffic. Even small amounts of ice or snow can cause an employee to lose footing or a vehicle to momentarily lose traction. To prevent this, employees should wear appropriate cold-weather boots with deep lug-soles which can provide better grip on icy or snowy surfaces. For vehicles, employees should keep on hand a vehicle-compatible set of chains or wires to install on their vehicles. It is recommended that employees practice putting on their chains/wires in non-emergency conditions prior to having to use them in an emergency. If hazardous slip conditions exist which might require crampons or heavy chains on vehicles, they should be avoided if possible.

Work Stoppage Requirements

In extreme conditions, cessation of work or early release from work may become necessary to ensure worker safety. Table 3, shown below, of this program provides an example for when cessation of work may be necessary based strictly on ambient temperature and wind conditions alone. Multiple other factors play a part in the decision to cease work due to extreme cold weather, including:

- Clothing worn or immediately available to employees in the event of an unforeseen weather shift.
- Road conditions and the distance employees must travel to return home.
- Levels of fatigue that employees on site are experiencing which may impede their driving abilities on the drive home.
- Weather reports for future which indicate un-mitigatable cold weather conditions are incoming.

Due to the varied conditions of GeoEngineers work sites, employee readiness, and the shifting nature of weather, set “limits” which when surpassed mean work on-site must cease must largely be calculated and implemented by the Health and Safety Coordinators or other supervisors on site with employee input.

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TABLE 3. GENERIC WORK/WARM-UP SCHEDULE FOR 4 HOUR SHIFTS

Air Temperature -- Sunny Sky		No Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
°C	°F	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks	Max Work Period	# of Breaks
-26 to -28	-15 to -19	Normal Breaks		Normal Breaks		75 min	2	55 min	3	40 min	4
-29 to -31	-20 to -24	Normal Breaks		75 min	2	55 min	3	40 min	4	30 min	5
-32 to -34	-25 to -29	75 min	2	55 min	3	40 min	4	30 min	5	Non-emergency work should cease	
-35 to -37	-30 to -34	55 min	3	40 min	4	30 min	5	Non-emergency work should cease			
-38 to -39	-35 to -39	40 min	4	30 min	5	Non-emergency work should cease					
-40 to -42	-40 to -44	30 min	5	Non-emergency work should cease							
-43 & below	-45 & below	Non-emergency work should cease									

(Schedule applies to any 4-hour work period with moderate to heavy work activity; with warm-up periods of ten (10) minutes in a warm location and with an extended break (e.g. lunch) at the end of the 4-hour work period in a warm location.

Training

Awareness training may be provided to effected staff and managers through in-person training, Ascent, at staff meetings or field briefings. Select field personnel may receive annual training through HAZWOPER refresher or other expanded training

The training should cover the following issues:

- Identification of the causes, signs and prevention of cold stress.
- General awareness of personal factors that may increase susceptibility to cold-related illness including, but not limited to, an individual's age, degree of acclimatization, medical conditions, drinking water consumption, alcohol use, caffeine use, nicotine use and use of medications that affect the body's responses to cold. This information is for the employee's personal use.
- The importance of acclimatization.
- The importance of wearing proper cold-weather PPE.
- The importance of immediately reporting signs or symptoms of cold-related illness in either themselves or in co-workers to the person in charge and the procedures the employee must follow including appropriate emergency response procedures.

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Recordkeeping

Training will be documented by a sign-in sheet, quiz, or other field-based form (to include a brief description of the training and trainer's name) and the date will be documented in site files and/or GeoEngineers' Ascent.

Revised December 2019
Revised April 2020
Revised August 2020

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Appendix E
Heat Stress Prevention Program

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GeoEngineers

Heat Stress Prevention Program

Revised April 2020

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Heat Stress Prevention Program

Purpose

This program establishes GeoEngineers guidelines for the prevention of work-related injuries and illnesses resulting from participating in outdoor field work during hot weather conditions.

Scope

This program applies in its entirety to all GeoEngineers employees and locations unless the Health and Safety Manager grants a variance from the requirements.

Responsibilities

Principals/Associates/Project Managers—Responsible and accountable for ensuring that the provisions of this program are implemented and followed at all projects for which the Principal/Associate or Project Manager has oversight and responsibility.

Group Managers/Field Supervisors—Responsible and accountable for ensuring compliance with this program within their areas of responsibility and at their work sites on a daily basis. All supervisors must lead by example to promote heat stress awareness and enact practices to protect their staff in high temperature conditions. Supervisors will be trained capable of identifying heat injury symptoms.

Health and Safety Coordinators—Responsible for assisting in the implementation of activities associated with this program.

Health and Safety Program Manager—GeoEngineers' HSM shall monitor and evaluate the Heat Stress Prevention Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements will be promptly incorporated under their direction.

Employees—GeoEngineers' employees are responsible and accountable for complying with this this program. Employees who will be working in high heat high risk conditions will be trained to detect heat injury symptoms and avoidance work procedures.

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Definitions

Acclimatization—the positive physiological changes that take place after prolonged exposure to heat, which partly involve increased sweat production. Core body temperature can be controlled within acceptable limits, and the body then becomes accustomed to a hot environment. Acclimatization takes place over several days, with the greatest benefit occurring during the first four to five days.

Dehydration—the loss or deficiency of water in body tissues, which may be caused by perspiration, vomiting or diarrhea. Symptoms include excessive thirst, nausea and exhaustion.

Heat Cramps—often the first sign of heat stress or heat exhaustion. Symptoms include painful muscle spasms, sweaty skin and normal body temperature.

Heat Exhaustion—caused by stress on body organs and includes poor blood circulation from insufficient cardiovascular function or dehydration. Symptoms include moist, clammy skin, weakness and fatigue, nausea and vomiting, slightly elevated temperature, headache and disorientation.

Heat Index— also occasionally known as apparent temperature, is what the temperature feels like to the average human body in direct sunlight when relative humidity is combined with ambient temperature.

Heat Stress—there are three forms of heat stress: Heat Cramps, Heat Exhaustion and Heat Stroke. The risk of heat-related disorders and accidents increases substantially with increasing heat stress.

Heat Strain—the series of physiological responses to heat stress. These responses reflect the degree of heat stress. When the strain is excessive for the exposed individual, a feeling of discomfort or distress may result, and, finally, a heat disorder may ensue. The severity of strain will depend not only on the magnitude of the prevailing stress, but also on the age, physical fitness, degree of acclimatization and dehydration of the worker.

Heat Stroke—the most extreme and serious form of Heat Stress. In this life-threatening condition, the body's temperature regulation mechanism has failed, and the victim's temperature is rising to critically high levels. Symptoms include hot, dry, red skin, mental confusion, convulsions and possible loss of consciousness.

Humidity (Relative)—the ratio of the water vapor content of air to the maximum possible water vapor content of air at the same temperature and air pressure.

Wet Bulb Globe Temperature (WBGT)—a measure of relative heat stress in direct sunlight taking into account multiple factors including: temperature, humidity, wind speed, sun angle and cloud cover.

General Information

Staff become overheated from two primary sources: (1) the environmental conditions in which they work and (2) the internal heat generated by physical labor.

Heat-related illnesses occur when the body is not able to lose enough heat to balance the heat generated by external heat sources and/or physical work.

Signs and Symptoms of Heat-related Illness

Table 1. provides examples of heat-related Illness, symptoms and first aid measures to take in the event of heat overexposure. Project Managers and Supervisors should be familiar with these types of heat-related illnesses and the response measures to take to ensure staff safety.

Field Staff shall use the following as a guide for recognizing the signs and symptoms of heat-related illnesses to prevent the onset of heat-related injuries.

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TABLE 1. HEAT-RELATED ILLNESSES: SYMPTOMS AND FIRST AID

Heat-related Illness	Symptoms	First Aid
Heat Fatigue	Weakness; impaired motor skills; reduced ability to concentrate	Take a short break in a cooler area. Pushing yourself to work through the condition can lead to a more serious illness.
Heat Cramps	Painful muscle spasms caused by salt imbalances in the body because of sweating	Drinking sodium (electrolyte) replacement liquids may not eliminate the pain but helps during recovery. Prevent by drinking small amounts of water every 15 to 20 minutes – even if you aren't thirsty.
Heat Rash	Irritation, especially where skin is wet with sweat or clothing is tight.	Move to cooler area. Wash and change clothing.
Heat Collapse	A person suddenly faints. Happens when the brain doesn't get enough oxygen because the blood has pooled in the victim's arms or legs.	Remove the victim to a cooler area to lie down during recovery. Do not give liquids to an unconscious person.
Heat Exhaustion	Headache, nausea, dizziness, thirst and giddiness. Can lead to vomiting and/or fainting. Victim has pale, clammy (moist) skin.	Remove victim to a cool, shaded area. Give water if the victim is alert and not nauseated. Don't leave the person alone. Cool the victim with a spray mist or wet cloth. If the person does not feel better in a few minutes, call for emergency help.
Heat Stroke	Victim has dry, pale skin (no sweating) or hot, red skin (looks like a sunburn) and is confused. Victim may have seizures and pass out.	Call for emergency assistance immediately. Remove the victim to lie down in a cool, shaded area. Don't leave the person alone. If the victim is alert and not nauseated, give water. Cool the person. Place ice packs under the arm pits and in groin area.

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Determining Risk: The Heat Index Value

A Heat Index (HI) value is a measure of the synergistic effects of ambient temperature and humidity at a work area. This combined value better reflects the heat conditions as felt by field staff. Using a HI value is a superior metric to just using temperature alone when forecasting heat risk.

TABLE 2. HEAT INDEX VALUES

Temperature (°F)

Relative Humidity (%)	80	82	84	86	88	90	92	94	96	98	100	102	104	106	108	110
40	80	81	83	85	88	91	94	97	101	105	109	114	119	124	130	136
45	80	82	84	87	89	93	96	100	104	109	114	119	124	130	137	
50	81	83	85	88	91	95	99	103	108	113	118	124	131	137		
55	81	84	86	89	93	97	101	106	112	117	124	130	137			
60	82	84	88	91	95	100	105	110	116	123	129	137				
65	82	85	89	93	98	103	108	114	121	128	136					
70	83	86	90	95	100	105	112	119	126	134						
75	84	88	92	97	103	109	116	124	132							
80	84	89	94	100	106	113	121	129								
85	85	90	96	102	110	117	126	135								
90	86	91	98	105	113	122	131									
95	86	93	100	108	117	127										
100	87	95	103	112	121	132										

TABLE 3. HEAT INDEX VALUE RISK LEVEL DEFINITIONS

Heat Index	Risk Level	Protective Measures
Less than 91°F	Lower (Caution)	Basic heat safety and planning
91°F to 103°F	Moderate	Implement precautions and heighten awareness
103°F to 115°F	High	Additional precautions to protect workers
Greater than 115°F	Very High to Extreme	Triggers even more aggressive protective measures

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To determine daily HI, obtain the expected peak ambient temperature and humidity for that workday. On the table above, find the junction between the row containing the peak humidity and the column of the peak temperature.

A HI's color reflects its' risk (Table 3.). A HI falling in the deep red zone indicates a need to enact the highest level of heat precautions for field staff. That HI value is the starting point for mitigative planning.

Additional risk factors should include:

- Work in direct sunlight - adds up to 15 degrees to the heat index.
- Performance of prolonged or strenuous work.
- Use of heavy protective clothing or impermeable suits dramatically increases heat stress risk.
- This information is also available for reference by downloading the OSHA-NIOSH Heat Safety APP here

For work occurring in Washington State (WAC 296-307-09710) between May 1 through September 30, heat related protections become required when the following clothing-influenced Outdoor Temperature Action Levels (Table 4) are met. Protective measures are discussed in the next section.

TABLE 4. WASHINGTON STATE HEAT STRESS PREVENTION ACTION LEVELS

Outdoor Temperature Action Levels	
All other clothing work clothing	89°F
Double-layer woven clothes including coveralls, jackets and sweatshirts	77°F
Nonbreathing clothes (raincoats) including vapor barrier clothing or PPE such as chemical resistant coveralls	52°F

Protecting Field Staff from Heat-related Illness

Whether planning for heat exposures based on HI values (Tables 2 and 3), or under Washington State regulations (Table 4), the same precautions will be met. GeoEngineers field Supervisors/Project Managers will ensure the following are performed:

1. Field Supervisors must be properly trained to and actively observe staff for alertness and signs/symptoms of heat illness prior to supervising employees.
2. Field Supervisors must maintain effective communication at all times with heat exposed employees.
3. GeoEngineers will have ensure that all effected staff will have access to sufficient drinking water throughout the shift; and will communicate the benefit of maintaining hydration.
4. Field Supervisors will consider the recommended Work/Rest Cycle when staffing projects.
5. Field Supervisors will be aware and plan accordingly when using newly hired or transferred field staff allowing for a heat acclimatization period when determined appropriate.

Hydration Requirements and Replenishing Sodium

Water loss should be balanced with water intake. To stay hydrated, a minimum consumption rate of 1 gallon of water per day is recommended. This rate may be elevated as exertion levels or clothing requirements increase sweat and respiration water loss. During exertive work, staff should drink 5 to 7 ounces of fluids every 15 to 20 minutes to replenish the necessary fluids in the body. Additionally, some sodium must be replenished in the body daily to keep muscles and nerves working properly.

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Keep these hydrations tips in mind when planning for hot weather field work:

- Fluids should be replaced frequently in amounts of at least 1 gallon per day.
- Offered water shall be kept cool.
- Sodium (electrolyte) replacement can be in the form of a commercial non-caffeinated sports drink. Salted food items may also be used so long as it is balanced with water intake.
- Avoid excessive caffeine (including coffee and tea), which may lead to dehydration.

When working in Washington, GeoEngineers is required to make up to 1 quart of water per hour available for workers regardless of actual consumption. This volume can be resupplied throughout a workday as needed.

Appropriate Dress

Staff should dress appropriately for the heat expected. Keeping clothing protective and comfortable but not overly heat retaining is the goal for all field work. General recommendations for clothing follow.

High Heat Work Clothing should be:

- Light colored
- Lightweight – as light as the work performed allows (PPE matches task)
- Natural breathable fibers
- Brimmed hats (when appropriate)
- Cooling vest, neck "gaiters" or cooling bandanas may be helpful in some cases

Rest Breaks and Acclimatization

When HI values are high or work tasks require medium to heavy exertion, breaks should be taken periodically throughout the day to avoid over-heating.

Every person on the job site may have a different tolerance for heat and exertion. Staff should be encouraged to know their personal limits and to take breaks as necessary. Field Supervisors should be knowledgeable of those limits and plan accordingly.

Heat acclimatization is a physiological process that allows workers to gradually take on larger workloads in higher than normal heat environments. Full acclimatization can take up to 2 weeks. If a previously acclimated staff member is away from heat for more than 2 weeks, they may need to undergo another acclimatization process.

The National Institute for Occupational for Safety and Health (NIOSH) recommendations for high HI work/rest cycles are provided in Table 5, below. Dark red boxes indicate the highest risk conditions for heat injury. Note the assumptions used to developed Table 5 listed beneath the table. If these assumptions are exceeded, refer to Table 6 for corresponding additive temperature adjustments.

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TABLE 5. NIOSH WORK/REST CYCLE SCHEDULE RECOMMENDATIONS

Temperature (°F)	Light Work Minutes Work/Rest	Moderate Work Minutes Work/Rest	Heavy Work Minutes Work/Rest
90	Normal	Normal	Normal
91	Normal	Normal	Normal
92	Normal	Normal	Normal
93	Normal	Normal	Normal
94	Normal	Normal	Normal
95	Normal	Normal	45/15
96	Normal	Normal	45/15
97	Normal	Normal	40/20
98	Normal	Normal	35/25
99	Normal	Normal	35/25
100	Normal	45/15	30/30
101	Normal	40/20	30/30
102	Normal	35/25	25/35
103	Normal	30/30	20/40
104	**Normal**	**30/30**	**20/40**
105	Normal	25/35	15/45
106	45/15	20/40	**Caution**
107	40/20	15/45	**Caution**
108	**35/25**	**Caution**	**Caution**
109	30/30	**Caution**	**Caution**
110	15/45	**Caution**	**Caution**
111	**Caution**	**Caution**	**Caution**
112	**Caution**	**Caution**	**Caution**

Assumptions: workers are physically fit, well-rested, fully hydrated, under age 40, and environment has 30% humidity and perceptible air movement.

TABLE 6. TEMPERATURE ADJUSTMENTS FOR NIOSH WORK/REST CYCLE TABLE

Environmental Conditions	Humidity
Full sun (no clouds): Add 13 °F	40% Humidity: Add 3°F
Partly cloudy/overcast: Add 7 °F	50% Humidity: Add 6°F
In shade or at night: No adjustment	60% Humidity: Add 9°F

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Shelter (Shade) from the Sunlight

Periodic access to shade should be available to staff as respite from heat generated by direct sunlight. Field tarps or canopies are acceptable whenever air-conditioned spaces/work vehicles are not available. Workers should be encouraged to take off unnecessary PPE when at rest to permit rapid cooling. Fans are also useful cooling aides, when feasible.

