CLEANUP ACTION PLAN
R.G. HALEY INTERNATIONAL SITE
BELLINGHAM, WASHINGTON

Prepared by

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ABBREVIATIONS AND ACRONYMS

ARARs	Applicable or Relevant and Appropriate Requirements
Bgs	Below ground surface
BNSF	Burlington Northern/Santa Fe
CAP, Plan	Cleanup Action Plan
CAOs	Cleanup action objectives
CFR	Code of Federal Regulations
City	City of Bellingham
Cornwall Site	Cornwall Avenue Landfill site
cPAHs	carcinogenic PAHs
CSL	Cleanup Screening Level
CUL	Cleanup level
DNR	Washington State Department of Natural Resources
Ecology	Washington State Department of Ecology
EDR	Engineering Design Report
ENR	Enhanced natural recovery
ESA	Endangered Species Act
HIS	Indicator Hazardous Substances
LNAPL	Light non-aqueous phase liquid
MNR	Monitored natural recovery
MTCA	Model Toxics Control Act
NEPA	National Environmental Policy Act
ng/kg	nanograms per kilogram
PCP	Pentachlorophenol
Pilot Project	Bellingham Bay Demonstration Pilot Project
PLPs	Potentially Liable Persons
Port	Port of Bellingham
PQL	Practical quantitation limit
RCRA	Resource Conservation and Recovery Act
RCW	Revised Code of Washington
RI/FS	Remedial Investigation/Feasibility Study
SCO	Sediment Cleanup Objective
Site, Haley Site	R.G. Haley International site
SMS	Sediment Management Standards
SSI	Supplemental Sediment Investigation
SEPA	State Environmental Policy Act
TEQ	Toxic equivalent concentration
TPH	Total petroleum hydrocarbons
µg/kg	micrograms per kilogram
USACE	United States Army Corps of Engineers
WAC	Washington Administrative Code

1.0 INTRODUCTION

This document is the Washington State Department of Ecology's (Ecology) Cleanup Action Plan (CAP or Plan) for the R.G. Haley International site (Site, Haley Site, R.G. Haley Site) in Bellingham Washington. The general location of the Site south[1] of the downtown business district is shown on Figure 1. The production and handling of pentachlorophenol-treated wood products occurred at the Site between approximately 1948 and 1985.

This CAP has been prepared pursuant to the requirements of the Model Toxics Control Act (MTCA) administered by Ecology under Chapter 173-340 of the Washington Administrative Code (WAC), and the requirements of the Sediment Management Standards (SMS) administered by Ecology under Chapter 173-204 WAC. The CAP is based on the February 2016 Final Remedial Investigation/Feasibility Study (RI/FS) (GeoEngineers 2016) and additional information collected since completion of the RI/FS which is described in the Updated Supplemental Sediment Investigation (SSI) (GeoEngineers 2023), attached as Appendix A, and the Final Engineering Design Report (EDR) (GeoEngineers 2022).

1.1. General Facility Information

The following is a summary of general facility information for the Haley Site:

Site Name	R.G. Haley International
Property Address	Cornwall Avenue N, Bellingham, Washington, 98227-1075
Cleanup Site ID	3928
Facility Site ID	2870
RI/FS Agreed Order No.	DE 2186
RI/FS Agreed Order Dates	April 5, 2005 (Original), October 15, 2010 (Amendment 1), August 14, 2013 (Amendment 2)
Design Agreed Order No.	DE 15776
Design Agreed Order Dates	June 1, 2018
Parties to the Orders	Ecology, City of Bellingham
Current Property Owners	City of Bellingham, Washington State (managed by the Department of Natural Resources), and Port of Bellingham

[1] All directions are referenced relative to "project north." The relationship between project north and true north is shown in the CAP's figures.

1.2. Purpose and Contents of the Cleanup Action Plan

The purpose of the CAP is to present Ecology's chosen cleanup action for the Site. The Plan includes the following elements required under WAC 173-340-355, -360, and -380, plus a summary of site history and contamination:

- Cleanup levels and points of compliance for Indicator Hazardous Substances (IHS);
- Applicable state and federal laws for the proposed cleanup action that are known at this point in the process;
- A summary of the process used in the FS to select the preferred cleanup alternative, including a description of other cleanup alternatives evaluated in the FS;
- A general description of the selected cleanup action for the Site;
- A summary of the contamination that will remain at the Site after completing the cleanup action;
- Institutional controls required as part of the proposed cleanup action; and
- The anticipated cleanup action schedule.

Ecology has made a preliminary determination that a cleanup in conformance with the CAP will comply with the requirements for selection of a remedy under WAC 173-340-360.

1.3. Site Location and Definition

The R.G. Haley International Corporation wood treatment facility was formerly located on the eastern shore of Bellingham Bay, at the foot of a steep bluff (Figure 1). The wood treatment facility operated on a shoreline parcel currently owned by the City (Haley property) and on adjacent State-owned upland located west of the Inner Harbor Line (Figure 2). Other properties adjoining the Haley property include the Nielson Brothers parcel to the north, a City-owned parcel to the south (Cornwall property), and an active Burlington Northern/Santa Fe (BNSF) rail line to the east (BNSF right-of-way) (Figure 2). A small Port of Bellingham (Port) parcel is located near the northwest corner of the Haley property; the Port parcel comprises part of the Pine Street Beach.

The R.G. Haley Site cleanup area is based on RI/FS data and additional data collection and analyses conducted since completion of the RI/FS, as described in Appendix A and the EDR. The cleanup area boundary is shown on Figure 2. Note that the aquatic boundary is approximate, based on extrapolation from and interpolation between available data points.

