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ANCHOR QEA

Memorandum

November 10, 2025

To: Rachel McDermott and Peter Adolphson, WA State Department of Ecology
Denise Taylor and Alison Osullivan, Suquamish Tribe

From: Clay Patmont, Jason Cornetta, and Eli Patmont, Anchor QEA
Lorraine Brown, Exa Data & Mapping Services
Cindy Bartlett, Geosyntec Consultants

cc: Mike Warjone and Leif Hansen, Port Blakely Tree Farms
Lynn Manolopoulos and Nick Wegley, Davis Wright Tremaine

Re: Blakely Harbor Feasibility Study Work Plan Addendum 3: Site-Specific Sediment Regional Background Sampling and Analysis Plan

Introduction

Using approaches and procedures described in the *Blakely Harbor Park Site (Site) Remedial Investigation/Feasibility Study Work Plan* (Work Plan; Geosyntec 2022) along with addenda approved by the Washington State Department of Ecology (Ecology), between 2019 and 2023 data were collected to characterize the nature and extent of contamination in upland and aquatic areas of the Site. In October 2025, the Remedial Investigation (RI) report presenting these data and addressing Ecology and Suquamish Tribe (Tribe) review comments on the earlier draft was submitted to Ecology (Geosyntec 2025).

In September 2024, Ecology approved Addendum 1 to the Feasibility Study (FS) Work Plan, describing sampling and analysis activities to characterize sediment stability and surface sediment natural recovery at the Site (Anchor QEA 2024). FS Work Plan Addendum 1 sampling and analysis activities were completed in January 2025; these data will be summarized in the forthcoming draft FS.

In September 2025, Ecology approved Addendum 2 to the FS Work Plan, describing site-specific sediment wood waste sampling and analysis (Anchor QEA 2025). FS Work Plan Addendum 2 sampling was completed in September 2025; laboratory analyses are ongoing. These data will be summarized in the forthcoming draft FS.

Based on recent discussions with Ecology and the Tribe and consistent with Ecology (2021) guidance for implementing the Sediment Management Standards (SMS) regulation, Chapter 173-204 Washington Administrative Code (WAC), additional sampling and analysis is needed to support development of a site-specific sediment regional background level for key Site bioaccumulative chemicals of concern (CoCs). This information will be used to develop appropriate site-specific sediment cleanup levels and to develop and evaluate remedial alternatives in the forthcoming FS.

This Addendum 3 to the FS Work Plan describes site-specific sediment regional background sampling and analysis; sediment sampling is currently targeted for January 2026.

A forthcoming Addendum 4 to the FS Work Plan describing tissue sampling and analysis to support site-specific human health risk evaluations will be developed in consultation with the Tribe and Ecology. Tissue sampling is currently targeted for spring 2026.

Definition of Regional Background

The SMS regulation includes a two-tiered framework to establish site-specific sediment cleanup levels for human health protection (Ecology 2021). It incorporates natural background as one component of the sediment cleanup objective (SCO) and regional background as one component of the cleanup screening level (CSL). The SMS regulation allows adjustment of the site-specific sediment cleanup level upward from the SCO to the CSL based on technical possibility and/or net adverse environmental impacts to practicably protect human health and the environment at cleanup sites.

The SMS regulation provides a definition for regional background in WAC 173-204-505(16) and parameters for establishing it in WAC 173-204-560(5):

> *"Regional Background" means the concentration of a contaminant within a department defined geographic area that is primarily attributable to diffuse sources, such as atmospheric deposition or stormwater, not attributable to a specific source or release."*

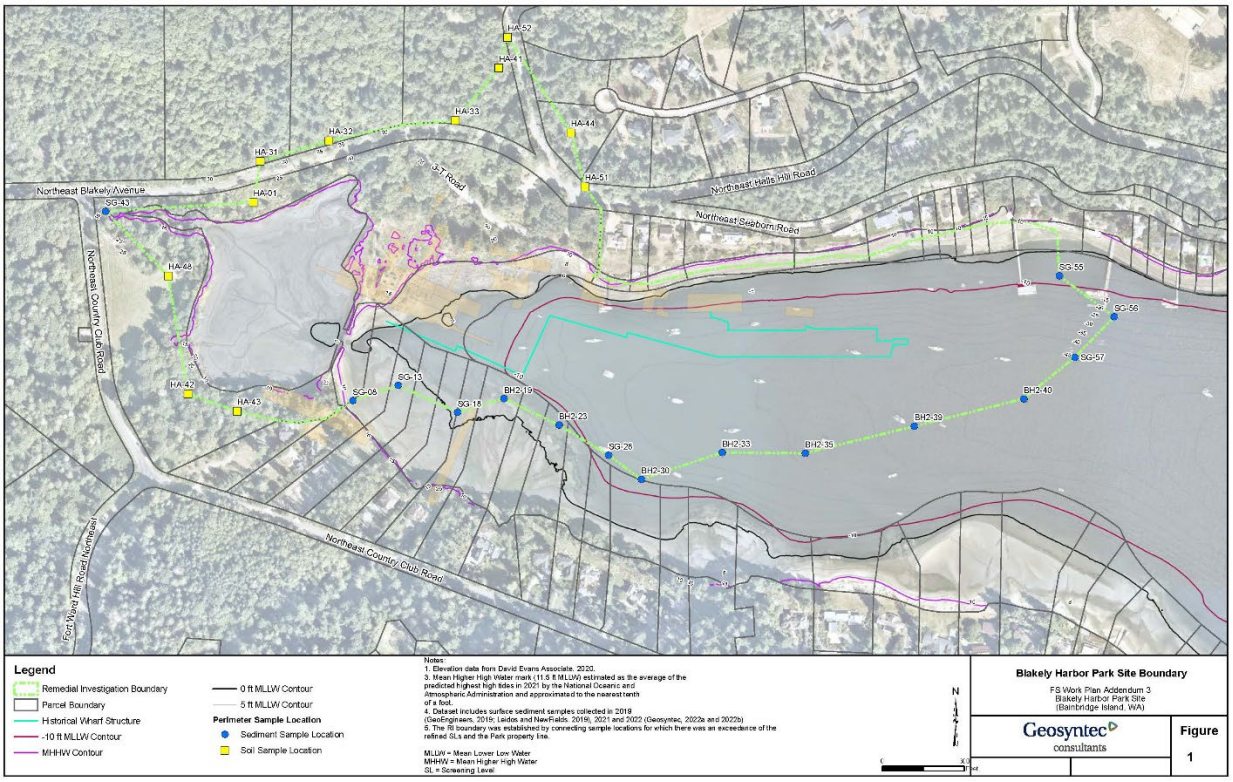
Ecology has developed regional background levels for other areas of Puget Sound to support progress on sediment cleanup projects (Ecology 2015, 2021), but no regional background level has yet been developed for Blakely Harbor. The SMS regulation provides flexibility to establish regional background levels on a case-by-case basis.