Additional Factors in Heat Management Planning

Project Managers and Field Staff should the following additional guidelines when planning field events:

- Consider a worker's physical condition when determining fitness to work in hot environments. Obesity, lack of conditioning, pregnancy and inadequate rest can increase susceptibility to heat stress.
- Schedule strenuous physical activity at the beginning and end of the day, when external temperatures may be cooler.
- Consider the effects of medications being taken (such as for heart conditions) or treatments (such as low-sodium diets) that can increase the risk from heat exposure.
- Seek medical advice when symptoms of heat stress appear. Contact your Project Manager or Health and Safety Manager for assistance if needed.
- Your plan for heat risk reduction should be part of your site-specific health and safety plan or job hazard analysis.
- Wet Bulb Globe Temperature (WBGT) Meters can be obtained on a per project basis if required. Contact your Project Manager for additional information if this is a contractual need.

Training

Awareness training may be provided to effected staff and managers through in-person training, Ascent, at staff meetings or field briefings. Select field personnel may receive annual training through HAZWOPER refresher or other expanded training.

The training should cover the following issues:

- The environmental factors that contribute to the risk of heat-related illness.
- General awareness of personal factors that may increase susceptibility to heat-related illness including, but not limited to, an individual's age, degree of acclimatization, medical conditions, drinking water consumption, alcohol use, caffeine use, nicotine use and use of medications that affect the body's responses to heat. This information is for the employee's personal use.
- The importance of removing heat-retaining personal protective equipment such as non-breathable chemical-resistant clothing during all breaks.
- The importance of frequent consumption of small quantities of drinking water or other acceptable beverages.
- The importance of acclimatization.

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- The different types of heat-related illness, the common signs and symptoms of heat-related illness.
- The importance of immediately reporting signs or symptoms of heat-related illness in either themselves or in co-workers to the person in charge and the procedures the employee must follow including appropriate emergency response procedures.

Recordkeeping

Training will be documented by a sign-in sheet, quiz, or other field-based form (to include a brief description of the training and trainer's name) and the date will be documented in site files and/or GeoEngineers' Ascent.

Issued January 1, 2010
Revised June 1, 2015
Revised April 6, 2020

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Appendix F
Working Over Water Safety Program

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GeoEngineers

Working Over Water Safety Program

Revised May 2022

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Working Over Water Safety Program

Purpose

The purpose of the GeoEngineers Working Over Water Safety Program is to protect the health and safety of employees working on or near water.

Scope

This policy and procedure applies in its entirety to all GeoEngineers employees who have an actual or potential exposure to drowning.

Responsibilities

Principals/Associates/Project Managers/Health and Safety Coordinators—Responsible and accountable for ensuring that the provisions of this policy and procedure are implemented and followed at offices and projects in which they have oversight and responsibility.

Employees—GeoEngineers' employees are responsible and accountable for complying with this policy and procedure as it applies to them.

Health and Safety Program Manager—GeoEngineers' HSM shall monitor and evaluate for compliance, effectiveness and improvement opportunities and changes in regulations as needed.

Definitions

Boat Operator—the locally licensed individual responsible for operating the boat.

Bow—the bow of a boat is the front part of the vessel.

Coaming—any vertical surface on a ship designed to deflect or prevent entry of water. It usually refers to raised section of deck plating around an opening, such as a hatch. Coamings also provide a frame onto which to fit a hatch cover.

Dispatcher—the member of the boating team responsible for maintaining shore communication with the boat operator. The dispatcher will always remain on land and will track the boat's location.

Fender/ing—a cushioned place between boats or between a pier and a boat to prevent damage. Fendering is relying on said cushion to prevent impact damage to your boat when docking.

Freeboard—the minimum vertical distance from the surface of the water to the gunwale (upper edge of the boats sides.

Gunwale—the upper edge of the boat's sides that stay out of the water generally.

Hull—the body of the boat that remains in the water.

Hypothermia—a symptom of severe cold stress resulting from the body core temperature dropping below 95 degrees Fahrenheit. Signs of hypothermia include uncontrollable shivering, mental confusion, and fatigue. In extreme and untreated cases, a warm or euphoric feeling is experienced.

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International Waters—areas of water outside the 12-mile offshore exclusive economic zone of any nation.

Inboard—towards the center of a vessel or dock.

Jacob's Ladder—a rope or metal ladder used to board vessels along its side.

Lee—the side of a vessel sheltered from the wind.

Outboard—towards the edges of a vessel or dock.

Personal Flotation Devices (PFDs) or Lifejacket Types—See Personal Floatation Device (PFD) Specifications Section.

Port—the left side of the boat from the perspective of looking forward in the boat.

Starboard—the right side of the boat from the perspective of looking forward in the boat.

Stern—the stern of a boat is the back part of the vessel.

Regulatory References

When working near water, over water or on a barge, Occupational Safety and Health Administration (OSHA) has authority. The U.S. Coast Guard has authority 12 miles off shore until international waters begin. The Coast Guard also has authority over operations on the Great Lakes.

This safety program is based on the following state and federal regulations:

- OSHA 1926.106 Working over or near water; 1926.605 Marine operations and equipment; Access to vessels 1915.74 and Access to barges and river towboats 1918.26 (Idaho, Missouri)
- Washington Administrative Code (WAC) 296-800-160 Personal Protective Equipment for PFD (Washington)
- OR-OSHA 1926 (Oregon)
- AAC Title 8 (Alaska)
- HIOSH Title 12 (Hawaii)
- Cal/OSHA Title 8 (California)

General Requirements

Use of a boat for work requires safe boating practices, good equipment, and training. These procedures are not meant to replace the safety manuals provided by the Coast Guard. Instead, they should highlight some of the areas of concern and address specific GeoEngineers. work procedures. While working near water that is over waist deep or while on a boat, always wear a Coast Guard approved personal flotation device. Remember that being submersed in water increases the chance of hypothermia. Have a dry set of clothes and work with a buddy if you are working around water. If an employee is required to work partially or fully immersed in the water for long periods of time, they

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will wear appropriate gear including waders, a wet suit, or dry suit if necessary for safe accomplishment of the task.

The Coast Guard's Federal Requirements state, "All recreational boats must carry one wearable PFD (Type I, II, III, or Type V) for each person aboard… [and that] any boat 16 feet and longer (except canoes and kayaks) must also carry one throw-able Type IV PFD."

GeoEngineers' insurance for working over water is covered under the USL&H policy (worker's comp over water) and is not specific to the individuals participating. For work in arctic waters, an additional site safety plan will be created to address the additional hazards of working in extremely cold water. Refer to GeoEngineers Cold Stress Prevention Program for cold weather guidance.

For work on barges or boats or areas near water that have an OSHA standard height and strength guardrail, PFDs are not required while working behind the guardrail. The access to the barge or near water area also requires that the gangway be protected by guardrails. If employees are not wearing PFDs, there cannot be a risk of falling in the water. Fall protection rules can be utilized on projects where employees are not within 6 feet of a leading edge and there is no risk of falling in the water.

Implementation

Procedures for Using Boats

Three people will always be involved with the use of the boat. The boat operator, the assistant operator, and the dispatcher back on land. The boat operator will be locally licensed to operate the boat and should always plan a course of travel which is the safest and minimizes the distance to the shore. The dispatcher must be able to maintain communication with the boat operator while back on land. As a general courtesy, the boat should be cleaned up by the user after each day.

Maneuvering a Boat

- To move boat from dock, move stern away then bow (but not into waves or wind)
- Try not to depend on fendering, slow down
- Communicate with other person in boat when:
    - Increase or decrease speed
    - Dramatically change direction
    - Approach pilings/docking so hands and objects hanging off the side of the boat can be put inside

Right-of-Way

- Watch out for ferry traffic—large vessels have right of way and cannot stop
- Larger vessel has right of way over smaller
- With boats of similar size, sailboat have right of way
- When lights are visible, green has the right of way over red

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Ferryboats

Do not cut off ferryboats or other vessels, they move much faster than they appear to. If the boat breaks down in a ferry lane, use radio, flares, and wave and make sure they see you until help arrives. See Emergency Procedures Section for additional details.

Load Limits

Cargo should be evenly distributed and there should be a safe amount of freeboard, which depends on water conditions. In more turbulent water, give the boat more freeboard. When loading up the boat for travel that goes beyond the protection of the pier, the employee should drive to the end of the pier and check wave conditions before entering. Check the boat's loading limits and safety information via the operator's manual.

Engine Use

When using an outboard motor, the boat operator will wear the tether kill switch. This will hook to the operator's wrist and turn off the engine if the boat operator were to be launched into the water.

Personal Floatation Device (PFD)

Type 1 PFDs will be worn in the boat at all times when on ocean or fast moving waters. PFDs will be the correct size for the wearer and will be securely fastened. The PFD should be inspected for damage prior to each use.

In you end up in water with PFD, to help prevent water from lowering body temperature:

- 1 person: cross arms pull knees up
- 2 or more persons: huddle together

The chances of swimming 100 yards or finding help in open water is not very good, so the best strategy is to stay with the boat. The boat should always be closer to shore than this distance during transport so the employee would be close enough to swim to shore.

Throwing Lines

- Make first two coils larger
- Kneel in boat
- Shoulder pointed to victim
- Throw over their head

Water on Board

- A five-gallon bucket will always be available on the boat to bale water that comes inside the boat

Towing

- Take time to set up
- Look at lines
- Stay in step with waves
- For logs, may want to tow from bow. Use timber hitch, shackle to weigh down
- Don't overstress lines

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- Don't shock load lines
- Sea anchor—can use to slow down tow, make more controllable. For some situations, a sea anchor is not necessary and could make things worse.

Safety and Signals

- Horn blasts: 5 short signals danger
- Lights: Employees will not be traveling between terminals in the dark. If it becomes dark while working, the operator will moor the boat at that terminal for the night. A flashlight will be available in the waterproof box stored in the workboat.

Vessel, Barge or Platform Procedures

Any work within 6 feet of an unprotected leading edge will require a life jacket if water is below the leading edge. Railings must be present if a leading edge is above a hard surface. Refer to GeoEngineers' Fall Protection Program for additional details.

Employees shall not be permitted to walk along the sides of covered lighters or barges with coamings more than 5 feet high, unless there is a 3-foot clear walkway, or a grab rail, or a taut hand line is provided.

Employees shall not be permitted to walk over deck loads from rail to coaming unless there is a safe passage. If it is necessary to stand at the outboard or inboard edge of the deck load where less than 24 inches of bulwark, rail, coaming, or other protection exists, all employees shall be provided with a suitable means of protection against falling from the deck load.

The employer shall ensure that there is in the vicinity of each barge in use at least one Coast Guard-approved 30-inch life ring with not less than 90 feet of line attached, and at least one portable or permanent ladder which will reach the top of the apron to the surface of the water. If the above equipment is not available at the pier, the employer shall furnish it during the time that he is working the barge.

Whenever practicable, a gangway of not less than 20 inches walking surface of adequate strength, maintained in safe repair and safely secured shall be used. If a gangway is not practicable, a substantial straight ladder, extending at least 36 inches above the upper landing surface and adequately secured against shifting or slipping shall be provided. When conditions are such that neither a gangway nor a straight ladder can be used, a double-rung or flat tread type of Jacob's ladder may be used. The Jacob's ladder must hang without slack from its lashings or be pulled up entirely when not in use.

Means of access and all work areas will be adequately illuminated at all times.

Loads of cargo will not pass over employees nor will they be stored over areas where employees may reasonably congregate.

Cranes/ Hoists/ Cables

Employees need to use caution when working in areas where cranes, hoists and cables are in use. Refer to the GeoEngineers' Drilling and Rigging Safety Program.

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Working Near Water Procedures

GeoEngineers' employees working over or near water, where the danger of drowning exists, shall be provided with Coast Guard-approved life jacket or buoyant work vests. If the employee is over 6 feet away from the water, they will not be required to wear the life vest.

Prior to and after each use, the buoyant work vests or life preservers shall be inspected for defects that would alter their strength or buoyancy. Defective units shall not be used.

Ring buoys with at least 90 feet of line shall be provided and readily available for emergency rescue operations. Distance between ring buoys shall not exceed 200 feet.

At least one lifesaving skiff or similar vessel shall be immediately available at locations where employees are working over or adjacent to water to perform rescue when necessary if the employee falls into the water.

Emergency Procedures

The following topics are items that are important for handling an emergency. The boat operator should know these procedures and follow them at all times.

Communication

The Marine Radio will be with the boat operator at all times. Before entering the boat, the operator will call in to the dispatcher and notify them of the location and destination of the boat. Each time an employee enters or exits the boat, this will be recorded by the dispatcher. This contact should occur at departure and arrival for long transits.

In the event the Coast Guard must be called for an emergency, use the following reporting procedure:

1. Tune the radio to Channel 16 (Coast Guard)
2. Clearly say MAYDAY three times for life threatening emergencies or PAN-PAN for non-life threatening emergencies
3. Give your vessels name and current position
4. Describe your vessel and give its registration number
5. Give the number of personnel on board
6. Describe the emergency
7. Say OVER and repeat process if no response
8. While waiting for rescue, blow horn five short times to signal danger near your location

Engine Problems

In the event of engine problems, contact the dispatcher and notify them of the situation immediately. Depending on the situation, a rescue could be dispatched by the Coast Guard, another employee, or a contractor. If a repair is made in the interim while waiting for the tow, call the dispatcher again and notify them of the situation. If the boat is mobile, head back to dock until the engine can be fully repaired or replaced.

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Spare plugs will be in the waterproof kit for offshore engine problems only. The boat operator will be required to take a spare tank and line for fuel, thus eliminating the need for spare line.

Distress Flares

Distress flares will be located in the waterproof boxes that the boat operator will ensure are on the boat before each travel session. Boat operators should also make sure that they are familiar with the operation of these flares.

Person Overboard / Rescue

Boat operators should be familiar with in water rescue techniques. The following steps are a general procedure for rescuing individuals who have gone overboard.

1. Yell "Person Overboard!" to get everyone's attention
2. Designate one person to maintain visual contact with the victim
3. Position the boat downwind so the victim will naturally float towards the boat
4. Throw the victim bright, buoyant objects on a line. Ensure the line is secured prior to throwing
5. Turn the engine off during rescue to avoid possible injury
6. Slowly pull the victim in towards the boat
7. Dry and warm victim

If you go overboard, follow these guidelines to increase your chances of survival if rescue isn't immediate.

- Remain calm, try to conserve energy
- Pull your knees in and hold them to your chest to minimize body heat loss
- Don't try to swim to safety unless it is very close by and visible

Fire

Each workboat will be equipped with a 5 lb. ABC fire extinguisher located near the bow. The fire extinguisher should be checked each time the boat is used to ensure that it is ready to operate.

Work Related Injuries

Work related injuries that are not threatening to the safety of the persons on board should be reported to the Supervisor as soon as possible. Any work related injury that impairs operation of the boat should be called in to the GeoEngineers' office immediately. The office will call for the Coast Guard and or the Fire Department in the event of a serious injury.

Weather/Tides

If the visibility is very low due to fog or other conditions, the operator will not take the boat out.

Fog

If a boat gets trapped in fog, employees will stay within sight of the shoreline and/or head in and tie up. Employees are not likely to be caught unexpected in dense fog as long as they turn on all lights and use the boat horn. Remember, many boats cannot pick you up on radar and cannot stop quickly.

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Rough Water

If possible, rough water should be avoided. However, if the boat operator is experienced, work will not be impeded by rough water, and such conditions were planned for appropriately in the JHA or HASP, work may be approved in rough water. Here are some basic tips for boating in rough water.

- Look for lee and stay in it if possible
- Head into swells, throttle up when approaching, throttle down when dropping down
- Check wave conditions before taking the boat out and regularly check for updates
- Head in at 45 degree angle at times, depending on wave size

Tides

Tidal changes in the Puget Sound and northern areas can be significant. Employees should always be aware of the tide changes and plan their work accordingly. There have been several instances where work under the docks became dangerous due to changing tides and lack of planning.

Storms

GeoEngineers employees will not work on boats in stormy weather. If stormy weather is reported as incoming or caught by unexpected stormy weather while on water, GeoEngineers employees will return to harbor as soon as safely possible.

List of Supplies

In addition to the list of supplies necessary for the project and those generated as necessary at the Maritime Training Center, the Coast Guard identified the following items to be critical for safe boating.

Items to be stored with the boat at all times:

- Oars and oarlocks
- Anchor
- Bucket for baling water
- Fire Extinguisher
- 1 spare fuel tank and line
- 1 change of dry clothes per person
- Emergency food and water

Items that will be brought onto the boat when in use:

- Marine radio
- Watertight box with first aid kit, flashlight, and flares
- Personal Floatation Device(s)
- Knife with serrated edge
- Tide book
- Spare plugs and wrench

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Personal Floatation Device (PFD) Specifications

Personal Flotation Device (PFD) use applies to terminals and piers and employees working near other bodies of water. It also applies to all activities conducted by GeoEngineers employees at these facilities, including construction, maintenance, inspections, tours, and operations. Type I PFDs will be worn in the boats at all times. PFD will be the correct size for the wearer and will be securely fastened. The PFD should be inspected for damage prior to each use. Boats longer than 16 feet must carry at least one Type I, II, III, or V PFD for each person on board.