Blakely Harbor Conceptual Site Model

Blakely Harbor is located on the southeast side of Bainbridge Island, Washington. The 26-acre upland portion of the Site includes vacant and forested uplands (Geosyntec 2025). The aquatic portion of the Site includes a 7-acre intertidal estuary previously used as a Mill Log Pond with a former tide gate, and 67 acres of marine harbor. Water depths within the RI Study Area (Figure 1) extend to approximately -40 feet mean lower low water (MLLW).

Bottom currents are relatively low throughout the harbor, typically below velocities required to resuspend sediments, except in nearshore areas where waves can resuspend sediments (Williams et al. 2003). Relatively fine-grained sediment (sandy silt) predominates in the former Mill Log Pond and in deeper portions of the harbor, while coarser sediment (sand) is present in the southern harbor (Geosyntec 2025). Radiometric dating performed as part of FS Work Plan Addendum 1 measured an

average net sedimentation rate in the former Mill Log Pond of approximately 0.16 ± 0.05 centimeters (cm) per year over the last century.



Development and operation of the former Port Blakely Mill Company (Mill) began in 1863, when the northern and southern shorelines were dredged and reshaped to extend the shoreline, build new Mill structures, and increase berthing depths for vessel traffic and mooring (Price 1989, Geosyntec 2025). The former Mill Pond area and the shoreline between the former Mill Log Pond and the Inner Harbor were reshaped when the Mill was first built and after two subsequent fires in 1888 and 1907. No known dredging has occurred in the harbor over the last 100 years.

Mill operations peaked in the early 1900s and ended in 1922 (Price 1989). At the height of operations in 1904, the Mill complex included a machine shop, a blacksmith shop, an oil house, foundry, steam dry kilns, planing mill, hog fuel/refuse burner, and warehouse facilities, as well as an expansive wharf extending east into the harbor that was used for loading/unloading materials onto ships (Figure 1; Geosyntec 2025). After the Mill was dismantled, Blakely Harbor facilities included a ferry terminal between 1924 and 1937 (Figure 2), log storage between 1942 and 1958, and mooring for the United States Army between 1943 and 1944.

In addition to the Mill, two other facilities historically operated in the harbor. From 1880 to 1903, the Hall Brothers Shipbuilding Company operated a shipyard east of the Mill on the northern shore of the harbor, and from 1899 to 1918, the Walworth & Neville Crossarm Company operated a telegraph

crossarm manufacturing facility on the southern shore of the harbor (Figure 2; Price 1989). Neither of these facilities has been identified as a potential cleanup site and there is no known documentation of these facilities using hazardous substances.

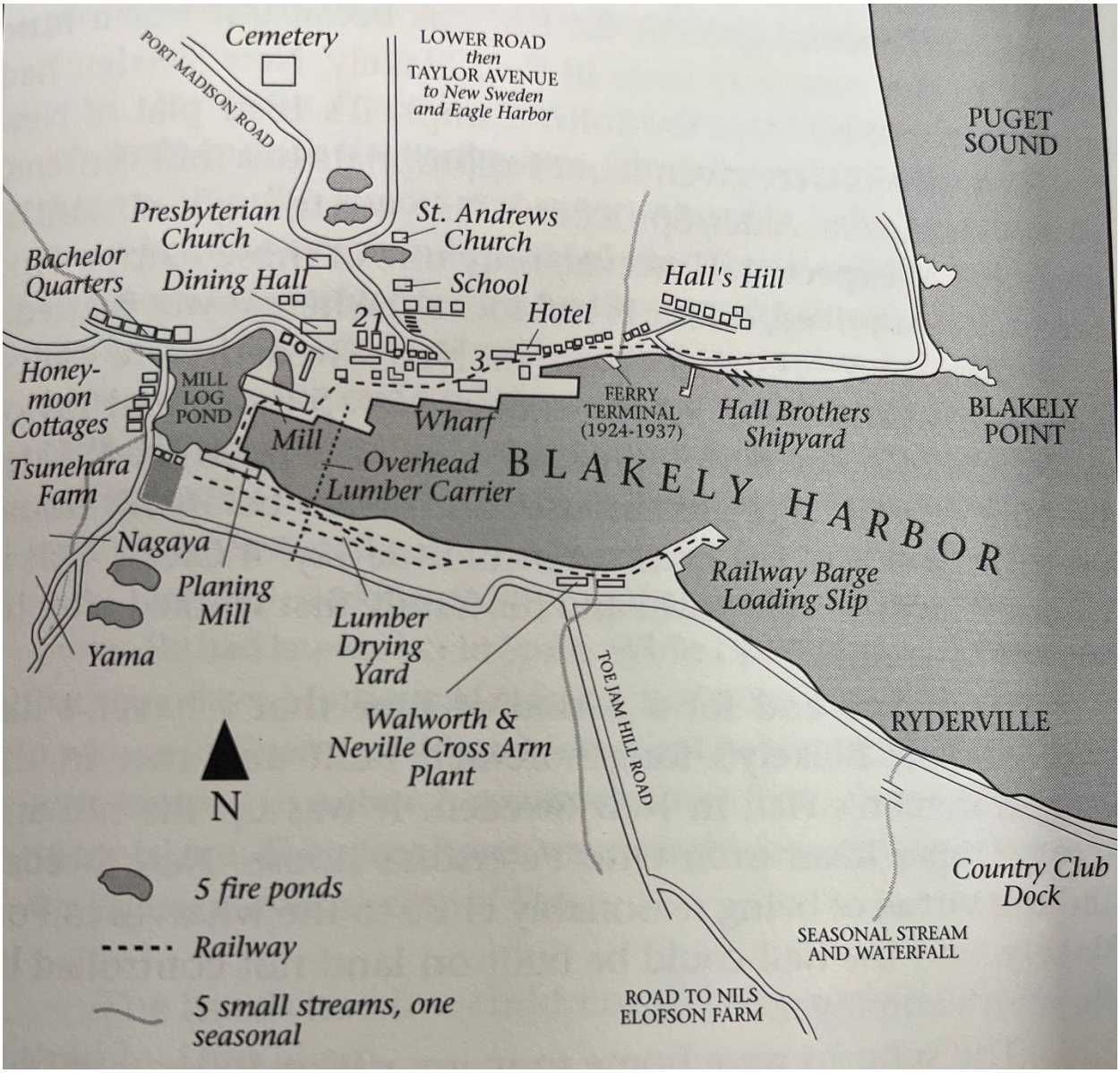


Figure 2. Blakely Harbor Historical Facilities: 1863 to 1922 (Price 1989)

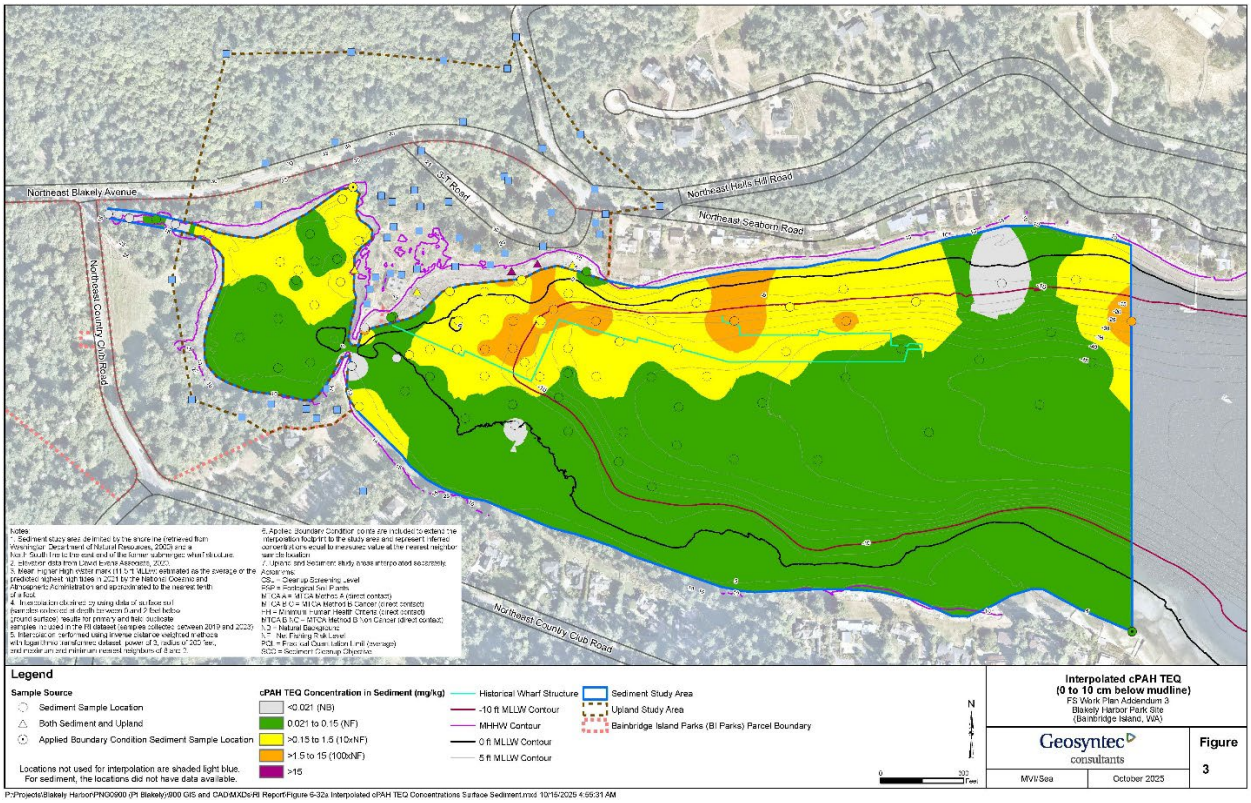
Other potential current sources of bioaccumulative CoCs to the harbor include streams, in-water structures (e.g., private docks supported by creosote-treated pilings), and local and regional airborne releases (Geosyntec 2025). The largest stream discharging to Blakely Harbor enters at the northwest end of the former Mill Log Pond (Figure 2). Four other smaller streams draining residential watersheds discharge into northern and southern areas of the harbor.

The RI characterizes the nature and extent of bioaccumulative Site CoCs, including carcinogenic aromatic hydrocarbons (cPAHs), chlorinated dibenzo-*p*-dioxins and dibenzofurans (dioxins/furans), and metals (arsenic, lead, and mercury; Geosyntec 2025). Ongoing bioaccumulative CoC transport processes at the Site include shoreline soil erosion by tidal action and overland runoff during storm events. Localized soil erosion and associated CoC transport occurs along the northern shoreline in the former Mill Log Pond and inner harbor.