In addition, at least one Type IV (throw-able device) must be carried on the vessel for use in person overboard procedures. No one may not use a Type IV "flotation cushion" as the sole PFD in any situation.

PFDs are required for:

- Any employee in a boat/skiff/barge,
- Any employee is working on top of, or beyond the bull rail (a railing for docking the boat), or
- Employees working near water where the danger of drowning exists

PFDs are not specifically required when:

- Employees are working behind standard height and strength guardrails.
- Employees are working inside operating cabs or stations that eliminate the possibility of accidentally falling into the water.
- Employees are wearing an approved safety harness with a lifeline attached that prevents the possibility of accidentally falling into the water.
- Employees are working more than 6 feet from the edge.
- Working over shallow water (less than chest deep) where floatation would not be achieved (other protective measures required).

Provide your employees with PFDs approved by the Coast Guard for use on commercial or merchant vessels. The following are appropriate or allowable United States Coast Guard-approved PFDs:

Type of PFD	General Description
Type I	Off-Shore Life Jacket–effective for all waters or where rescue may be delayed. Should turn ALL wearers upright in water. Most buoyant.
Type II	Near-Shore Buoyant Vest–intended for calm, inland water or where there is a good chance of quick rescue. Will turn SOME wearers upright in water. Check weight category.
Type III	Flotation aid–good for calm, inland water, or where there is a good chance of rescue. Will NOT turn wearers upright in water.
Type IV	Flotation aid–(throwable device) rings, buoyant cushions, horseshoe buoys. Meant to supplement other PFDs or for pulling in for rescue.

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Off-Shore Life Jacket (Type I PFD)

Best for open, rough, or remote water, where rescue may be slow coming.

- Advantages
  - Floats person the best
  - Turns most unconscious wearers face-up in water
  - Highly visible color
- Disadvantages
  - Bulky

Near-Shore Buoyant Vest (Type II PFD)

Good for calm, inland water, or where there is good chance for fast rescue.

- Advantages
  - Turns some unconscious wearers face-up in water
  - Less bulky, more comfortable than Off-Shore Life Jacket (Type I PFD)
  - Compromise between Type I PFD performance and wearer comfort
- Disadvantages
  - May be uncomfortable wearing for extended periods
  - Will not turn as many people face-up as a Type I PFD will
  - In rough water, a wearer's face may often be covered by waves
  - Not for extended survival in rough water

Flotation Aid (Type III PFD)

Good for calm, inland water, or where there is good chance of fast rescue.

- Advantages
  - Generally, the most comfortable type for continuous wear
  - Freedom of movement for water skiing, small boat sailing, fishing, etc.
  - Available in many styles, including vests and flotation coats
- Disadvantages
  - Not for rough water
  - Wearer may have to tilt head back to avoid face-down position in water

Flotation Aid Throwable Device (Type IV PFD)

Used for rescue during overboard procedures.

- Advantages
  - Easy to throw and grab onto
  - Don't have to be worn constantly.
- Disadvantages
  - Inadequate by themselves to keep individuals safely afloat
  - Require someone else to throw the PFD to the overboard individual

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Training

Each state has specific boat training requirements. In addition, the Coast Guard can also be contacted for local training opportunities. All GeoEngineers employees operating a boat should have documented training and be locally licensed/certified.

GeoEngineers employees who will be working over water must review the GeoEngineers Working Over Water training module at least once prior to work commencing.

GeoEngineers employees working over or near water should be trained in the contents of the Working Over Water Safety Program. At the start of each project in which working over or near water presents a danger of drowning employees should have a tailgate safety meeting and discuss the following:

- The danger of drowning where it exists
- Use of Coast Guard-approved life jacket or buoyant work vests
- Life jacket or buoyant work vests inspections
- Location of ring buoys for emergency rescue operations
- Location of a lifesaving skiff for rescue if needed

Training shall be recorded in Ascent.

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Appendix G
TOXFAQS Guides

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Arsenic - ToxFAQs™

CAS # 7440-38-2

This fact sheet answers the most frequently asked health questions (FAQs) about arsenic. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to higher than average levels of arsenic occur mostly in the workplace, near hazardous waste sites, or in areas with high natural levels. At high levels, inorganic arsenic can cause death. Exposure to lower levels for a long time can cause a discoloration of the skin and the appearance of small corns or warts. Arsenic has been found in at least 1,149 of the 1,684 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What is arsenic?

Arsenic is a naturally occurring element widely distributed in the earth's crust. In the environment, arsenic is combined with oxygen, chlorine, and sulfur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds.

Inorganic arsenic compounds are mainly used to preserve wood. Copper chromated arsenate (CCA) is used to make "pressure-treated" lumber. CCA is no longer used in the U.S. for residential uses; it is still used in industrial applications. Organic arsenic compounds are used as pesticides, primarily on cotton fields and orchards.

What happens to arsenic when it enters the environment?

- Arsenic occurs naturally in soil and minerals and may enter the air, water, and land from wind-blown dust and may get into water from runoff and leaching.
- Arsenic cannot be destroyed in the environment. It can only change its form.
- Rain and snow remove arsenic dust particles from the air.
- Many common arsenic compounds can dissolve in water. Most of the arsenic in water will ultimately end up in soil or sediment.
- Fish and shellfish can accumulate arsenic; most of this arsenic is in an organic form called arsenobetaine that is much less harmful.

How might I be exposed to arsenic?

- Ingesting small amounts present in your food and water or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.
- Working in a job that involves arsenic production or use, such as copper or lead smelting, wood treating, or pesticide application.

How can arsenic affect my health?

Breathing high levels of inorganic arsenic can give you a sore throat or irritated lungs.

Ingesting very high levels of arsenic can result in death. Exposure to lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and a sensation of "pins and needles" in hands and feet.

Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small "corns" or "warts" on the palms, soles, and torso.

Skin contact with inorganic arsenic may cause redness and swelling.

Almost nothing is known regarding health effects of organic arsenic compounds in humans. Studies in animals show that some simple organic arsenic

Arsenic

CAS # 7440-38-2

compounds are less toxic than inorganic forms. Ingestion of methyl and dimethyl compounds can cause diarrhea and damage to the kidneys.

How likely is arsenic to cause cancer?

Several studies have shown that ingestion of inorganic arsenic can increase the risk of skin cancer and cancer in the liver, bladder, and lungs. Inhalation of inorganic arsenic can cause increased risk of lung cancer. The Department of Health and Human Services (DHHS) and the EPA have determined that inorganic arsenic is a known human carcinogen. The International Agency for Research on Cancer (IARC) has determined that inorganic arsenic is carcinogenic to humans.

How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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How can arsenic affect children?

There is some evidence that long-term exposure to arsenic in children may result in lower IQ scores. There is also some evidence that exposure to arsenic in the womb and early childhood may increase mortality in young adults.

There is some evidence that inhaled or ingested arsenic can injure pregnant women or their unborn babies, although the studies are not definitive. Studies in animals show that large doses of arsenic that cause illness in pregnant females, can also cause low birth weight, fetal malformations, and even fetal death. Arsenic can cross the placenta and has been found in fetal tissues. Arsenic is found at low levels in breast milk.

How can families reduce the risks of exposure to arsenic?

- If you use arsenic-treated wood in home projects, you should wear dust masks, gloves, and protective clothing to decrease exposure to sawdust.
- If you live in an area with high levels of arsenic in water or soil, you should use cleaner sources of water and limit contact with soil.
- If you work in a job that may expose you to arsenic, be aware that you may carry arsenic home on your clothing, skin, hair, or tools. Be sure to shower and change clothes before going home.

Is there a medical test to determine whether I've been exposed to arsenic?

There are tests available to measure arsenic in your blood, urine, hair, and fingernails. The urine test is the most reliable test for arsenic exposure within the last few days. Tests on hair and fingernails can measure exposure to high levels of arsenic over the past 6-12 months. These tests can determine if you have been exposed to above-average levels of arsenic. They cannot predict whether the arsenic levels in your body will affect your health.

Has the federal government made recommendations to protect human health?

The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) has set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 $\mu g/m^3$) for 8 hour shifts and 40 hour work weeks.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2007. Toxicological Profile for Arsenic (Update). Atlanta, GA: U.S. Department of Health and Human Services. Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

DRAFT

Cadmium- ToxFAQs™

CAS # 7440-43-9

This fact sheet answers the most frequently asked health questions (FAQs) about cadmium. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to cadmium happens mostly in the workplace where cadmium products are made. The general population is exposed from breathing cigarette smoke or eating cadmium contaminated foods. Cadmium damages the kidneys, lungs, and bones. Cadmium has been found in at least 1,014 of the 1,669 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What is cadmium?

Cadmium is a natural element in the earth's crust. It is usually found as a mineral combined with other elements such as oxygen (cadmium oxide), chlorine (cadmium chloride), or sulfur (cadmium sulfate, cadmium sulfide).

All soils and rocks, including coal and mineral fertilizers, contain some cadmium. Most cadmium used in the United States is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses, including batteries, pigments, metal coatings, and plastics.

What happens to cadmium when it enters the environment?

- Cadmium enters soil, water, and air from mining, industry, and burning coal and household wastes.
- Cadmium does not break down in the environment, but can change forms.
- Cadmium particles in air can travel long distances before falling to the ground or water.
- Some forms of cadmium dissolve in water.
- Cadmium binds strongly to soil particles.
- Fish, plants, and animals take up cadmium from the environment.

How might I be exposed to cadmium?

- Eating foods containing cadmium; low levels are found in all foods (highest levels are found in leafy vegetables, grains, legumes, and kidney meat).
- Smoking cigarettes or breathing cigarette smoke.
- Breathing contaminated workplace air.
- Drinking contaminated water.
- Living near industrial facilities which release cadmium into the air.

How can cadmium affect my health?

Breathing high levels of cadmium can severely damage the lungs. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea.

Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones.

How likely is cadmium to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have determined that cadmium and cadmium compounds are human carcinogens. The EPA determined that cadmium is a probable human carcinogen (group B1).

Cadmium

CAS # 7440-43-9

How can cadmium affect children?

The health effects in children are expected to be similar to the effects seen in adults (kidney and lung damage depending on the route of exposure).

A few studies in animals indicate that younger animals absorb more cadmium than adults. Animal studies also indicate that the young are more susceptible than adults to a loss of bone and decreased bone strength from exposure to cadmium.

We don't know if cadmium causes birth defects in people. Studies in animals exposed to high levels of cadmium during pregnancy have resulted in harmful effects to the young. Young animals exposed to cadmium before birth have shown effects on behavior and learning. There is also some information from animal studies that high enough exposures to cadmium before birth can reduce body weights and affect the skeleton in the developing young.

How can families reduce the risk of exposure to cadmium?

- Do not allow children to play with batteries. Dispose of nickel-cadmium batteries properly.
- Cadmium is a component of tobacco smoke. Avoid smoking and smoking in enclosed spaces like inside the home or car in order to limit exposure to children and other family members.
- If you work with cadmium, use all safety precautions to avoid carrying cadmium-containing dust home from work on your clothing, skin, hair, or tools.
- A balanced diet can reduce the amount of cadmium taken into the body from food and drink.

Is there a medical test to determine whether I've been exposed to cadmium?

Cadmium can be measured in blood, urine, hair, or nails. Urinary cadmium has been shown to accurately reflect the amount of cadmium in the body.

The amount of cadmium in your blood shows your recent exposure to cadmium. The amount of cadmium in your urine shows both your recent and your past exposure.

Has the federal government made recommendations to protect human health?

The EPA has determined that exposure to cadmium in drinking water at concentrations of 0.04 milligrams per liter (0.04 mg/L) for up to 10 days is not expected to cause any adverse effects in a child.

The EPA has determined that lifetime exposure to 0.005 mg/L cadmium is not expected to cause any adverse effects.

The Food and Drug Administration (FDA) has determined that the cadmium concentration in bottled drinking water should not exceed 0.005 mg/L.

The Occupational Health and Safety Administration (OSHA) has limited workers' exposure to an average of 5 $\mu g/m^3$ for an 8-hour workday, 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2012. Toxicological Profile for Cadmium. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Copper - ToxFAQs™

What is copper?

Copper (Cu) is an element and metal. It is found in rocks, soils, water, and air. Copper is an essential nutrient for humans and is in many foods. It's also essential to animals and plants. Copper and substances containing copper are used in many industries in the U.S.. Copper can be found in materials and products such as wiring, plumbing, pesticides, cookware, and dietary supplements, among others. Copper scrap can be combined with other metals to make brass and bronze pipes. In the U.S., copper is mined and recovered from metal through smelting.

What happens to copper in the environment?

- Copper is released from natural sources, such as windblown dusts, decaying vegetation, and from human activities like municipial solid waste management and fossil fuel burning.
- In air, copper usually attaches to particles (particulate matter) and can travel far from its source.
- In water, copper will usually attach to soils if possible, or dissolve.
- Copper attaches to soils, where it can be taken up by plants.
- Mollusks, such as clams and oysters, can build up copper in their bodies.
- Copper does not break down in the environment.

Ingesting copper in food is necessary for human health. Too much copper can be harmful.

How can I be exposed to copper?

- People ingest copper from drinking water and food, inhale copper from air, and may touch copper or products that contain copper.
- Drinking water can contain high levels of copper if your home has copper pipes and acidic water. This is more likely to occur in new or recently renovated buildings/homes using copper plumbing.
- Blue copper sulfate crystals are available to purchase and have been accidentally ingested by people who confused them for candy or toys.
- You may be exposed to copper fumes if you work or live near a site that uses copper in mining, agriculture, or in a facilitity that processes copper.
- Soils near mines, processing facilities, or waste dump sites may have a lot of copper.

How can copper affect my health?

It is essential for people to ingest small amounts of copper everyday in food and water. Ingesting too much or too little copper can lead to illness and/or disease. Ingesting a high amount of copper, usually in drinking water, can cause vomiting, nausea, abdominal pain, and/or diarrhea. Ingesting higher than recommended amounts of copper every day over time, such as in water or in copper supplements, can lead to severe illness, such as kidney and liver damage.

Breathing in copper dusts, sprays, or crystals can irritate your nose and throat, and cause dizziness and headaches. People who have ingested these substances have gotten very sick and/or died.

Copper is essential to the development of babies and children, and is found in breastmilk. Babies and children are expected to have symptoms similar to adults when exposed to high levels of copper in air, water, or food. If you have a disorder that causes copper to build up in your body, like Wilson's disease, you may be especially vulnerable to high copper levels in air, food, or water.

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Copper

Can copper cause cancer?

The U.S. Department of Health and Human Services (DHHS) has not evaluated the carcinogenicity (whether it causes cancer) of copper.

The U.S. Environmental Protection Agency (EPA) has not classified if copper is carcinogenic (cancer causing) to humans.

The International Agency for Research on Cancer (IARC) has not evaluated the carcinogenicity of copper. IARC lists copper 8-hydroyquinoline as a group 3 agent indicating the carcinogenicity in humans cannot be classified due to lack of cancer studies in humans and animals.

Can I get a medical test to check for copper?

There are tests to measure the amount of copper in your blood, urine, nails, and hair. Your medical provider can help decide if a test is needed and which is the most appropriate for you. High levels of copper in these tests can show if you have been exposed to a lot of copper or if there is a problem with copper regulation in the body. These tests will not predict if you will have health problems. These tests are not part of standard health tests that are done at your doctor's office and are done through a special lab. If you think you may have been exposed to high levels of copper, talk to your doctor, nurse, or clinic, or call poison control.

How can I protect my family from copper exposure?

If your water is metallic or bitter in taste or smell, and/or is green-blue in color this may be a sign that there is too much copper in your drinking water. If you have copper piping, it can leach into water if your home is new or recently renovated, or if your water is corrosive. Regularly cleaning or flushing out your system can help avoid this. There are tests available to check if your water is corrosive or if copper levels in your water are high.

Safely store copper powders, crystals, or dusts away from children, pets, or other adults.

Monitor your copper intake if you are adding more copper to your diet, such as by taking dietary supplements with copper, to make sure you are not eating too much. Talk to your doctor, nurse, or clinic to figure out if you are taking the proper amount of copper.

If you work with copper, wear the necessary protective clothing and equipment, and always follow safety procedures. Shower and change your clothes before going home each day.

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Want more information?

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Copper

Go to ATSDR's Toxic Substances Portal: http://www.atsdr.cdc.gov/substances/index.asp

If you have any more questions or concerns, you can also find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

CHLORINATED DIBENZO-p-DIOXINS (CDDs)

Division of Toxicology and Environmental Medicine ToxFAQs™ February 1999

This fact sheet answers the most frequently asked health questions (FAQs) about dibenzo-p-dioxins. For more information, call the ATSDR Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to chlorinated dibenzo-p-dioxins (CDDs) (75 chemicals) occurs mainly from eating food that contains the chemicals. One chemical in this group, 2,3,7,8-tetrachlorodibenzo-p-dioxin or 2,3,7,8-TCDD, has been shown to be very toxic in animal studies. It causes effects on the skin and may cause cancer in people. This chemical has been found in at least 91 of the 1,467 National Priorities List sites identified by the Environmental Protection Agency (EPA).