Surface Sediment Bioaccumulative CoC Concentration Distributions

As discussed above, detailed site characterization sampling of Blakely Harbor was performed between 2019 and 2023, resulting in the collection of 180 sediment samples within the RI Study Area (Geosyntec 2025). Surface (0 to 10 cm) sediment concentrations of cPAHs, dioxins/furans, arsenic, lead, and mercury within the RI Study Area are presented in Figures 3 to 7, respectively. Concentration distributions of each of these bioaccumulative CoCs are summarized below:

- **cPAHs**: Surface sediment cPAH toxic equivalence quotient (TEQ) levels throughout nearly all of the RI Study Area exceed Puget Sound natural background (21 micrograms per kilogram dry weight [µg/kg]; Figure 3; Geosyntec 2025). cPAH TEQ levels are highest at intertidal and shallow subtidal depths closest to the former Mill (within approximately 250 feet of the shoreline) and also at shallow subtidal depths adjacent to a private dock supported by creosote-treated pilings along the eastern boundary of the RI Study Area. Surface sediment cPAH TEQ levels along the entire southern and eastern boundaries of the RI Study Area exceed natural background.
- **Dioxins/furans**: Surface sediment dioxin/furan TEQ levels at locations closest to the former Mill (within approximately 250 feet of the shoreline) currently exceed Puget Sound natural background (4 nanograms per kilogram dry weight [ng/kg]; Figure 4; Geosyntec 2025). Dioxin/furan TEQ levels are highest in an intertidal beach area at the western end of the harbor near the former Mill Log Pond outlet. Surface sediment dioxin/furan TEQ levels along most of the southern and eastern boundaries of the RI Study Area are within the natural background range.
- **Arsenic**: Surface sediment arsenic concentrations at locations closest to the former Mill (within approximately 250 feet of the shoreline) currently exceed Puget Sound natural background (11 milligrams per kilogram dry weight [mg/kg]; Figure 5; Geosyntec 2025). Arsenic concentrations are highest in an intertidal beach area near the western end of the harbor. Surface sediment arsenic concentrations along the southern and eastern boundaries of the RI Study Area are within the natural background range.



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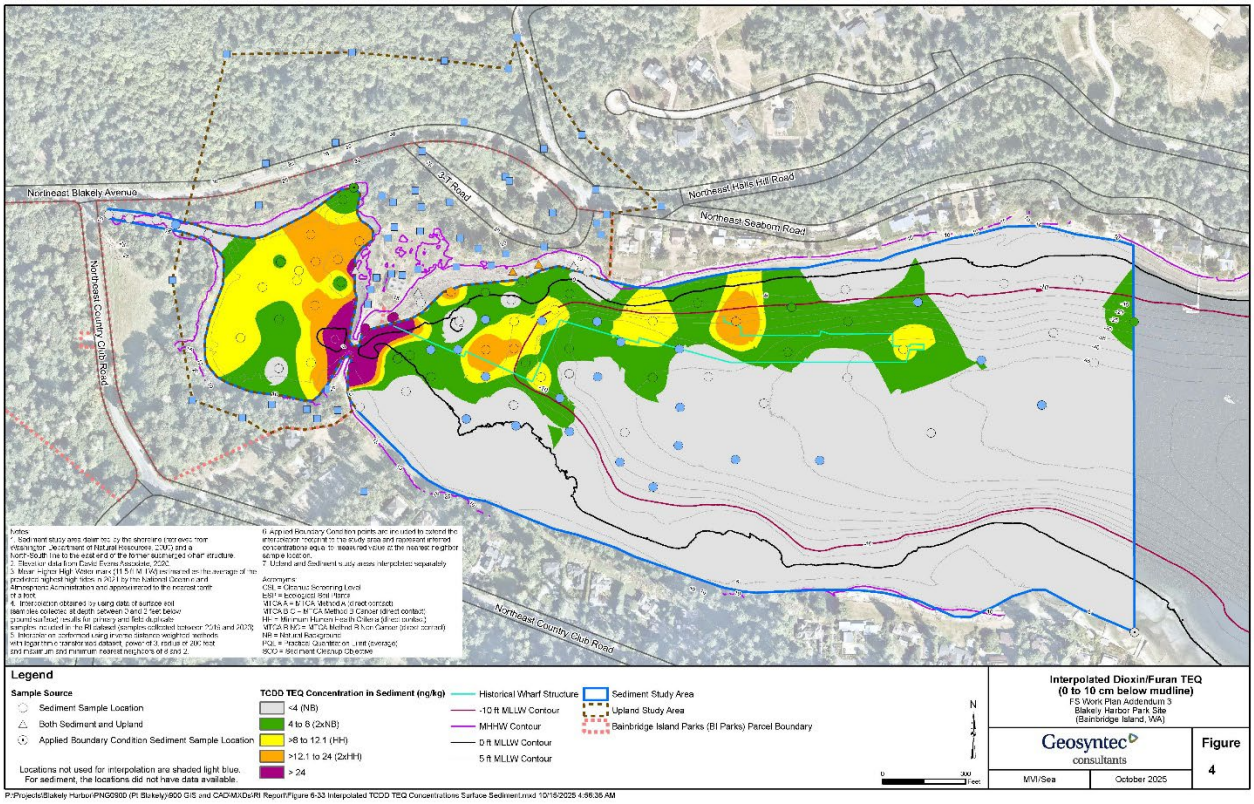

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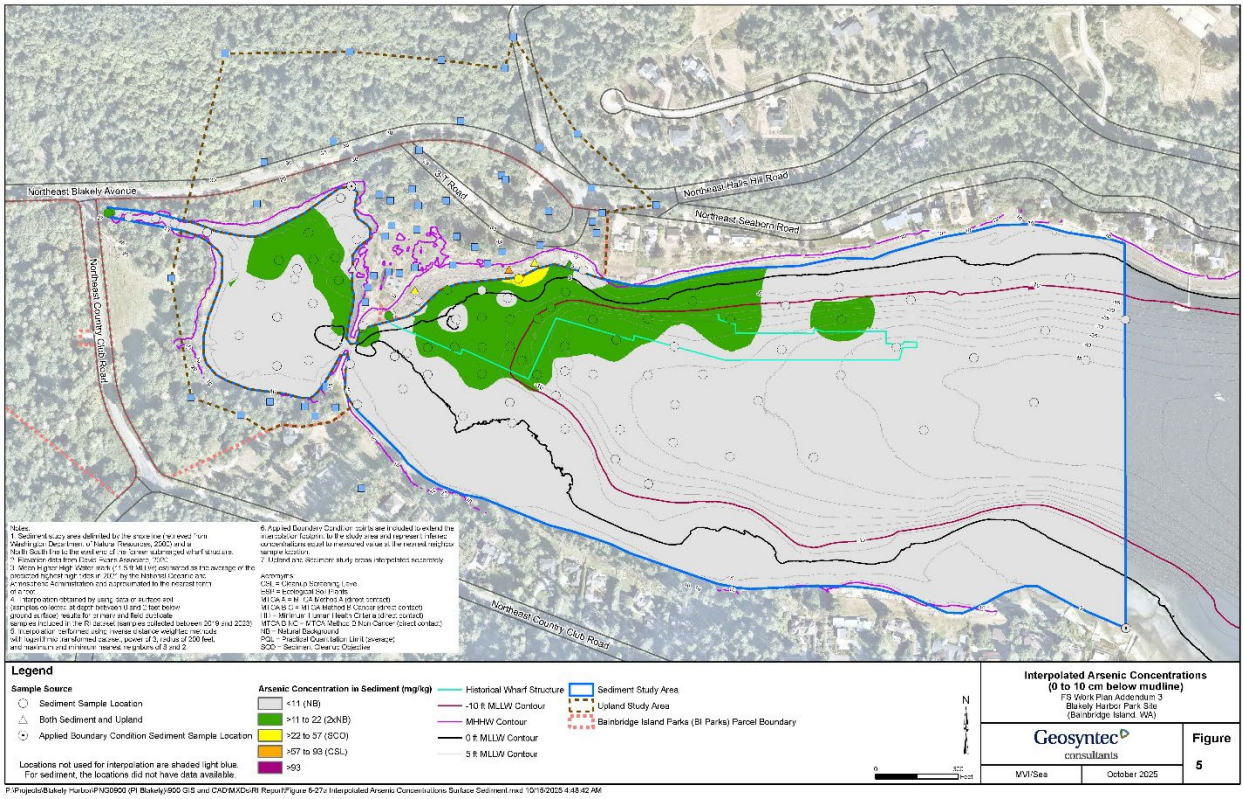