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What are CDDs?

CDDs are a family of 75 chemically related compounds commonly known as chlorinated dioxins. One of these compounds is called 2,3,7,8-TCDD. It is one of the most toxic of the CDDs and is the one most studied.

In the pure form, CDDs are crystals or colorless solids. CDDs enter the environment as mixtures containing a number of individual components. 2,3,7,8-TCDD is odorless and the odors of the other CDDs are not known.

CDDs are not intentionally manufactured by industry except for research purposes. They (mainly 2,3,7,8-TCDD) may be formed during the chlorine bleaching process at pulp and paper mills. CDDs are also formed during chlorination by waste and drinking water treatment plants. They can occur as contaminants in the manufacture of certain organic chemicals. CDDs are released into the air in emissions from municipal solid waste and industrial incinerators.

What happens to CDDs when they enter the environment?

❏ When released into the air, some CDDs may be transported long distances, even around the globe.

❏ When released in waste waters, some CDDs are broken down by sunlight, some evaporate to air, but most attach to soil and settle to the bottom sediment in water.

❏ CDD concentrations may build up in the food chain, resulting in measurable levels in animals.

How might I be exposed to CDDs?

❏ Eating food, primarily meat, dairy products, and fish, makes up more than 90% of the intake of CDDs for the general population.

❏ Breathing low levels in air and drinking low levels in water.

❏ Skin contact with certain pesticides and herbicides.

❏ Living near an uncontrolled hazardous waste site containing CDDs or incinerators releasing CDDs.

❏ Working in industries involved in producing certain pesticides containing CDDs as impurities, working at paper and pulp mills, or operating incinerators.

How can CDDs affect my health?

The most noted health effect in people exposed to large amounts of 2,3,7,8-TCDD is chloracne. Chloracne is a severe skin disease with acne-like lesions that occur mainly on the face and upper body. Other skin effects noted in people exposed to high doses of 2,3,7,8-TCDD include skin rashes, discoloration, and excessive body hair. Changes in blood and urine that may indicate liver damage also are seen in people. Exposure to high concentrations of CDDs may induce longterm alterations in glucose metabolism and subtle changes in hormonal levels.

In certain animal species, 2,3,7,8-TCDD is especially harmful and can cause death after a single exposure. Exposure to lower levels can cause a variety of effects in

animals, such as weight loss, liver damage, and disruption of the endocrine system. In many species of animals, 2,3,7,8-TCDD weakens the immune system and causes a decrease in the system's ability to fight bacteria and viruses. In other animal studies, exposure to 2,3,7,8-TCDD has caused reproductive damage and birth defects. Some animal species exposed to CDDs during pregnancy had miscarriages and the offspring of animals exposed to 2,3,7,8-TCDD during pregnancy often had severe birth defects including skeletal deformities, kidney defects, and weakened immune responses.

How likely are CDDs to cause cancer?

Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people. Animal studies have also shown an increased risk of cancer from exposure to 2,3,7,8-TCDD.
The World Health Organization (WHO) has determined that 2,3,7,8-TCDD is a human carcinogen.
The Department of Health and Human Services (DHHS) has determined that 2,3,7,8-TCDD may reasonably be anticipated to cause cancer.

How can CDDs affect children?

Very few studies have looked at the effects of CDDs on children. Chloracne has been seen in children exposed to high levels of CDDs. We don't know if CDDs affect the ability of people to have children or if it causes birth defects, but given the effects observed in animal studies, this cannot be ruled out.

How can families reduce the risk of exposure to CDDs?

❏ Children should avoid playing in soils near uncontrolled hazardous waste sites.
❏ Discourage children from eating dirt or putting toys or other objects in their mouths.
❏ Everyone should wash hands frequently if playing or working near uncontrolled hazardous waste sites.
❏ For new mothers and young children, restrict eating foods from the proximity of uncontrolled sites with known CDDs.
❏ Children and adults should eat a balanced diet preferably containing low to moderate amounts of animal fats including meat and dairy products, and fish that contain lower amounts of CDDs and eat larger amounts of fruits, vegetables, and grains.

Is there a medical test to determine whether I've been exposed to CDDs?

Tests are available to measure CDD levels in body fat, blood, and breast milk, but these tests are not routinely available. Most people have low levels of CDDs in their body fat and blood, and levels considerably above these levels indicate past exposure to above-normal levels of 2,3,7,8-TCDD. Although CDDs stay in body fat for a long time, tests cannot be used to determine when exposure occurred.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.00003 micrograms of 2,3,7,8-TCDD per liter of drinking water (0.00003 µg/L). Discharges, spills, or accidental releases of 1 pound or more of 2,3,7,8-TCDD must be reported to EPA. The Food and Drug Administration (FDA) recommends against eating fish and shellfish with levels of 2,3,7,8-TCDD greater than 50 parts per trillion (50 ppt).

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1998. Toxicological Profile for Chlorinated Dibenzo-p-Dioxins. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Environmental Medicine, 1600 Clifton Road NE, Mailstop F-62, Atlanta, GA 30333. Phone: 1-800-232-4636, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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Chlorodibenzofurans (CDFs) - ToxFAQs™

What are chlorodibenzofurans (CDFs)?

Chlorodibenzofurans, or CDFs, are a family of chemicals that contain one to eight chlorine atoms attached to the carbon atoms of the parent chemical, dibenzofuran. There are 135 different types of CDFs called congeners. The different congeners have varying harmful health effects. CDF congeners that contain chlorine atoms at the 2,3,7,8- positions of the dibenzofuran molecule are known to be especially harmful.

There is no known use for these chemicals. Other than for research purposes, they are not deliberately produced by industry. Most CDFs are produced in small amounts as undesirable byproducts during the manufacturing of other chemicals. CDFs can also be released from incinerators and landfill fires.

What happens to CDFs in the environment?

CDFs in the environment can be found in air, soil, and sediment. Most CDFs are not soluble in water. In the air, CDFs are bound to particles or exist as vapors. CDFs can be removed from the air by snow or rain. CDFs bind to soil and sediment and are not likely to move into groundwater from soil. They accumulate in fish at much higher levels than levels found in the water or sediment. CDFs can also build up in other animals, birds, and people that are exposed to them in their food.

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How can I be exposed to CDFs?

You could be exposed to very small amounts of CDFs in contaminated food, such as meat, fish, and dairy products. Consuming high amounts of fatty fish may result in exposure to higher levels of CDFs. You could also be exposed to CDFs in air, in drinking water, by using certain consumer products, or in soil in areas near incinerators or landfill fires, but these sources of exposure are less likely.

How can CDFs affect my health?

CDFs can stay in your body for a long time after you were exposed. Studies in animals show that CDFs with chlorine atoms in the 2,3,7,8 positions are the most harmful. The most harmful congener appears to be 2,3,4,7,8-pentaCDF (CDF with 5 chlorine atoms in the 2, 3, 4, 7, and 8 positions).

CDFs are persistent in the environment and body.

Most of the information on health problems comes from studies in people who were accidentally exposed to food contaminated with CDFs. The amount of CDFs was much higher than from environmental exposures or from a normal diet. CDFs caused skin and eye irritations, including severe acne, darkened skin color, and swollen eyelids with discharge from the eyes. CDF poisoning also caused vomiting and diarrhea, anemia, more frequent lung infections, numbness in arms and legs, and other effects on the nervous system.

Chlorodibenzofurans (CDFs)

Many of the same effects that occurred in people also occurred in laboratory animals that ate CDFs. Animals also had severe weight loss, and their stomachs, livers, kidneys, and immune systems were seriously damaged. Some animals had birth defects, and in severe cases, some animals died. These effects in animals were seen when they were fed large amounts of CDFs over a short time, or small amounts over several weeks or months.

Can CDFs cause cancer?

The U.S. Department of Health and Human Services (DHHS) has not evaluated the potential of CDFs to cause cancer in humans.

The U.S. Environmental Protection Agency (EPA) has not evaluated the potential of CDFs to cause cancer in humans.

The International Agency for Research on Cancer (IARC) has determined that 2,3,4,7,8-pentaCDF is carcinogenic to humans; other CDF congeners are not classifiable as to their carcinogenicity to humans.

Can I get a medical test to check for CDFs?

Tests are available to measure levels of CDFs in blood, body fat, and breast milk. These tests cannot predict whether you will have health problems from exposure to CDFs. Doctor's offices do not routinely offer these tests. If you think you have been exposed to CDFs, call your doctor, nurse, or poison control center.

How can I protect myself and my family from CDFs?

Most people don't need to take any special steps to avoid CDFs in their daily lives. Children should avoid playing in the dirt near hazardous waste sites to avoid coming in contact with CDFs.

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For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for CDFs: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=938&tid=194

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Lead - ToxFAQs™

What is lead?

Lead is a metal found naturally in the earth's crust. It can be found in all parts of our environment, including air, water, and soil. Lead can combine with other chemicals to make different compounds.

Lead is used in the production of batteries, ammunition, and metal products (solder and pipes). Because of health concerns, the use of lead in paints, ceramic products, caulking, and pipe solder has been dramatically reduced. The use of lead as an additive to automobile gasoline was banned in 1996 in the United States.

What happens to lead in the environment?

- Lead is an element, so it does not break down.
- When lead is released into the air, it may be transported long distances before it lands and stays on the ground.
- Once on the ground, lead can often stick to soil particles.
- Lead in soil can get into groundwater, but the amount of lead that moves into groundwater will depend on the lead compound and soil type.

How can I be exposed to lead?

Lead can cause health problems in almost every organ and system in your body.

- Eating food or drinking water that contains lead.
- Drinking water from pipes that were soldered with lead can cause exposure.
- Spending time or living in homes with lead-based paints can result in exposure when the paint breaks down and forms dust, which can get on your hands, or into your mouth and nose and be swallowed.
- Spending time in areas where the soil is contaminated with lead.
- Working in a job where lead is used or participating in certain hobbies where lead is used, such as making stained glass.
- Using healthcare products from other countries, alternative treatments, or folk remedies.

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How can lead affect my health?

The effects of lead are the same whether it enters the body by breathing it in or eating it. Lead can affect almost every organ and system in your body. The nervous system is the main target for lead poisoning in children and adults. Long-term exposure can result in decreased learning, memory, and attention, and weakness in fingers, wrists, or ankles. Lead exposure can cause anemia (low iron in the blood) and damage to the kidneys. It can also cause increases in blood pressure, particularly in middle-aged and older individuals. Exposure to high lead levels can severely damage the brain and kidneys and can cause death. In pregnant women, exposure to high levels of lead may cause a miscarriage. In men, it can cause damage to reproductive organs.

Lead

How can lead affect children?

Children are more vulnerable to lead poisoning than adults because their nervous system is still developing. Children can be exposed to lead in their environment and before birth from lead in their mother's body. At lower levels of exposure, lead can decrease mental development, especially learning, intelligence, and behavior. Physical growth may also be decreased. A child who swallows large amounts of lead may develop anemia, severe stomachache, muscle weakness, and brain damage. Exposure to lead during pregnancy can also result in premature births. Some effects of lead poisoning in a child may continue into adulthood.

Can lead cause cancer?

Several agencies and organizations both in the United States and internationally have reviewed studies and made an assessment about whether lead can cause cancer.

- The Department of Health and Human Services (HHS) has determined that lead and lead compounds are reasonably anticipated to be human carcinogens (causing cancer in people).
- The U.S. Environmental Protection Agency (EPA) has classified lead as a probable human carcinogen.
- The International Agency for Research on Cancer (IARC) has determined that inorganic lead is probably carcinogenic to humans, and that there is insufficient information to determine whether organic lead compounds will cause cancer in humans.

Can I get a medical test to check for lead?

A blood test is available to measure the amount of lead in your blood. Blood tests are commonly used to screen children for lead poisoning. Your doctor can draw blood samples and send them to appropriate laboratories for analysis. If you think you or anyone in your family has been exposed to lead, contact your doctor, nurse, or poison control center.

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How can I protect my family from lead exposure?

- Avoid exposure to sources of lead.
- Do not allow children to chew or mouth surfaces that may have been painted with lead-based paint.
- If your home contains lead-based paint (built before 1978), or if you live in an area contaminated with lead, wash children's hands and faces often to remove lead dusts and soil, and regularly clean the house to remove lead dust and lead tracked in soil.
- Certain water pipes may contain lead, so if you know that pipes have lead solder, you should avoid drinking from that source.
- Check for lead in some products such as toys and jewelry and avoid such products.
- Lead is sometimes in candies imported from other countries or traditional home remedies; find out if yours has any lead and avoid using these products or giving them to children.
- You can learn more about preventing lead poisoning here: https://www.cdc.gov/nceh/lead/faqs/lead-faqs.htm

Want more information?

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for Lead

CDC Lead Poisoning Prevention Program https://www.cdc.gov/nceh/lead/default.htm

Environmental Protection Agency https://www.epa.gov/lead/protect-your-family-exposures-lead

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

If you have any more questions or concerns, you can also find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Mercury - ToxFAQs™

What is mercury?

Mercury is a naturally occurring element with a chemical symbol of Hg. Elemental mercury is a silver liquid at room temperature that can also evaporate into the air as a gas or become a solid at very low temperatures. It can combine with other substances to form solid compounds that are categorized into two groups: inorganic mercury salts and organic mercury compounds. Mercury and mercury compounds are odorless.

Mercury is used in a number of industries and products. It is primarily used in the manufacture of electronics, fluorescent-lighting, and production of chlorine-caustic soda. It is also used in dental products (fillings), although uses in dentistry are being phased-out. Other historical uses of mercury (batteries; thermometers and other scientific and medical devices; electronic switches and lighting applications; paints and pigments; fungicides and pesticides) have been eliminated or drastically reduced.

What happens to mercury in the environment?

Because mercury is a naturally occurring element, it can be found in the air, water, or soil. It can also be found in the environment due to industrial releases to air and water. Industrial releases to air have steadily decreased over the past few decades.

Mercury does not break down in the environment. In air, mercury may spread far from where it was released. Mercury seldom appears as a silver liquid in the environment. In water, mercury can evaporate into the air. In soil, it can adhere (stick) to soil and sediments (dirt deposits at the bottom of bodies of water). One type of organic mercury compound called methylmercury can build up in plants and fish.

How can I be exposed to mercury?

Most people are exposed to organic mercury compounds (typically methylmercury) in food (such as fish, seafood, rice) or to elemental mercury from dental fillings. Food is the most common form of exposure. Most people are not exposed to inorganic mercury salts. Industrial and dental workers who use mercury are primarily exposed to elemental mercury. Some cultures use mercury in traditional medicines or religious practices, although this is not recommended or approved for use in the United States.

How can mercury affect my health?

Mercury can affect the nervous system and kidneys. The health effects from exposure to mercury depend on a number of factors including the amount and form of mercury, route and length of exposure, and age.

All forms of mercury can affect the nervous system and the kidneys. Workers exposed to elemental mercury vapor and people who eat foods with high levels of methylmercury experienced tremors, incoordination, impaired vision, impaired learning and memory, and mood changes. Some children born in communities that ate food with high levels of organic mercury had learning, sensory, and movement problems. In people exposed to high levels of methylmercury in their diets, birth defects have occurred. Some humans and animals that ate mercury compounds had high blood pressure and alterations in their immune systems. Animals that breathed elemental mercury vapor or ate organic or inorganic mercury compounds in their diets showed nervous system effects and/or kidney damage. Animals that ate high levels of mercury compounds showed decreased fertility and/or birth defects.

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Mercury

Can mercury cause cancer?

Rats that ate an inorganic mercury compound for a long period of time developed stomach or thyroid cancer. Rats and mice that ate organic mercury compounds for a long period of time developed kidney cancer.

The U.S. Department of Health and Human Services (DHHS) has not evaluated the potential of mercury or mercury compounds to cause cancer in people.

The U.S. Environmental Protection Agency (EPA) has determined that mercuric chloride (inorganic mercury salt) and methylmercury (organic mercury compound) are possible human carcinogens (cause cancer). The EPA did not classify the potential of elemental mercury to cause cancer in humans.

The International Agency for Research on Cancer (IARC) classified methylmercury compounds as possibly carcinogenic to humans. IARC designated inorganic mercury and elemental mercury as not classifiable for causing cancer in humans.

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Can I get a medical test to check for mercury?

Mercury can be measured in your blood, urine, hair, or toenails. However, tests cannot determine which form of mercury you were exposed to. Tests also cannot predict whether you will have health problems. If you think you have been exposed to mercury, call your doctor, nurse, or poison control center.

How can I protect myself and my family from mercury?

People should avoid eating fish that contain high levels of methylmercury. This is particularly important for pregnant women and children. Follow your state's health advisories that tell you about whether it is okay to eat fish or wildlife caught in contaminated areas. Avoid all contact with spills of the liquid form of elemental mercury (the type of mercury found in old thermometers). If a spill occurs, refer to https://www.atsdr.cdc.gov/dontmesswithmercury for safe clean-up practices. Most people don't need to take any special steps to avoid exposure to inorganic mercury salts in their daily lives. Keep children from playing in areas near hazardous waste sites to avoid coming in contact with mercury.