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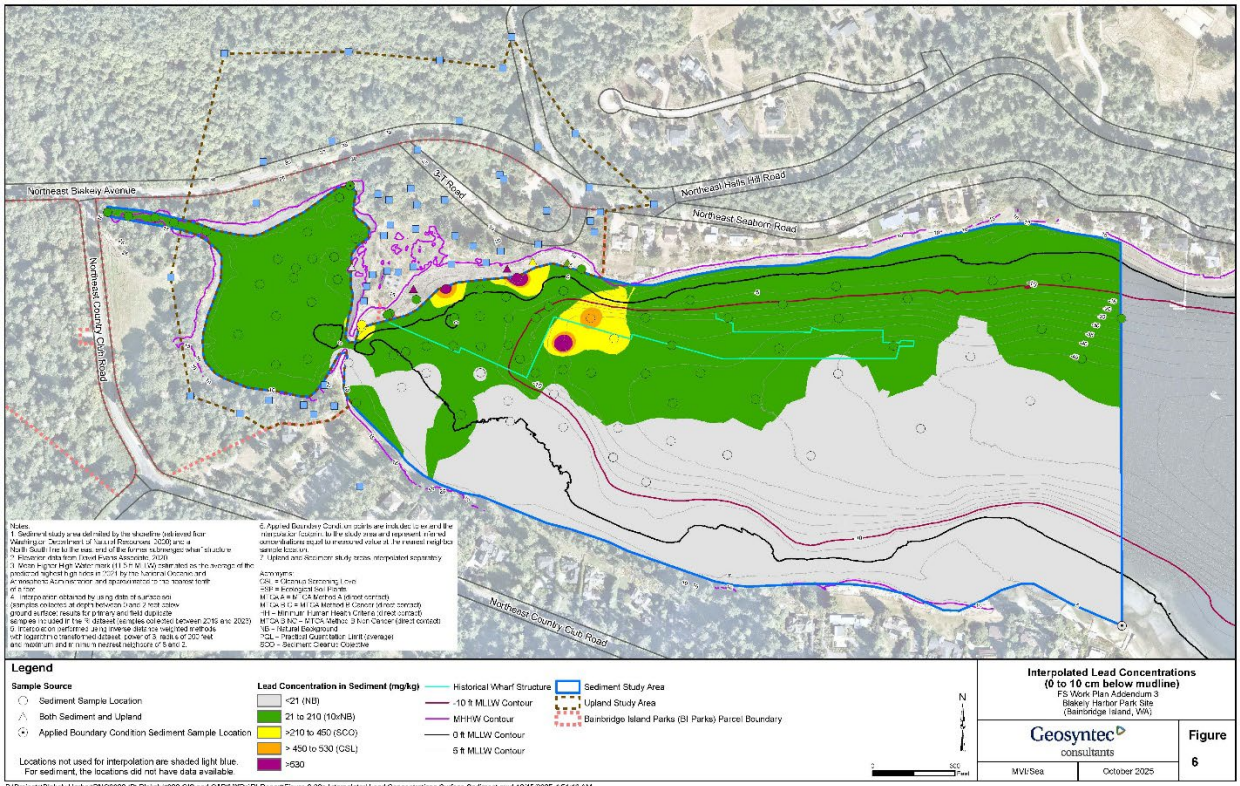
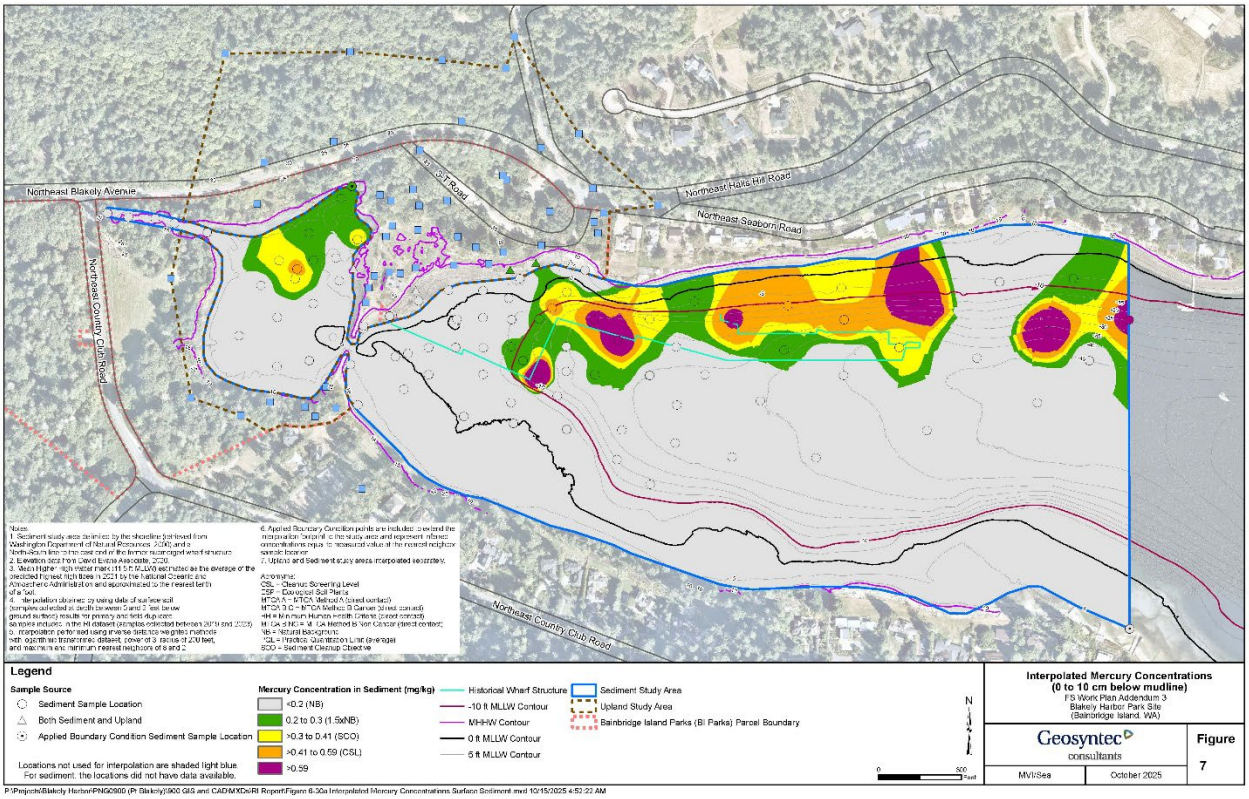


P:\Projects\Blakely Harbor\PNG0900 (PI Blakely)\900 GIS and CAD\MXDs\RI Report\Figure 6-28a Interpolated Lead Concentrations Surface Sediment.mxd 10/15/2025 4:51:16 AM



- **Lead**: Surface sediment lead concentrations at locations closest to the former Mill (within approximately 250 feet of the shoreline) currently exceed Puget Sound natural background (21 mg/kg; Figure 6; Geosyntec 2025). Lead concentrations are highest at intertidal and shallow subtidal depths closest to the former blacksmith shop, foundry, and slag piles. Surface sediment lead concentrations along most of the southern and eastern boundaries of the RI Study Area are within the natural background range.
- **Mercury**. Surface sediment mercury concentrations at locations closest to the former Mill (within approximately 250 feet of the shoreline) currently exceed Puget Sound natural background (0.20 mg/kg; Figure 7; Geosyntec 2025). Mercury concentrations are highest at shallow subtidal depths near the former wharf structure. Surface sediment mercury concentrations along most of the southern and eastern boundaries of the RI Study Area are within the natural background range.

Based on surface sediment concentration distributions of bioaccumulative CoCs as summarized above, only cPAHs need to be evaluated for development of regional background concentrations in Blakely Harbor. Surface sediment cPAH concentrations are elevated above natural background levels

in large portions of Blakely Harbor, possibly due to diffuse inputs separate from the direct influence of sites and sources.

Dioxins/furans, arsenic, lead, and mercury do not need to be evaluated for development of regional background concentrations in Blakely Harbor. These bioaccumulative CoCs are not consistently elevated above natural background levels outside of the RI Study Area.

Regional Background Area of Interest

The area of interest (AOI) for this regional background evaluation is a hydraulically connected protected marine environment that excludes areas directly influenced by known cleanup sites (i.e., the former Mill) or potential sources (i.e., former Hall Brothers shipyard and former Walworth & Neville telegraph crossarm manufacturing facility), as well as areas more representative of natural background conditions (as defined in WAC 173-204-505). Specifically, the AOI boundaries (Figure 8) were determined as described below.

Exclusion areas for sites and sources:

- The Mill is excluded based on locally elevated levels of bioaccumulative CoCs (Figures 3 to 7). While surface sediment CoC concentrations are predominantly elevated within approximately 250 feet of the former Mill shoreline, the exclusion area includes the entire RI Study Area (Figure 1) to ensure that the AOI is outside areas of direct influence from the Mill.
- The former Hall Brothers shipyard and former Walworth & Neville telegraph crossarm manufacturing facilities are excluded based on the potential for historic release of hazardous substances from these operations. Due to the lack of data within and near these former facilities, a 250-foot buffer was applied from the former facility shorelines to ensure that the AOI is outside areas of direct influence from these possible historical sources.