For more information:

Call **CDC-INFO** at 1-800-232-4636, or submit your question online at https://wwwn.cdc.gov/dcs/ContactUs/Form

Go to ATSDR's Toxicological Profile for mercury: https://wwwn.cdc.gov/TSP/ToxProfiles/ToxProfiles.aspx?id=115&tid=24

Go to ATSDR's Toxic Substances Portal: https://wwwn.cdc.gov/TSP/index.aspx

Find & contact your ATSDR Regional Representative at http://www.atsdr.cdc.gov/DRO/dro_org.html

Polycyclic Aromatic Hydrocarbons (PAHs) - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polycyclic aromatic hydrocarbons (PAHs). For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. This information is important because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Exposure to polycyclic aromatic hydrocarbons usually occurs by breathing air contaminated by wild fires or coal tar, or by eating foods that have been grilled. PAHs have been found in at least 600 of the 1,430 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What are polycyclic aromatic hydrocarbons?

(Pronounced pŏl′ĭ-sī′klĭk ăr′ə-măt′ĭk hī′drə-kar′bənz)

Polycyclic aromatic hydrocarbons (PAHs) are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances like tobacco or charbroiled meat. PAHs are usually found as a mixture containing two or more of these compounds, such as soot.

Some PAHs are manufactured. These pure PAHs usually exist as colorless, white, or pale yellow-green solids. PAHs are found in coal tar, crude oil, creosote, and roofing tar, but a few are used in medicines or to make dyes, plastics, and pesticides.

What happens to PAHs when they enter the environment?

- PAHs enter the air mostly as releases from volcanoes, forest fires, burning coal, and automobile exhaust.
- PAHs can occur in air attached to dust particles.
- Some PAH particles can readily evaporate into the air from soil or surface waters.
- PAHs can break down by reacting with sunlight and other chemicals in the air, over a period of days to weeks.
- PAHs enter water through discharges from industrial and wastewater treatment plants.
- Most PAHs do not dissolve easily in water. They stick to solid particles and settle to the bottoms of lakes or rivers.
- Microorganisms can break down PAHs in soil or water after a period of weeks to months.
- In soils, PAHs are most likely to stick tightly to particles; certain PAHs move through soil to contaminate underground water.
- PAH contents of plants and animals may be much higher than PAH contents of soil or water in which they live.

How might I be exposed to PAHs?

- Breathing air containing PAHs in the workplace of coking, coal-tar, and asphalt production plants; smokehouses; and municipal trash incineration facilities.
- Breathing air containing PAHs from cigarette smoke, wood smoke, vehicle exhausts, asphalt roads, or agricultural burn smoke.
- Coming in contact with air, water, or soil near hazardous waste sites.
- Eating grilled or charred meats; contaminated cereals, flour, bread, vegetables, fruits, meats; and processed or pickled foods.
- Drinking contaminated water or cow's milk.
- Nursing infants of mothers living near hazardous waste sites may be exposed to PAHs through their mother's milk.

Polycyclic Aromatic Hydrocarbons

How can PAHs affect my health?

Mice that were fed high levels of one PAH during pregnancy had difficulty reproducing and so did their offspring. These offspring also had higher rates of birth defects and lower body weights. It is not known whether these effects occur in people.

Animal studies have also shown that PAHs can cause harmful effects on the skin, body fluids, and ability to fight disease after both short- and long-term exposure. But these effects have not been seen in people.

How likely are PAHs to cause cancer?

The Department of Health and Human Services (DHHS) has determined that some PAHs may reasonably be expected to be carcinogens.

Some people who have breathed or touched mixtures of PAHs and other chemicals for long periods of time have developed cancer. Some PAHs have caused cancer in laboratory animals when they breathed air containing them (lung cancer), ingested them in food (stomach cancer), or had them applied to their skin (skin cancer).

Is there a medical test to show whether I've been exposed to PAHs?

In the body, PAHs are changed into chemicals that can attach to substances within the body. There are special tests that can detect PAHs attached to these substances in body tissues or blood. However, these tests cannot tell whether any health effects will occur or find out the extent or source of your exposure to the PAHs. The tests aren't usually available in your doctor's office because special equipment is needed to conduct them.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m^3). The OSHA Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m^3 averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m^3 for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Glossary

Carcinogen: A substance that can cause cancer.

Ingest: Take food or drink into your body.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 1995. Toxicological profile for polycyclic aromatic hydrocarbons. Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

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Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

Polychlorinated Biphenyls - ToxFAQs™

This fact sheet answers the most frequently asked health questions (FAQs) about polychlorinated biphenyls. For more information, call the CDC Information Center at 1-800-232-4636. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It's important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Polychlorinated biphenyls (PCBs) are a mixture of individual chemicals which are no longer produced in the United States, but are still found in the environment. Health effects that have been associated with exposure to PCBs include acne-like skin conditions in adults and neurobehavioral and immunological changes in children. PCBs are known to cause cancer in animals. PCBs have been found in at least 500 of the 1,598 National Priorities List (NPL) sites identified by the Environmental Protection Agency (EPA).

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What are polychlorinated biphenyls?

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor.

PCBs have been used as coolants and lubricants in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. The manufacture of PCBs was stopped in the U.S. in 1977 because of evidence they build up in the environment and can cause harmful health effects. Products made before 1977 that may contain PCBs include old fluorescent lighting fixtures and electrical devices containing PCB capacitors, and old microscope and hydraulic oils.

What happens to PCBs when they enter the environment?

- PCBs entered the air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- PCBs can still be released to the environment from hazardous waste sites; illegal or improper disposal of industrial wastes and consumer products; leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.
- PCBs do not readily break down in the environment and thus may remain there for very long periods of time. PCBs can travel long distances in the air and be deposited in areas far away from where they were released. In water, a small amount of PCBs may remain dissolved, but most stick to organic particles and bottom sediments. PCBs also bind strongly to soil.
- PCBs are taken up by small organisms and fish in water. They are also taken up by other animals that eat these aquatic animals as food. PCBs accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

How might I be exposed to PCBs?

- Using old fluorescent lighting fixtures and electrical devices and appliances, such as television sets and refrigerators, that were made 30 or more years ago. These items may leak small amounts of PCBs into the air when they get hot during operation, and could be a source of skin exposure.
- Eating contaminated food. The main dietary sources of PCBs are fish (especially sportfish caught in contaminated lakes or rivers), meat, and dairy products.
- Breathing air near hazardous waste sites and drinking contaminated well water.
- In the workplace during repair and maintenance of PCB transformers; accidents, fires or spills involving transformers, fluorescent lights, and other old electrical devices; and disposal of PCB materials.

How can PCBs affect my health?

The most commonly observed health effects in people exposed to large amounts of PCBs are skin conditions such as acne and rashes. Studies in exposed workers have shown changes in blood and urine that may indicate liver damage. PCB exposures in the general population are not likely to result in skin and liver effects. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs.

Animals that ate food containing large amounts of PCBs for short periods of time had mild liver damage and some died. Animals that ate smaller amounts of PCBs in food over

Polychlorinated Biphenyls

several weeks or months developed various kinds of health effects, including anemia; acne-like skin conditions; and liver, stomach, and thyroid gland injuries. Other effects of PCBs in animals include changes in the immune system, behavioral alterations, and impaired reproduction. PCBs are not known to cause birth defects.

How likely are PCBs to cause cancer?

Few studies of workers indicate that PCBs were associated with certain kinds of cancer in humans, such as cancer of the liver and biliary tract. Rats that ate food containing high levels of PCBs for two years developed liver cancer. The Department of Health and Human Services (DHHS) has concluded that PCBs may reasonably be anticipated to be carcinogens. PCBs have been classified as probably carcinogenic, and carcinogenic to humans (group 1) by the Environmental Protection Agency (EPA) and International Agency for Research on Cancer (IARC), respectively.

How can PCBs affect children?

Women who were exposed to relatively high levels of PCBs in the workplace or ate large amounts of fish contaminated with PCBs had babies that weighed slightly less than babies from women who did not have these exposures. Babies born to women who ate PCB-contaminated fish also showed abnormal responses in tests of infant behavior. Some of these behaviors, such as problems with motor skills and a decrease in short-term memory, lasted for several years. Other studies suggest that the immune system was affected in children born to and nursed by mothers exposed to increased levels of PCBs. There are no reports of structural birth defects caused by exposure to PCBs or of health effects of PCBs in older children. The most likely way infants will be exposed to PCBs is from breast milk. Transplacental transfers of PCBs were also reported In most cases, the benefits of breast-feeding outweigh any risks from exposure to PCBs in mother's milk.

How can families reduce the risks of exposure to PCBs?

- You and your children may be exposed to PCBs by eating fish or wildlife caught from contaminated locations. Certain states, Native American tribes, and U.S. territories have issued advisories to warn people about PCB-contaminated fish and fish-eating wildlife. You can reduce your family's exposure to PCBs by obeying these advisories.
- Children should be told not play with old appliances, electrical equipment, or transformers, since they may contain PCBs.
- Children should be discouraged from playing in the dirt near hazardous waste sites and in areas where there was a transformer fire. Children should also be discouraged from eating dirt and putting dirty hands, toys or other objects in their mouths, and should wash hands frequently.
- If you are exposed to PCBs in the workplace it is possible to carry them home on your clothes, body, or tools. If this is the case, you should shower and change clothing before leaving work, and your work clothes should be kept separate from other clothes and laundered separately.

Is there a medical test to show whether I've been exposed to PCBs?

Tests exist to measure levels of PCBs in your blood, body fat, and breast milk, but these are not routinely conducted. Most people normally have low levels of PCBs in their body because nearly everyone has been environmentally exposed to PCBs. The tests can show if your PCB levels are elevated, which would indicate past exposure to above-normal levels of PCBs, but cannot determine when or how long you were exposed or whether you will develop health effects.

Has the federal government made recommendations to protect human health?

The EPA has set a limit of 0.0005 milligrams of PCBs per liter of drinking water (0.0005 mg/L). Discharges, spills or accidental releases of 1 pound or more of PCBs into the environment must be reported to the EPA. The Food and Drug Administration (FDA) requires that infant foods, eggs, milk and other dairy products, fish and shellfish, poultry and red meat contain no more than 0.2-3 parts of PCBs per million parts (0.2-3 ppm) of food. Many states have established fish and wildlife consumption advisories for PCBs.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2000. Toxicological profile for polychlorinated biphenyls (PCBs). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information?

For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology and Human Health Sciences, 1600 Clifton Road NE, Mailstop F-57, Atlanta, GA 30329-4027.

Phone: 1-800-232-4636.

ToxFAQs™ Internet address via WWW is http://www.atsdr.cdc.gov/toxfaqs/index.asp.

ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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TIN AND TIN COMPOUNDS

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about tin and tin compounds. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because these substances may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: The main route of exposure to tin and tin compounds is by eating food contaminated with these compounds. Swallowing large amounts of inorganic tin compounds may cause stomachache, anemia, and liver and kidney problems. Humans exposed for a short period of time to some organic tin compounds have experienced skin and eye irritation and neurological problems; exposure to very high amounts may be lethal. Metallic tin and inorganic tin compounds have been found in at least 214 of the 1,662 National Priority List (NPL) sites identified by the Environmental Protection Agency (EPA). Organic tin compounds have been identified in at least 8 of the NPL sites.

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What are tin and tin compounds?

Tin is a natural element in the earth's crust. It is a soft, white, silvery metal that does not dissolve in water. It is present in brass, bronze, pewter, and some soldering materials. Tin metal is used to line cans for food, beverages, and aerosols.

Tin can combine with other chemicals to form compounds. Combinations with chemicals like chlorine, sulfur, or oxygen are called inorganic tin compounds (i.e., stannous chloride, stannous sulfide, stannic oxide). These are used in toothpaste, perfumes, soaps, food additives and dyes. Tin also can combine with carbon to form organotin compounds (i.e., dibutyltin, tributyltin, triphenyltin). These compounds are used to make plastics, food packages, plastic pipes, pesticides, paints, and pest repellents.

Tin metal, and inorganic and organic tin compounds can be found in the air, water, and soil near places where they are naturally present in the rocks, or where they are mined, manufactured, or used.

What happens to tin and tin compounds when they enter the environment?

❑ Tin is released into the environment by both natural processes and human activities, such as mining, coal and oil combustion, and the production and use of tin compounds. Metallic tin released to the environment will quickly form inorganic tin compounds.

❑ Inorganic tin cannot be destroyed in the environment; it can only change its form. Organic tin compounds can be degraded to inorganic tin compounds by sunlight and bacteria.

❑ In the atmosphere, tin exists as gases and fumes, and attaches to dust particles. Particles in the air containing tin may be transported by wind or washed out of the air by rain or snow.

❑ Inorganic tin binds to soil and to sediments in water. Some inorganic tin compounds dissolve in water.

❑ Organic tin compounds stick to soil sediment, and particles in water.

❑ The time each organic tin compound stays in water and soil differs for each compound. In water it may range from days to weeks and in soil it may be years.

❑ Organic tin compounds can build up in fish, other organisms, and plants.

How might I be exposed to tin and tin compounds?

❑ Eating food or drinking liquids from tin-lined cans (today greater than 90% of tin-lined cans used for food are protected with lacquer).

❑ Breathing air or touching dusts that contains tin in the workplace or near hazardous waste sites.

❑ Exposure to some organotins can occur by eating seafood from coastal waters or from contact with household products that contain organotin compounds (i.e., some plastics).

How can tin and tin compounds affect my health?

Metallic tin is not very toxic due to its poor gastrointestinal absorption. Human and animal studies show that ingestion

of large amounts of inorganic tin compounds can cause stomachache, anemia, and liver and kidney problems. Breathing or swallowing, or skin contact with some organotins, such as trimethyltin and triethyltin compounds, can interfere with the way the brain and nervous system work. In severe cases, it can cause death.

Some organotin compounds, such as dibutyltins and tributyltins, have been shown to affect the immune system in animals, but this has not been examined in people. Studies in animals also have shown that some organotins, such as dibutyltins, tributyltins, and triphenyltins can affect the reproductive system. This, also, has not been examined in people.

Inorganic or organic tin compounds placed on the skin or in the eyes can produce skin and eye irritation.

How likely are tin and tin compounds to cause cancer?

There is no evidence that tin or tin compounds cause cancer in humans. Studies in animals have not shown evidence of carcinogenicity for inorganic tin. A study in rats and another in mice showed that a specific organotin, triphenyltin hydroxide, can produce cancer in animals after long-term oral administration.

The Department of Health and Human Services (DHHS), the International Agency for Research on Cancer (IARC), and the EPA have not classified metallic tin or inorganic tin compounds for carcinogenicity. The EPA has determined that a specific organotin, tributyltin oxide, is not classifiable as to human carcinogenicity.

How can tin and tin compounds affect children?

There are no studies on health effects in children exposed to tin and tin compounds. However, it is reasonable to assume that children would exhibit the same type of health effects observed in exposed adults. There are no reports of adverse developmental effects in humans exposed to tin or its compounds. There are no studies examining developmental effects in animals exposed to inorganic tin. Exposure of rodents to some organotins during pregnancy has produced birth defects in the newborn animals. A study with tributyltin in rats found that exposure during gestation, lactation, and following lactation affected the development of some sexual characteristics in female rats. We do not know whether tin and tin compounds can be passed to newborn animals in maternal milk. We know that some organotins can cross the placenta and reach the fetus in animals.

How can families reduce the risk of exposure to tin and tin compounds?

- ❏ Because tin is naturally found in the environment, we cannot avoid being exposed to it.
- ❏ Reduce the amount of canned products you eat or drink and store unused portions in separate containers.
- ❏ Reduce your consumption of seafood from waters that may be contaminated with organic tin compounds and your contact with household products that contain organotin compounds (for example, silicon-coated baking parchment paper).

Is there a medical test to show whether I've been exposed to tin and tin compounds?

There are tests to measure total tin and specific organotin compounds in your blood, urine, feces, and body tissues. Normally, small amounts of tin can be found in the body because of the daily exposure to small amounts in the food. Therefore, the available tests cannot tell you when you were exposed or the exact amount of tin to which you were exposed, but can help determine if you were recently exposed to an unusually high amount of tin. These tests are not routinely performed at your doctor's office, but your doctor can take samples and send them to a testing laboratory.

Has the federal government made recommendations to protect human health?

The Occupational Safety and Health Administration (OSHA) has set a limit of 0.1 milligrams per cubic meter of air (0.1 mg/m^3) in the workplace for organotin compounds and 2.0 mg/m^3 for inorganic tin compounds, except oxides.

The Food and Drug Administration (FDA) regulates the use of some organic tin compounds in coatings and plastic food packaging. The FDA also has set limits for the use of an inorganic tin compound, stannous chloride, as an additive for food.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Tin and Compounds (Update). Atlanta, GA: U.S. Department of Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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ZINC

CAS # 7440-66-6

Division of Toxicology ToxFAQs™ August 2005

This fact sheet answers the most frequently asked health questions (FAQs) about zinc. For more information, call the ATSDR Information Center at 1-888-422-8737. This fact sheet is one in a series of summaries about hazardous substances and their health effects. It is important you understand this information because this substance may harm you. The effects of exposure to any hazardous substance depend on the dose, the duration, how you are exposed, personal traits and habits, and whether other chemicals are present.

HIGHLIGHTS: Zinc is a naturally occurring element. Exposure to high levels of zinc occurs mostly from eating food, drinking water, or breathing workplace air that is contaminated. Low levels of zinc are essential for maintaining good health. Exposure to large amounts of zinc can be harmful. It can cause stomach cramps, anemia, and changes in cholesterol levels. Zinc has been found in at least 985 of the 1,662 National Priority List sites identified by the Environmental Protection Agency (EPA).

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What is zinc?

Zinc is one of the most common elements in the earth's crust. It is found in air, soil, and water, and is present in all foods. Pure zinc is a bluish-white shiny metal.

Zinc has many commercial uses as coatings to prevent rust, in dry cell batteries, and mixed with other metals to make alloys like brass, and bronze. A zinc and copper alloy is used to make pennies in the United States.

Zinc combines with other elements to form zinc compounds. Common zinc compounds found at hazardous waste sites include zinc chloride, zinc oxide, zinc sulfate, and zinc sulfide. Zinc compounds are widely used in industry to make paint, rubber, dyes, wood preservatives, and ointments.

What happens to zinc when it enters the environment?

❏ Some is released into the environment by natural processes, but most comes from human activities like mining, steel production, coal burning, and burning of waste.
❏ It attaches to soil, sediments, and dust particles in the air.
❏ Rain and snow remove zinc dust particles from the air.
❏ Depending on the type of soil, some zinc compounds can move into the groundwater and into lakes, streams, and rivers.
❏ Most of the zinc in soil stays bound to soil particles and does not dissolve in water.
❏ It builds up in fish and other organisms, but it does not build up in plants.

How might I be exposed to zinc?

❏ Ingesting small amounts present in your food and water.
❏ Drinking contaminated water or a beverage that has been stored in metal containers or flows through pipes that have been coated with zinc to resist rust.
❏ Eating too many dietary supplements that contain zinc.
❏ Working on any of the following jobs: construction, painting, automobile mechanics, mining, smelting, and welding; manufacture of brass, bronze, or other zinc-containing alloys; manufacture of galvanized metals; and manufacture of machine parts, rubber, paint, linoleum, oilcloths, batteries, some kind of glass, ceramics, and dyes.

How can zinc affect my health?

Zinc is an essential element in our diet. Too little zinc can cause problems, but too much zinc is also harmful.

Harmful effects generally begin at levels 10-15 times higher than the amount needed for good health. Large doses taken by mouth even for a short time can cause stomach cramps, nausea, and vomiting. Taken longer, it can cause anemia and decrease the levels of your good cholesterol. We do not know if high levels of zinc affect reproduction in humans. Rats that were fed large amounts of zinc became infertile.

Inhaling large amounts of zinc (as dusts or fumes) can cause a specific short-term disease called metal fume fever. We do not know the long-term effects of breathing high levels of zinc.

Putting low levels of zinc acetate and zinc chloride on the skin of rabbits, guinea pigs, and mice caused skin irritation. Skin irritation will probably occur in people.

How likely is zinc to cause cancer?

The Department of Health and Human Services (DHHS) and the International Agency for Research on Cancer (IARC) have not classified zinc for carcinogenicity. Based on incomplete information from human and animal studies, the EPA has determined that zinc is not classifiable as to its human carcinogenicity.

How can zinc affect children?

Zinc is essential for proper growth and development of young children. It is likely that children exposed to very high levels of zinc will have similar effects as adults. We do not know whether children are more susceptible to the effects of excessive intake of zinc than the adults.

We do not know if excess zinc can cause developmental effects in humans. Animal studies have found decreased weight in the offspring of animals that ingested very high amounts of zinc.

How can families reduce the risks of exposure to zinc?

❑ Children living near waste sites that contain zinc may be exposed to higher levels of zinc through breathing contaminated air, drinking contaminated drinking water, touching or eating contaminated soil.

❑ Discourage your children from eating soil or putting their hands in their mouths and teach them to wash their hands frequently and before eating.

❑ If you use medicines or vitamin supplements containing zinc, make sure you use them appropriately and keep them out of the reach of children.

Is there a medical test to determine whether I've been exposed to zinc?

There are tests available to measure zinc in your blood, urine, hair, saliva, and feces. These tests are not usually done in the doctor's office because they require special equipment. High levels of zinc in the feces can mean high recent zinc exposure. High levels of zinc in the blood can mean high zinc consumption and/or high exposure. Tests to measure zinc in hair may provide information on long-term zinc exposure; however, the relationship between levels in your hair and the amount of zinc you were exposed to is not clear.

Has the federal government made recommendations to protect human health?

The EPA recommends that drinking water should contain no more than 5 milligrams per liter of water (5 mg/L) because of taste. The EPA requires that any release of 1,000 pounds (or in some cases 5,000 pounds) into the environment be reported to the agency.

To protect workers, the Occupational Safety and Health Administration (OSHA) has set an average limit of 1 mg/m^3 for zinc chloride fumes and 5 mg/m^3 for zinc oxide (dusts and fumes) in workplace air during an 8-hour workday, 40-hour workweek.

Similarly, the National Institute for Occupational Safety and Health (NIOSH) has set the same standards for up to a 10-hour workday over a 40-hour workweek.

References

Agency for Toxic Substances and Disease Registry (ATSDR). 2005. Toxicological Profile for Zinc (Update). Atlanta, GA: U.S. Department of Public Health and Human Services, Public Health Service.

Where can I get more information? For more information, contact the Agency for Toxic Substances and Disease Registry, Division of Toxicology, 1600 Clifton Road NE, Mailstop F-32, Atlanta, GA 30333. Phone: 1-888-422-8737, FAX: 770-488-4178. ToxFAQs Internet address via WWW is http://www.atsdr.cdc.gov/toxfaq.html. ATSDR can tell you where to find occupational and environmental health clinics. Their specialists can recognize, evaluate, and treat illnesses resulting from exposure to hazardous substances. You can also contact your community or state health or environmental quality department if you have any more questions or concerns.

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Appendix H

Occupational Exposure Limits (OEL) for Contaminants of Potential Concern

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CHEMICAL HAZARD EXPOSURE LIMITS

COMPOUND/ DESCRIPTION	OSHA PEL EXPOSURE LIMIT	WA-DOSH PEL EXPOSURE LIMIT	ACGIH TLV EXPOSURE LIMITS	NIOSH REL EXPOSURE LIMITS
Arsenic, metallic grey solid/dust	PEL: 0.010 mg/m³	PEL: 10 mg/m³	TLV: 0.01 mg/m³	REL: 0.002 mg/m³ IDLH: 5 mg/ m³
Cadmium, soft, silvery-white metal. Usually found as dust	TWA: 0.005 mg/m³ IDLH: 9 mg/m³	No available data	TLV: 0.01 mg/m³ (total particulates) TLV: 0.002 mg/m³ respirable particulate	ALARA
Chromium, steely-grey, lustrous, hard, and brittle transition metal	PEL: 1 mg/ m³ IDLH: 250 mg/m³	No available data	TLV: 0.5 mg/m³	REL: 0.5 mg/m³ IDLH: 250 mg/m³
Lead, soft heavy metal that is silvery with a hint of blue; it tarnishes to a dull gray color when exposed to air	PEL: 0.05 mg/m³	AL: 30 µg/m³ PEL: 0.05 mg/m³	TLV: 0.05 mg/m³	REL: 0.05 mg/m³ IDLH: 100 mg/m³
Mercury (and inorganic compounds as mercury), silvery liquid metal in pure forms	No available data	No available data	No available data	No available data
Nickel, silvery-white lustrous metal with a slight golden tinge	PEL as metal 0.5 mg/m³, insoluble 0.1 mg/m³, soluble 0.05 mg/m³	No available data	IHL: 0.1 mg/m³	TWA: 0.015 mg/m³
Zinc, slightly brittle metal and has a silvery-greyish appearance when oxidation is removed	TLV/PEL none Treat as Particles not otherwise specified and maintain levels below 3 mg/m³ respirable and 10 mg/m³ inhalable	No available data	No available data	No available data
Tributyltin	No available data	No available data	No available data	No available data
Carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs)* coal tar pitch volatiles	PEL: 0.2 mg/m³	TWA: 0.2 mg/m³ STEL: 0.6 mg/ m³	0.2 mg/m³ (TLV)	0.1 mg/m³ (TWA) 80 mg/m³ (IDLH)

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COMPOUND/ DESCRIPTION	OSHA PEL EXPOSURE LIMIT	WA-DOSH PEL EXPOSURE LIMIT	ACGIH TLV EXPOSURE LIMITS	NIOSH REL EXPOSURE LIMITS
Polychlorinated biphenyls (PCBs), pale-yellow viscous liquids	No available data	No available data	TLV = 0.5 mg/m^3	No available data
Dioxins/Furans	No available data	No available data	No available data	No available data

Notes:

*If a State has established a PEL more restrictive than the OSHA limits, then the applicable State limit becomes the legal limit.
IDLH = immediately dangerous to life or health
OSHA = Occupational Safety and Health Administration
ACGIH = American Conference of Governmental Industrial Hygienists
NIOSH = National Institute of Occupational Safety & Health
mg/m3 = milligrams per cubic meter (dust or particulate conc.)
TWA = time-weighted average (Over 8 hrs.), basis of most exposure limits
PEL = permissible exposure limit, legally enforceable
TLV = threshold limit value (over 8 hrs)
REL= recommended exposure limit (over 10 hrs)
STEL = short-term exposure limit (15 min)
Ceiling (C) – concentration never to be exceeded
ppm = parts per million (vapor conc.)

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Appendix I
Personal Protective Equipment Program

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GeoEngineers

Personal Protective Equipment Program

Revised September 2023

GeoEngineers
Health & Safety World
GEO-CENTRIC BEHAVIOR ACCEPTED SAFETY RULES
HAZARD AWARENESS INDIVIDUAL BEHAVIORS & TALENTS

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Personal Protective Equipment Program

Purpose

The purpose of the GeoEngineers Personal Protective Equipment (PPE) Program is to reduce employee exposure to hazards through the use of PPE when engineering and administrative controls are not feasible or able to completely remove the hazards.

Scope

This program covers each employee who may need to wear PPE and ensures that they have been properly trained and/or retrained when the workplace changes; previous training becomes obsolete; the type of PPE changes; or when the employee demonstrates lack of use, improper use, or insufficient skill or understanding in using the PPE.

Responsibilities

Principals/Associates/Project Managers/Group Leaders/Site Supervisors—Responsible for ensuring that the provisions of this program are implemented and followed at locations in which they have oversight and influence. Including:

- Conducting worksite evaluations in cooperation with other supervisors and Health and Safety Program Managers to identify if PPE is being properly utilized.
- Ensuring effective first aid response and supplies are readily available.
- Ensuring employees are properly trained in safe worksite habits and understand how to use and the role of their PPE.
- Immediately reporting up all workplace related injuries and illnesses which occur in their area of responsibility. Provide written reports of all investigations and planned corrective actions to the Health and Safety Manager.
- Correct identified workplace hazards or report up deficiencies they cannot correct.
- Communicate key health and safety regulations to affected employees

Health and Safety Manager (HSM)—GeoEngineers' HSM shall monitor and evaluate the Program for compliance and effectiveness. Improvement opportunities and changes in regulations or other legal requirements shall be promptly addressed. Additional duties include:

- Conduct worksite evaluations in cooperation with supervisors and employees to identify workplace hazards and the ways to avoid or correct them to prevent injuries.
- Establish systems for ensuring supervisors and employees comply with the company or worksite PPE policy and utilize the safety tools, equipment, and safety training for their tasks.
- Establish a system for communicating with employees in readily understandable methods relevant and up to date information related to their safety and health.
- Provide training to employees and supervisors that allows them to identify workplace hazards so that they can prevent injuries.
- Maintain records of activities and training related to the PPE program.
- Review the effectiveness of the PPE program with supervisor and employee input at least annually.

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Employees—GeoEngineers' employees are responsible and accountable for complying with this program, including:

- Attending all required training programs provided.
- Maintaining their PPE in good working condition and replacing PPE when necessary.
- Complying with worksite policies regarding safety and work practices.
- Reporting known or suspected safety hazards to their Supervisor or Safety Coordinator.
- Reporting all workplace related injuries or illnesses to their supervisor.

Definitions

Personal Protective Equipment (PPE)—includes a variety of devices and garments to protect workers from injuries. PPE is designed to protect Eyes/Face; Head; Ears/Hearing; Feet; Respiratory System and; Hands, Arms, and Whole Body. PPE includes such items as: Safety glasses; Goggles; Face shields; Hard hats; Safety shoes; Gloves; High Visibility Garments

General Requirements

This program provides guidance on the use, issuing, inspection, maintenance, and replacement of PPE and protective work clothing. All basic work-required PPE will be provided to GeoEngineers' employees at no cost to them in a sanitary and reliable condition. Additional PPE may be required based on the hazard or client requirements. PPE selected must be fitted to each affected employee. Defective and damaged equipment SHALL NOT be used.

GeoEngineers will provide reimbursement for an initial field clothing allowance for new employees who work in the field to purchase steel-toed work boots, rubber muck boots, and outerwear for protection from all weather conditions (rain, cold, heat, etc.), up to a combined total of $400. Employees who work in the field are eligible for subsequent $400 reimbursement every 2 years following their first year of employment, with the exception of field technicians and drillers, who will be eligible for the $400 reimbursement every year. Manager approval will be required for allowance exceedances.

GeoEngineers Safety Store provides pre-approved PPE for GeoEngineers' employees to order at no cost to them. The Safety Store is accessible on the Health and Safety Department page.

GeoEngineers field staff shall have in their possession and wear on project sites a full accompaniment of basic PPE including:

- Hard hat.
- Safety vest or similar high visibility clothing.
- Appropriate footwear to mitigate potential hazards associated with slips, falls (i.e., traction) and protection of the feet. Steel toed boots are required when working around or with heavy materials and equipment.

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- Appropriate gloves (accounting for dexterity needs as well as potential chemical and/or sharp object protection) to mitigate potential hazards associated with cutting, grasping and hand exposures.
- Appropriate eye protection (e.g., safety glasses and/or face shields) to mitigate potential hazards associated with foreign objects or materials that could enter the eyes.
- Appropriate hearing protection (e.g., ear plugs and/or noise reducing ear muffs) to mitigate potential hearing damage from loud noises.

Implementation

Safety Glasses

Safety glasses worn by employees shall have permanent side shields and meet the requirements of ANSI/ISEA standard; Z87.1-2010, and ANSI Z87.1-2003, Occupational and Educational Personal Eye and Face Protection Devices.

In general, eye protection must:

- Fit comfortably.
- Be durable.
- Be easy to clean.
- Not restricting vision or movement.
- Not interfering with other PPE.
- Be inspected daily for damage and replaced as soon as possible if damaged.

Prescription Safety Glasses

Employees who wear prescription glasses may utilize a stipend to purchase prescription eye protection as well. Refer to GeoEngineers Expense Guidelines for the current reimbursable allowance provided for eye exams and glasses. Current reimbursement as of writing this program is $180 every 2 years. Employees who wear corrective lenses must wear eye protection which incorporates their prescription in its design. Ordinary corrective eyewear does not provide the required level of protection. Contact lenses should not be used in any hazardous environment.

Hard Hat

A hard hat shall be worn on project field sites as standard protection and to demonstrate to the public that we are conducting official business. The only exception is when the hard hat creates more of a hazard to wear it than not or during desk work in the field. In those situations, alternate head gear such as bump hats or skill hats should be discussed with the HSM.

- Where site-specific job safety analysis and PPE assessments have not been completed, hard hats are mandatory with the exception inside vehicle cabs and office areas.
- Hard hats are required in construction areas.
- Hard hats for electrical maintenance and construction work shall meet the applicable health and safety standards/requirements for limiting electric shock, burns or impact.
- Head protection is to be used in accordance with the manufacturer's instructions.

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Protective hats must meet ANSI STD. Z89.1 – 2009 and ANSI STD Z89.1-2003. There are three general classes of head protection which have been updated.

Classifications Under Old and New Standards			
Z89.1 – 1986 (Old Standard)	Z89.1 – 1997 onward (New Standard)	Application	Test Voltage
A	G	General	2,200 Volts
B	E	Electrical	20,000 Volts
C	C	Conductive	Not Tested

Types and Classes

- Type 1 Hard Hat—These devices are intended only to reduce the force of impact resulting from a blow to the top of the head. Hard hats that meet the requirements of the Z89.1 - 2009 revision should meet this specification also. Both cap and hat design styles can be a Type 1.
- Type 2 Hard Hat—A Type 2 head protector is a hat or cap that provides side impact protection as well as the top or vertical impact protection of a Type 1 device. They are typically lined with high density foam on the inside.
- Class G (General)—Class G head protectors are intended to reduce the danger of contact exposure to low voltage conductors. Test samples are proof tested at 2,200 volts (phase to ground). These were formerly known as Class A hard hats.
- Class E (Electrical)—Class E helmets are intended to reduce the danger of contact exposure to low voltage conductors. Test samples are proof tested at 20,000 volts (phase to ground). These were formerly known as Class E hard hats.
- Class C (Conductive)—Class C hard hats are not intended to provide protection against contact with electrical conductors.
- Note: Neither the Class G nor Class E electrical insulation properties are intended as an indication of the voltage at which the hard hat will protect the wearer.
- Bump Caps—Bump caps do not meet the ANSI requirements. They are recommended for areas where protection is needed from head bumps and lacerations.