Exclusion areas for natural background and natural features:

- Areas more than approximately 750 feet offshore of the RI Study Area or deeper than -80 feet MLLW were excluded from the regional background AOI. These offshore areas are least affected by local sources and are likely within the natural background cPAH TEQ range.
- Areas shallower than -6 feet MLLW in depth were excluded for logistical sampling reasons and to avoid intertidal areas.

Study Design

This section describes the study design for the regional background data collection effort in Blakely Harbor. Several key study objectives were taken into consideration in the development of the study design:

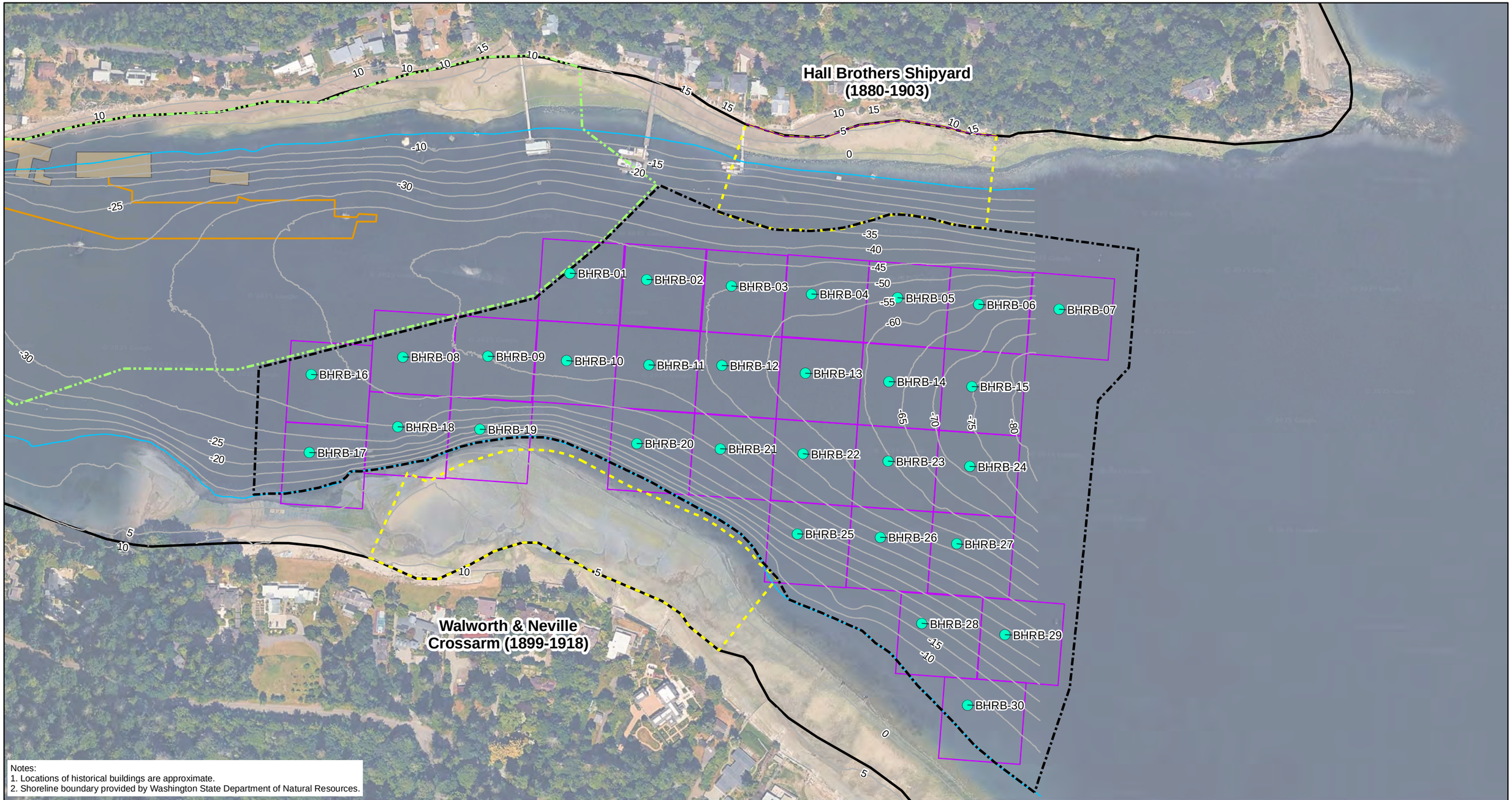
- Produce a data set with temporal consistency
- Determine the minimum number of samples needed to calculate regional background
- Define a minimum distance between sampling locations to minimize spatial bias
- Randomly select sediment sampling locations to meet study objectives

The following sections discuss the development and the details of the study design.

The precision of a regional background data set is calculated as the width of the 95% upper confidence level of the mean, expressed as a percentage of the mean (Ecology 2015). Precision of the mean expressed in this way is a common frame of reference for quantifying uncertainty in the population estimates that are necessary for calculation of a background threshold value. A precision of 25% is the target, consistent with previous regional background studies (Ecology 2021).

All regional background levels developed to date have used similar sampling and statistical approaches to achieve the 25% precision target (Ecology 2021). Specifically, for each completed regional background study, 20 to 30 surface sediment cPAH samples have been collected from subtidal areas beyond the direct influence of cleanup sites or potential sources, but near regional stormwater inputs and other diffuse sources. As discussed in Ecology (2015), a sample size of 30 for cPAHs is expected to provide enough samples to sufficiently characterize the shape of the concentration distribution, while providing similar power to the other regional background datasets. This target sample size should be sufficient even if several samples cannot be collected in the field due to site conditions or if several samples are designated as outliers.