Hard Hat Maintenance

- Inspect your hard hat for dents, cuts, breaks, and other damage regularly.
- Do not put excessive stickers or paint on your hard hat unless approved by a supervisor.
- Replace your hard hat if it is involved in an impact collision.
- Replace your hard hat suspension system once a year.
- Replace your hard hat entirely every five years.

Safety Shoes

Safety shoes must be closed shoes which, at a minimum, provide both impact and compression protection in/around the toe area shall be worn as minimum foot protection when in the field, laboratory areas and construction areas.

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- Footwear shall be non-porous and must cover the toes and instep.
- Selected safety footwear for personnel working in the field, should provide ankle support.
- Safety footwear shall have smooth leather uppers, (no suede). Soles may be leather, rubber, or composition with either a tread or rugged surface.
- When working in wet conditions rubber boots should be worn over the safety footwear.
- Where fall hazards are present steel-toed protection must meet or exceed ASTM F-2413-2005.

The following table gives PPE boot materials and the general benefits they provide.

Safety Feature	Benefits
Impact-resistant toes	Protects feet from falling objects or compression
Heat-resistant soles	Protects feet from extreme heat
Puncture resistant metal insoles	Protects the soles of the feet from sharp debris common on construction sites
Rubber	Provides traction and flexibility
Electrically conductive soles	Grounds the wearer to avoid static discharge in explosive environments
Electrically nonconductive soles	Insulates feet from electrically charged materials or surfaces

Purchase of Safety Shoes

Refer to GeoEngineers Expense Guidelines for the current reimbursable allowance provided for safety shoes and rubber boots. As of writing this program, the current stipend is $400 every 2 years for all self-purchased PPE, including safety shores. Field technicians and drillers are eligible for their 400$ PPE reimbursement every year instead of every 2 years.

Clothing

Long trousers must be worn (no shorts). Short-sleeve shirts must have a minimum of 4-inch sleeves (no sleeveless shirts or tank tops). Note: Personnel working with or in the vicinity of rotating equipment should not wear loose clothing (e.g., unbuttoned long sleeves, unfastened coveralls, un-tucked shirts, neck wear, etc.). Branded clothing is available on the GeoEngineers company store and may be subject to reimbursement or discounts upon purchase. See below for details.

High Visibility Clothing

High visibility clothing shall be provided by GeoEngineers and worn for field operations. High visibility vests are required on construction sites, on terminals, while conducting recons, working on roads, paths, and locations where there is moving equipment. Vest must be both bright in color and reflective.

Rain Gear

Refer to GeoEngineers Expense Guidelines for the current reimbursable allowance provided for rain gear. As of writing this program, rain gear may be purchased as PPE using the $400 self-purchased PPE stipend. Rain gear purchased from the Company Store by non-field employees receives a 50% discount.

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Fire Retardant Clothing

Fire retardant clothing is required predominantly on oil and gas sites, but based on client requirement may also be required on other sites as well. Fire retardant clothing may be made from several types of thermal protective fabrics (see below). Fire retardant clothing required by the client shall be purchased by GeoEngineers and replaced when needed. An assessment process such as the Safety Conversation/Observation shall be used to maintain compliance.

THERMAL PROTECTIVE PERFORMANCE (TPP) OF VARIOUS FABRICS **

Fabric	Nominal Weight (oz/yd^2)	Ignites (Yes/No)	TPP (cal/cm^2)
NOMEX IIIA	4.5	NO	10.6
NOMEX IIIA	6.0	NO	13.1
NOMEX III (Without static-dissipative fiber)	6.0	NO	13.1
Cotton	6.5	YES	***
Polyester/Cotton Blend (65%/35%)	7.0	YES	***
Flame-Retardant Treated Cotton	6.0	NO	7.6
Flame Retardant Treated Cotton	9.0	NO	9.8

Notes:

Fabric was tested according to ASTM D-4108 recommended mounting procedures to test single-layer fabrics, using combined radiant and convective heat.

** Each fabric was home laundered five times prior to testing

*** Fabric ignited and did not pass the flame resistance test (vertical flame test), so meaningful TPP values could not be obtained.

As of writing this program, fire retardant clothing may be purchased by a GeoEngineers employee and reimbursed up to $500 every two years.

Hearing Protection

Hearing protection will be provided to employees to guard against noise levels in excess of 90 decibels (dBA) and is required to be worn. Employees whose daily noise exposure exceeds an 8 hour, time weighted average (TWA) of 85 dBA must wear hearing protection and must participate in the GeoEngineers hearing conservation program. Hearing protection standards and practices will be based on the most up to date guidance from Occupational Safety and Health Administration (OSHA) standard 1910.95 – Occupational Noise Exposure.

Additionally, if the average noise level over an 8-hour period is averaging 105 dBA or louder, double hearing protection is required. Meaning usage of both internal ear plugs and external ear muffs.

For more details on hearing protection, see GeoEngineers Hearing Conservation Program.

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Gloves

Gloves made with a material(s) suitable for protection against specific hazards that may be encountered (e.g., chemical resistant gloves) should be worn or readily available when any task with potential hand hazards is undertaken. This would include handling contaminated soil or materials and handling items that could result in pinches, cuts, or scrapes, when drilling, sampling, or performing maintenance.

- Loose gloves should not be worn when working with rotating equipment (e.g., drill presses, shafts, sheaves, gears, sprockets, pedestal, grinders, and "in-rolling" pinch points, etc.) where there is a chance the glove "catches" and pulls an employee's arm into the equipment.
- When performing job specific tasks, which could require the gloves to be removed, they may be removed to perform that task and then put back on upon completion of the specific task. Examples would be writing, pressing small start/stop buttons, intricate electrical work, etc.
- Cut-resistant (Kevlar® or equivalent) gloves should be worn when working with knives, blades, razors, box-cutters, glass, or other sharp objects even for general office tasks.

The following table gives PPE glove materials and the general benefits they provide.

PPE	Benefits
Latex, butyl, nitrile, neoprene, synthetics	Protection against burns, chemical burns, biological hazards, irritation, and dermatitis (depending on the specific glove)
Metal mesh, leather, canvas	Protection against cuts, abrasions, punctures, and burns
Fabric and fabric-coated	Protection against dirt and abrasions
Rubber	Protection against cuts, punctures, and abrasions
Insulated	Protection against extreme heat or cold

Personal Flotation Devices (PFDs)

Personal Flotation Device (PFD) use applies to terminals and piers and employees working near other bodies of water. It also applies to activities conducted by GeoEngineers employees at these facilities, including construction, maintenance, inspections, tours and operations. As of June 26, 2002, the inflatable style PFD has not been approved by the Department of Labor and Industries. The regulations for PFDs are in three L&I locations: WAC 296-800-16070 Personal flotation devices, WAC 296-155-235 Working over or adjacent to water, and WAC 296-56-60115 – Other protective measures.

For more detailed information on working over water, see GeoEngineers Working Over Water program.

PFDs are required for the following:

- Any employee in a boat/skiff/barge,
- Any employee is working on top of, or beyond the bull rail

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PFDs are not specifically required when:

- Working behind a guardrail of standard height and strength or other stable restraint
- A single person is working more than 6 feet from the edge
- Working over shallow water (less than chest deep) where floatation would not be achieved (other protective measures required).

Off-Shore Life Jacket (Type I PFD)
Best for open, rough, or remote water, where rescue may be slow coming.

Advantages

- Floats you the best
- Turns most unconscious wearers face-up in water
- Highly visible color

Disadvantages

- Bulky

Near-Shore Buoyant Vest (Type II PFD)
Good for calm, inland water, or where there is good chance for fast rescue.

Advantages

- Turns some unconscious wearers face-up in water
- Less bulky, more comfortable than Off-Shore Life Jacket (Type I PFD)
- Compromise between Type I PFD performance and wearer comfort

Disadvantages

- May be uncomfortable wearing for extended periods
- Will not turn as many people face-up as a Type I PFD will
- In rough water, a wearer's face may often be covered by waves
- Not for extended survival in rough water

Flotation Aid (Type III PFD)
Good for calm, inland water, or where there is good chance of fast rescue.

Advantages

- Generally, the most comfortable type for continuous wear
- Freedom of movement for water skiing, small boat sailing, fishing, etc.
- Available in many styles, including vests and flotation coats

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Disadvantages

- Not for rough water
- Wearer may have to tilt head back to avoid face-down position in water

Respiratory Protection

Respiratory protection is covered in the GeoEngineers Respiratory Protection Program.

Employee-Owned Equipment

As a general rule, employees will not use employee-owned PPE. Exceptions must be approved by the Health and Safety Manager. Any approved employee-owned equipment shall be adequate, maintained and in good sanitary condition before use.

Maintenance and Replacement

Protective equipment must be routinely inspected and maintained/replaced if any damage or defects are identified. Mandatory protective work clothing and personal protective equipment must be maintained and replaced as necessary in accordance with the PPE program.

Site-Specific Hazard Assessments

Site-specific PPE Hazard Assessments shall be completed as part of job hazard analysis or health and safety plans.

Training

Training regarding this program shall be provided during new employee orientation, manager webinar or brown bag meetings, and periodically through other forms of communication such as feature safety articles and annual HAZWOPER Refresher. Training shall be documented in Ascent.

Proper training on PPE will include how to properly don, doff, adjust, and wear PPE. The limitations of PPE and proper care/maintenance, useful life expectancy of the PPE, and proper disposal. Retraining will take place when the workplace or type of PPE changes, or when employees display a lack of training in proper use of their PPE

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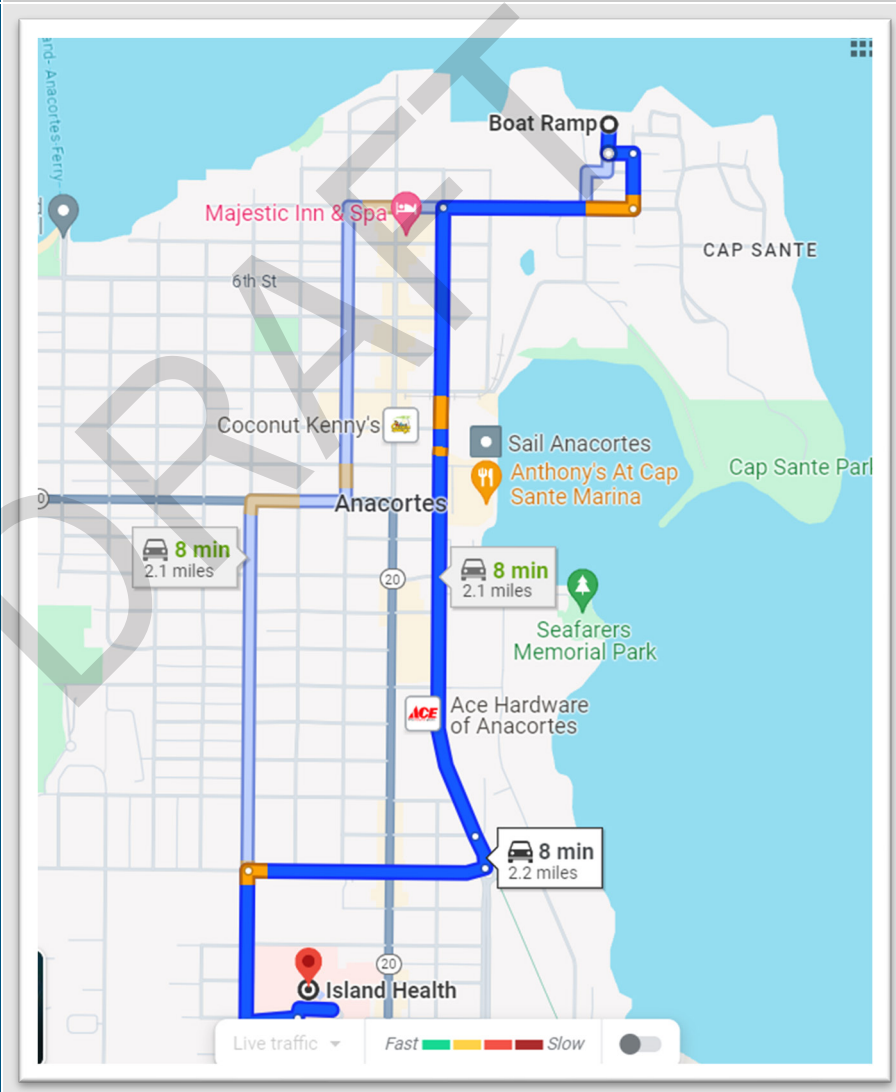
Issued March 1, 2007
Revised September 1, 2015
Revised January 8, 2020
Revised April 25, 2023
Revised September 25, 2023

Appendix J

Emergency/Hospital Contact Information and Directions

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HOSPITAL AND DIRECTIONS

HOSPITAL NAME	**Island Hospital**
HOSPITAL ADDRESS	1211 24th St, Anacortes, WA 98221
PHONE NUMBER (HOSPITAL ER)	(360) 299-1300
DRIVING DISTANCE	2.2 Miles
DRIVING DIRECTIONS	1. Take **4th St** to Q Ave 2. Turn **left** onto **Q Ave** 3. Turn **right** onto **22nd Street** 4. Turn **left** onto **M Avenue** 5. Turn **left** onto **26th Street** 6. Arrive at Destination
DRIVING MAP	

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Attachment 3

Inadvertent Discovery Plan

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INADVERTENT DISCOVERY PLAN

PLAN AND PROCEDURES FOR THE DISCOVERY OF CULTURAL RESOURCES AND HUMAN SKELETAL REMAINS

To request ADA accommodation, including materials in a format for the visually impaired, call Ecology at 360-407-6000 or visit https://ecology.wa.gov/accessibility. People with impaired hearing may call Washington Relay Service at 711. People with a speech disability may call TTY at 877-833-6341.

Site Name(s): **Anacortes Port Log Yard**

Location: **718 4th Street, Anacortes, Washington**

Project Lead/Organization: **Port of Anacortes**

County: **Skagit**

If this Inadvertent Discovery Plan (IDP) is for multiple (batched) projects, ensure the location information covers all project areas.

1. INTRODUCTION

The IDP outlines procedures to perform in the event of a discovery of archaeological materials or human remains, in accordance with applicable state and federal laws. An IDP is required, as part of Agency Terms and Conditions for all grants and loans, for any project that creates disturbance above or below the ground. An IDP is not a substitute for a formal cultural resource review (Executive 21-02 or Section 106).

Once completed, **the IDP shall always be kept at the project site** during all project activities. All staff, contractors, and volunteers shall be familiar with its contents and know where to find it.

2. CULTURAL RESOURCE DISCOVERIES

A cultural resource discovery could be prehistoric or historic artifacts. Examples include (see images for further examples):

- An accumulation of shell, burned rocks, or other food related materials.
- Bones, intact or in small pieces.
- An area of charcoal or very dark stained soil with artifacts.
- Stone tools or waste flakes (for example, an arrowhead or stone chips).
- Modified or stripped trees, often cedar or aspen, or other modified natural features, such as rock drawings.
- Agricultural or logging materials that appear older than 50 years. These could include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, and many other items.
- Clusters of tin cans or bottles, or other debris that appear older than 50 years.
- Old munitions casings. ***Always assume these are live and never touch or move.***
- Buried railroad tracks, decking, foundations, or other industrial materials.
- Remnants of homesteading. These could include bricks, nails, household items, toys, food containers, and other items associated with homes or farming sites.

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The above list does not cover every possible cultural resource. When in doubt, assume the material is a cultural resource.

3. ON-SITE RESPONSIBILITIES

If any employee, contractor, or subcontractor believes that they have uncovered cultural resources or human remains at any point in the project, take the following steps to ***Stop-Protect-Notify***. **If you suspect that the discovery includes human remains, also follow Sections 5 and 6.**

STEP A: Stop Work.

All work must stop immediately in the vicinity of the discovery.

STEP B: Protect the Discovery.

Leave the discovery and the surrounding area untouched and create a clear, identifiable, and wide boundary (30 feet or larger) with temporary fencing, flagging, stakes, or other clear markings. Provide protection and ensure integrity of the discovery until cleared by the Department of Archaeological and Historical Preservation (DAHP) or a licensed, professional archaeologist.

Do not permit vehicles, equipment, or unauthorized personnel to traverse the discovery site. Do not allow work to resume within the boundary until the requirements of this IDP are met.

STEP C: Notify Project Archaeologist (if applicable).

If the project has an archaeologist, notify that person. If there is a monitoring plan in place, the archaeologist will follow the outlined procedure.

STEP D: Notify Project and Washington Department of Ecology (Ecology) contacts.

Project Lead Contacts

Primary Contact		Alternate Contact	
Name:	Robert Trahan	Name:	Phil Cordell
Organization:	GeoEngineers	Organization:	GeoEngineers
Phone:	206.239.3253 (o) 206.240.2300 (c)	Phone:	503.603.6676 (o) 503.603.6676 (c)
Email:	rtrahan@geoengineers.com	Email:	pcordell@geoengineers.com

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Ecology Contacts (completed by Ecology Project Manager)

Ecology Project Manager		Alternate or Cultural Resource Contact	
Name:	Corey King	Name:	Jon Klem
Program:	Toxics Cleanup	Program:	Toxics Cleanup
Phone:	360.280.5684 (o)	Phone:	564.250.6671 (c)
Email:	corey.king@ecy.wa.gov	Email:	jon.klem@ecy.wa.gov

STEP E: Ecology will notify DAHP.

Once notified, the Ecology Cultural Resource Contact or the Ecology Project Manager will contact DAHP to report and confirm the discovery. To avoid delay, the Project Lead/Organization will contact DAHP if they are not able to reach Ecology.

DAHP will provide the steps to assist with identification. DAHP, Ecology, and Tribal representatives may coordinate a site visit following any necessary safety protocols. DAHP may also inform the Project Lead/Organization and Ecology of additional steps to further protect the site.

Do not continue work until DAHP has issued an approval for work to proceed in the area of, or near, the discovery.

DAHP Contact	Human Remains/Bones Contact
Name: Rob Whitlam, PhD	Name: Guy Tasa, PhD
Title: State Archaeologist	Title: State Anthropologist
Cell: 360.890.2615	Cell: 360-790-1633 (24/7)
Email: Rob.Whitlam@dahp.wa.gov	Email: Guy.Tasa@dahp.wa.gov
Main Office: 360-586-3065	

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4. TRIBAL CONTACTS

In the event cultural resources are discovered, the following tribes will be contacted. See Section 10 for Additional Resources.

Tribe: Samish
Name: Jackie Ferry
Title: Natural Resources Manager
Phone: 360.293.6404
Email: jferry@samishtribe.nsn.us

Tribe: Lummi
Name: Lena Tso
Title: Tribal Historic Preservation Officer
Phone: 360.384.2259
Email: lenat@lummi-nsn.gov

Tribe: Swinomish
Name: Josephine Jefferson
Title: Tribal Historic Preservation Officer
Phone: 360.466.7352
Email: jharrison@swinomish.nsn.us

Tribe: Suquamish
Name: Stephanie Trudel
Title: Cultural Resources
Phone: 360.394.8533
Email: STrudel@suquamish.nsn.us

Tribe: Tulalip
Name: Richard Young
Title: Cultural Resources
Phone: 425.239.0182
Email: ryoung@tulaliptribes-nsn.gov

Tribe: Upper Skagit
Name: Scott Schuyler
Title: Cultural, Natural Resources & Emergency Management
Phone: 360.854.7009
Email: ScottS@upperskagit.com

Please provide contact information for additional tribes within your project area, if needed, in Section 11.

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5. FURTHER CONTACTS (if applicable)

If the discovery is confirmed by DAHP as a cultural or archaeological resource, or as human remains, and there is a partnering federal or state agency, Ecology or the Project Lead/Organization will ensure the partnering agency is immediately notified.

Federal Agency:

Agency:
Name:
Title:
Phone:
Email:

Title:
Phone:
Email:

State Agency:

Agency:
Name:

6. SPECIAL PROCEDURES FOR THE DISCOVERY OF HUMAN SKELETAL REMAINS

Any human skeletal remains, regardless of antiquity or ethnic origin, will at all times be treated with dignity and respect. Follow the steps under ***Stop-Protect-Notify.*** For specific instructions on how to handle a human remains discovery, see: *RCW 68.50.645: Skeletal human remains—Duty to notify—Ground disturbing activities—Coroner determination—Definitions*.

Suggestion: If you are unsure whether the discovery is human bone or not, contact Guy Tasa with DAHP, for identification and next steps. Do not pick up the discovery.

Guy Tasa, PhD State Physical Anthropologist
Guy.Tasa@dahp.wa.gov
(360) 790-1633 (Cell/Office)

For discoveries that are confirmed or suspected human remains, follow these steps:

1. Notify law enforcement and the Medical Examiner/Coroner using the contacts below. **Do not call 911** unless it is the only number available to you.

   Enter contact information below (required):

   - Local Medical Examiner or Coroner name and phone:
   - Local Law Enforcement main name and phone:
   - Local Non-Emergency phone number (911 if without a non-emergency number):

2. The Medical Examiner/Coroner (with assistance of law enforcement personnel) will determine if the remains are human or if the discovery site constitutes a crime scene and will notify DAHP.
3. **DO NOT speak with the media, allow photography or disturbance of the remains, or release any information about the discovery on social media.**
4. If the remains are determined to be non-forensic, cover the remains with a tarp or other materials (not soil or rocks) for temporary protection and to shield them from being photographed by others or disturbed.

Further activities:

- Per RCW 27.44.055, RCW 68.50, and RCW 68.60, DAHP will have jurisdiction over non-forensic human remains. Ecology staff will participate in consultation. The Project Lead/Organization may also participate in consultation.
- Documentation of human skeletal remains and funerary objects will be agreed upon through the consultation process described in RCW 27.44.055, RCW 68.50, and RCW 68.60.
- When consultation and documentation activities are complete, work in the discovery area may resume as described in Section 8.

If the project occurs on federal lands (such as a national forest or park or a military

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reservation) the provisions of the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) apply and the responsible federal agency will follow its provisions. Note that state highways that cross federal lands are on an easement and are not owned by the state.

If the project occurs on non-federal lands, the Project Lead/Organization will comply with applicable state and federal laws, and the above protocol.

7. DOCUMENTATION OF ARCHAEOLOGICAL MATERIALS

Archaeological resources discovered during construction are protected by state law RCW 27.53 and assumed eligible for inclusion in the National Register of Historic Places under Criterion D until a formal Determination of Eligibility is made.

The Project Lead/Organization must ensure that proper documentation and field assessments are made of all discovered cultural resources in cooperation with all parties: the federal agencies (if any), DAHP, Ecology, affected tribes, and the archaeologist.

An archaeologist will record all prehistoric and historic cultural material discovered during project construction on a standard DAHP archaeological site or isolate inventory form. They will photograph site overviews, features, and artifacts and prepare stratigraphic profiles and soil/sediment descriptions for minimal subsurface exposures. They will document discovery locations on scaled site plans and site location maps.

Cultural features, horizons, and artifacts detected in buried sediments may require the archaeologist to conduct further evaluation using hand-dug test units. They will excavate units in a controlled fashion to expose features, collect samples from undisturbed contexts, or to interpret complex stratigraphy. They may also use a test unit or trench excavation to determine if an intact occupation surface is present. They will only use test units when necessary to gather information on the nature, extent, and integrity of subsurface cultural deposits to evaluate the site's significance. They will conduct excavations using standard archaeological techniques to precisely document the location of cultural deposits, artifacts, and features.

The archaeologist will record spatial information, depth of excavation levels, natural and cultural stratigraphy, presence or absence of cultural material, and depth to sterile soil, regolith, or bedrock for each unit on a standard form. They will complete test excavation unit level forms, which will include plan maps for each excavation level and artifact counts and material types, number, and vertical provenience (depth below surface and stratum association where applicable) for all recovered artifacts. They will draw a stratigraphic profile for at least one wall of each test excavation unit.

The archaeologist will screen sediments excavated for purposes of cultural resources investigation through 1/8-inch mesh, unless soil conditions warrant 1/4-inch mesh.

The archaeologist will analyze, catalogue, and temporarily curate all prehistoric and historic artifacts collected from the surface and from probes and excavation units. The ultimate disposition of cultural materials will be determined in consultation with the federal agencies (if any), DAHP, Ecology, and the affected tribe(s).

Within 90 days of concluding fieldwork, the archaeologist will provide a technical report

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describing any and all monitoring and resultant archaeological excavations to the Project Lead/Organization, who will forward the report to Ecology, the federal agencies (if any), DAHP, and the affected tribe(s) for review and comment.

If assessment activities expose human remains (burials, isolated teeth, or bones), the archaeologist and Project Lead/Organization will follow the process described in **Section 6**.

8. PROCEEDING WITH WORK

The Project Lead/Organization shall work with the archaeologist, DAHP, and affected tribe(s) to determine the appropriate discovery boundary and where work can continue.

Work may continue at the discovery location only after the process outlined in this plan is followed and the Project Lead/Organization, DAHP, any affected tribe(s), Ecology, and the federal agencies (if any) determine that compliance with state and federal laws is complete.

9. ORGANIZATION RESPONSIBILITY

The Project Lead/Organization is responsible for ensuring:

- This IDP has complete and accurate information.
- This IDP is immediately available to all field staff at the site and available by request to any party.
- This IDP is implemented to address any discovery at the site.
- That all field staff, contractors, and volunteers are instructed on how to implement this IDP.

10. ADDITIONAL RESOURCES

Informative Video

Ecology recommends that all project staff, contractors, and volunteers view this informative video explaining the value of IDP protocol and what to do in the event of a discovery. The target audience is anyone working on the project who could unexpectedly find cultural resources or human remains while excavating or digging. The video is also posted on DAHP's inadvertent discovery language website.

Ecology's IDP Video (https://www.youtube.com/watch?v=ioX-4cXfbDY)

Informational Resources

DAHP (https://dahp.wa.gov)

Washington State Archeology (DAHP 2003) (https://dahp.wa.gov/sites/default/files/Field%20Guide%20to%20WA%20Arch_0.pdf)

Association of Washington Archaeologists (https://www.archaeologyinwashington.com)

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Potentially Interested Tribes

Tribal Contacts: Interactive Map of Tribes by Area
(https://dahp.wa.gov/archaeology/tribal-consultation-information)

Tribal Contacts - WSDOT Tribal Contact Website
(https://wsdot.wa.gov/tribal/TribalContacts.htm)

11. ADDITIONAL INFORMATION

Please add any additional contact information or other information needed within this IDP.

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Implement the IDP if you see…

Chipped stone artifacts.

Examples are:

- Glass-like material.
- Angular material.
- “Unusual” material or shape for the area.
- Regularity of flaking.
- Variability of size.



Stone artifacts from Oregon.



Stone artifacts from Washington.



Biface-knife, scraper, or pre-form found in NE Washington. Thought to be a well knapped object of great antiquity. Courtesy of Methow Salmon Rec. Foundation.

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Implement the IDP if you see…

Ground stone artifacts.

Examples are:

- Unusual or unnatural shapes or unusual stone.
- Striations or scratching.
- Etching, perforations, or pecking.
- Regularity in modifications.
- Variability of size, function, or complexity.



Above: Fishing Weight - credit CRITFC Treaty Fishing Rights website.





Artifacts from unknown locations (left and right images).

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Implement the IDP if you see…

Bone or shell artifacts, tools, or beads.

Examples are:

- Smooth or carved materials.
- Unusual shape.
- Pointed as if used as a tool.
- Wedge shaped like a “shoehorn”.
- Variability of size.
- Beads from shell (dentalium) or tusk.











Upper Left:*Bone Awls from Oregon.*

Upper Center: *Bone Wedge from California.*

Upper Right: *Plateau dentalium choker and bracelet, from Nez Perce National Historical Park, 19th century, made using Antalis pretiosa shells Credit: Nez Perce - Nez Perce National Historical Park, NEPE 8762, Public Domain.*

Above: *Tooth Pendants.*

Right: Bone Pendants. Both from Oregon and Washington.

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Implement the IDP if you see…

Culturally modified trees, fiber, or wood artifacts.

Examples are:

- Trees with bark stripped or peeled, carvings, axe cuts, de-limbing, wood removal, and other human modifications.
- Fiber or wood artifacts in a wet environment.
- Variability of size, function, and complexity.







Left and Below: *Culturally modified tree and an old carving on an aspen (Courtesy of DAHP). These are examples of above ground cultural resources.*

Right, Top to Bottom: *Artifacts from Mud Bay, Olympia: Toy war club, two strand cedar rope, wet basketry*.





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Implement the IDP if you see…

Strange, different, or interesting looking dirt, rocks, or shells.

Human activities leave traces in the ground that may or may not have artifacts associated with them. Examples are:

- "Unusual" accumulations of rock (especially fire-cracked rock).
- "Unusual" shaped accumulations of rock (such as a shape similar to a fire ring).
- Charcoal or charcoal-stained soils, burnt-looking soils, or soil that has a "layer cake" appearance.
- Accumulations of shell, bones, or artifacts. Shells may be crushed.
- Look for the "unusual" or out of place (for example, rock piles in areas with otherwise few rocks).



Shell Midden pocket in modern fill discovered in sewer trench.



Underground oven. Courtesy of DAHP.

Shell Midden with fire cracked rock.





Hearth excavated near Hamilton, WA.

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Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Agricultural or logging equipment. May include equipment, fencing, canals, spillways, chutes, derelict sawmills, tools, etc.
- Domestic items including square or wire nails, amethyst colored glass, or painted stoneware.





Left: Top to Bottom: *Willow pattern serving bowl and slip joint pocket knife discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*

Right: *Collections of historic artifacts discovered during excavations in eastern Washington cities.*





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Implement the IDP if you see…

Historic period artifacts (historic archaeology considered older than 50 years).

Examples are:

- Railway tokens, coins, and buttons.
- Spectacles, toys, clothing, and personal items.
- Items helping to understand a culture or identity.
- Food containers and dishware.



Main Image: *Dishes, bottles, work boot found at the North Shore Japanese bath house (ofuro) site, Courtesy Bob Muckle, Archaeologist, Capilano University, B.C. This is an example of an above ground resource.*





Right, from Top to Bottom: *Coins, token, spectacles and Montgomery Ward pitchfork toy discovered during Seattle Smith Cove shantytown (45-KI-1200) excavation.*





Implement the IDP if you see…

- Old munition casings – if you see ammunition of any type – ***always assume they are live and never touch or move!***
- Tin cans or glass bottles with an older manufacturer's technique – maker's mark, distinct colors such as turquoise, or an older method of opening the container.



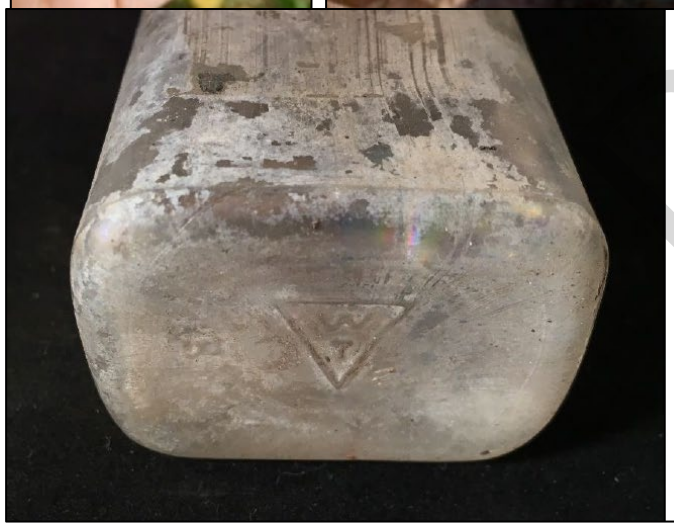


Far Left: *.303 British cartridge found by a WCC planting crew on Skagit River.* ***Don't ever touch something like this!***

Left: *Maker's mark on bottom of old bottle.*

Right: *Old beer can found in Oregon. ACME was owned by Olympia Brewery. Courtesy of Heather Simmons.*







Logo employed by Whithall Tatum & Co. between 1924 to 1938 (Lockhart et al. 2016).



Can opening dates, courtesy of W.M. Schroeder.

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Implement the IDP if you see…

Historic foundations or buried structures.

Examples are:

- Foundations.
- Railroad and trolley tracks.
- Remnants of structures.









Counter Clockwise, Left to Right: *Historic structure 45KI924, in WSDOT right of way for SR99 tunnel. Remnants of Smith Cove shantytown (45-KI-1200) discovered during Ecology CSO excavation, City of Spokane historic trolley tracks (above ground historic resources) uncovered during stormwater project, intact foundation of historic home that survived the Great Ellensburg Fire of July 4, 1889, uncovered beneath parking lot in Ellensburg.*

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Implement the IDP if you see…

Potential human remains.

Examples are:

- Grave headstones that appear to be older than 50 years.
- Bones or bone tools--intact or in small pieces. It can be difficult to differentiate animal from human so they must be identified by an expert.
- These are all examples of animal bones and are not human.







Center: *Bone wedge tool, courtesy of Smith Cove Shantytown excavation (45KI1200).*

Other images (Top Right, Bottom Left, and Bottom) Center: Courtesy of DAHP.





Directly Above: *This is a real discovery at an Ecology sewer project site.*

What would you do if you found these items at a site? Who would be the first person you would call?

Hint: *Read the plan!*

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