The AOI for the Blakely Harbor regional background evaluation encompasses approximately 41 acres (Figure 8). Thirty sampling locations within the AOI are targeted, resulting in an approximate 250-foot sampling grid, equivalent to the spatial scale of surface sediment concentration distributions measured within the harbor (Figures 3 to 7). Similar to other regional background sampling efforts (Ecology 2015, 2021), surface sediment sampling locations within the AOI were selected using a random design and an element of spatial balance to avoid bias if concentration trends are observed within the AOI. A systematic random design in equally sized strata is the selected sampling design (i.e., equally sized 250-foot square grids were laid out, a random coordinate was picked within the first grid, and that relative location was located within every grid square). If CoC concentrations measured within the AOI using this balanced/random design are found to be spatially autocorrelated, the data can be subsampled or methods that account for autocorrelation can be used to generate appropriate summary statistics. Otherwise, the samples can be assumed to be independent and the appropriate summary statistics estimated.



Legend

- Proposed Background Sediment Sampling Stations
- Shoreline
- Contour (-6 foot MLLW)
- Contours (Feet MLLW)
- Historical Wharf Structure
- Structures From 1917 Map and Figure 2 in GeoEngineers, 2019
- Proposed Remedial Investigation Boundary
- Proposed Background Sediment Sample Area
- 250-ft Facility Buffer

0 62.5 125 250 Feet

N

Site-Specific Regional Background Sediment Sampling Stations

FS Work Plan Addendum 3
Blakely Harbor Park Site
(Bainbridge Island, WA)

Geosyntec consultants

MVI/Sea | November 2025

Figure 8

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Consistent with regional background level sampling approaches used in other areas of Puget Sound (Ecology 2015, 2021), Figure 8 depicts the regional background sampling grid of 30 subtidal sediment sampling stations that will be collected in outer Blakely Harbor. A surface (0 to 10 cm) sediment grab sample will be collected at each station and analyzed for PAHs and total organic carbon (TOC). Target sampling coordinates are summarized in Table 1. All sampling procedures and chemical analyses will follow methods and data quality objectives described in the Work Plan (Geosyntec 2022) and addenda approved by Ecology. Analytical Resources (Tukwila, WA) will perform all chemical analyses using methods accredited by Ecology:

- Sediment
  - PAHs: EPA Method 8270E-SIM GC/MS
  - TOC: EPA 9060A

Data Use and Evaluation

The Blakely Harbor Site-specific regional background level for cPAHs will be developed following procedures used by Ecology in other Puget Sound regional background areas such as Bellingham Bay (Ecology 2015). Lorraine Brown (Exa Data & Mapping Services; formerly TerraStat Consulting Group) will perform statistical analyses including determinations of data sufficiency, identification of data outliers, autocorrelation analyses, and calculation of the cPAH 90/90 upper tolerance level. Statistical analyses will be included in the draft FS report and will be reviewed and approved as appropriate by Ecology and the Tribe as part of the FS.

Quality Assurance, Data Validation, and Data Management

At least one duplicate analysis will be performed for every 20 samples analyzed. As described in the RI Work Plan (Geosyntec 2022) and addenda approved by Ecology, analytical data will be validated to verify that data quality objectives have been met. All PAH and TOC data will undergo a detailed QA2/EPA Stage 4 level validation in accordance with Ecology (2021) guidance. Data validation reports detailing any data quality issues and additional qualifiers will be provided with the draft FS report.

All finalized and validated data will be formatted and submitted to Ecology for entry into the Environmental Information Management System. Geosyntec will manage the overall project database and will oversee data management to ensure that analytical data are incorporated into the project database with appropriate qualifiers following acceptance of the data validation.

Project Management

The Anchor QEA Project Manager and Field Coordinator for this FS Work Plan Addendum 3 is Eli Patmont (epatmont@anchorqea.com).

Table 1. Regional Background Sediment Sample Location Coordinates

Location Identifier	X coordinate	Y coordinate
BHRB-01	1227741	221799
BHRB-02	1227947	221782
BHRB-03	1228176	221764
BHRB-04	1228392	221743
BHRB-05	1228623	221733
BHRB-06	1228842	221715
BHRB-07	1229058	221702
BHRB-08	1227291	221574
BHRB-09	1227520	221576
BHRB-10	1227732	221564
BHRB-11	1227954	221552
BHRB-12	1228150	221551
BHRB-13	1228375	221530
BHRB-14	1228600	221507
BHRB-15	1228824	221494
BHRB-16	1227044	221527
BHRB-17	1227039	221316
BHRB-18	1227277	221385
BHRB-19	1227498	221379
BHRB-20	1227921	221340
BHRB-21	1228146	221326
BHRB-22	1228368	221313
BHRB-23	1228598	221293
BHRB-24	1228817	221279
BHRB-25	1228353	221097
BHRB-26	1228577	221088
BHRB-27	1228782	221070
BHRB-28	1228689	220856
BHRB-29	1228912	220826
BHRB-30	1228811	220636

Note: Horizontal Datum is NAD 1983_2011 State Plane Washington North FIPS 4601 Ft US

References

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Ecology (Washington State Department of Ecology), 2015. *Bellingham Bay Regional Background Sediment Characterization, Bellingham, WA: Final Data Evaluation and Summary Report*. Publication no. 15-09-044. February 2015.

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Price, A., 1989. *Port Blakely, the Community Captain Renton Built*. Bainbridge Island Historical Society, Bainbridge Island, Washington.

Williams, G.D., R.M. Thom, M.C. Miller, D.L. Woodruff, N.R. Evans, and P.N. Best, 2003. *Bainbridge Island Nearshore Assessment: Summary of Best Available Science*. PNWD-3233. Prepared for the City of Bainbridge Island, Bainbridge Island, WA, by Battelle Marine Sciences Laboratory, Sequim, WA.