The Site is subdivided into two units: an Upland Unit and a Marine Unit, separated by the ordinary high water mark (Figure 3). The Upland Unit includes the Haley property and a portion of the Cornwall property to the south. The Upland Unit also includes some Port-owned and State-owned land. The Marine Unit includes City-, Port-, and State-owned aquatic land.

The Haley Site overlaps the adjacent Cornwall Avenue Landfill cleanup Site (Cornwall Site), which is being cleaned up under a Consent Decree (Whatcom County Superior Court No. 14-2-02593-5). The two sites are differentiated as follows:

- Haley Site: Upland and in-water areas impacted by contaminant releases from former wood-treating operations. The footprint of wood treatment chemicals includes areas where wood waste was historically placed in tidelands prior to the existence of the Haley wood treatment facility. Where wood treatment chemicals are co-located with the wood waste, the Haley site includes the wood waste and chemicals potentially associated with degradation of the wood waste.
- Cornwall Site: The upland area containing the former municipal landfill and wood waste within the Cornwall property, plus adjacent in-water areas impacted by releases from the landfill and from the degradation of wood waste.

1.4. Site History and Description

Prior to development, the area comprising the Haley Site consisted of tidelands and open water. Various kinds of fill material were placed at the Site creating land and moving the shoreline out into the bay. Historical land uses at or near the Site included railroad activities, lumber mill operations, wood treatment and storage, disposal of municipal waste at the Cornwall Avenue Landfill, and pulp and paper mill activities.

The BNSF railroad was constructed in about 1890. Various mill operations and mill support activities began in the late 1880s. Several over-water structures (wharves and piers) were built within and adjacent to the Site to support mill operations and coal transport related to nearby mining and marine shipping. Wood-treating operations were conducted at the Site from 1948 to 1985. During the 1950s and 1960s, the Cornwall site was used for disposal of municipal refuse, pulp waste, and medical waste. No buildings associated with these historical activities remain on the Haley or Cornwall properties.

The upland portion of the Site is currently fenced and vacant. A vertical sheet pile barrier is present along a portion of the shoreline. The shoreline is covered with armoring, sparse vegetation, gravel and debris. Numerous remnant timber pilings and debris associated with former overwater structures remain in the intertidal zone.

Various cleanup activities have occurred or are continuing to occur at the Site including the removal of seepage pit sludge in 1985, the installation of the sheet pile wall referenced above in 2002, the placement of an oil absorbent layer over part of the shoreline in a 2013 Interim Action, and the periodic removal of oil from wells at the Site beginning in 2000.

1.5. Adjacent MTCA Cleanup Sites

Twelve cleanup sites located in the general vicinity of the Haley Site are part of the Bellingham Bay Demonstration Pilot Project (Pilot Project). The Pilot Project is a coordinated effort by federal, tribal, state, and local governments to clean up contamination around Bellingham Bay. Two of these cleanup sites overlap with the Haley Site: the Cornwall Site to the south (discussed previously) and the Whatcom Waterway Site to the west (Figure 4).

Cleanup of the Cornwall Site is being led by the Port, with involvement by the City and Washington State Department of Natural Resources (DNR). IHSs at the Cornwall Site include landfill refuse and wood waste, manganese and ammonia in groundwater, methane and other volatile organic compounds (VOCs) in soil gas, and metals, polycyclic aromatic hydrocarbons

(PAHs), polychlorinated biphenyls (PCBs) and phthalates in sediment. The Cornwall Site cleanup is currently in the design phase and will generally include construction of an upland low-permeability cap in Management Unit 1 (MU-1 in Figure 4), and a shoreline stabilization system and thin-layer sediment cap in Management Unit 2 (MU-2 in Figure 4). Additional remedial action will also likely be required in deeper water outside of MU-2; if needed, the remedial action in this broader area is anticipated to be monitored natural recovery (Ecology 2014).

The Whatcom Waterway cleanup is being led by the Port, with involvement by the City, DNR, and a private property owner. Mercury is the key IHS in sediment associated with the Whatcom Waterway Site. Whatcom Waterway cleanup actions that overlap with the Haley Site primarily consist of monitored natural recovery for offshore sediment (Units 6A, 6B, 6C and 9 in Figure 4; Anchor QEA 2015); the western portions of Units 6B and 6C will be capped to limit erosion at the location of the Port's barge off-loading pier. The Whatcom Waterway cleanup is being conducted in two phases; the first phase was completed in 2016 and the second phase is scheduled to begin in 2020. The Whatcom Waterway Site/Haley Site overlap occurs within the area slated for the second phase of cleanup.

The Haley, Cornwall and Whatcom Waterway cleanups will be coordinated to assure compatibility. In general, the upland caps and nearshore sediment actions associated with the Haley and Cornwall sites will be designed to provide seamless coverage. In deeper subtidal waters, the overlapping cleanups for the Haley and Whatcom Waterway Sites are nearly identical, with monitored natural recovery selected as the remedy for both. This is also anticipated to be the remedy for the Cornwall Site if its boundary is extended beyond MU-2. Compatibility and coordination of the cleanups are discussed further in Sections 5.7 and 6.5.

2.0 NATURE AND EXTENT OF CONTAMINATION

The nature and extent of contamination in both the Haley Upland and Marine Units is described in the RI). Haley-related contamination originated from the use and release of wood treatment chemicals, which consisted of a diesel-like carrier oil and the active ingredient pentachlorophenol (PCP). The primary contaminants associated with this source include diesel-range hydrocarbons and individual PAHs, including carcinogenic PAHs (cPAHs), PCP, and dioxins/furans. The diesel-like oil is referred to as light non-aqueous phase liquid (LNAPL) when encountered in the subsurface.

The Haley-related contaminants were released over time into surface soils across the upland portion of the Site. Oily fractions migrated down to the water table, where they collected and periodically discharged out into Bellingham Bay, or were retained in a "smear zone" at the water table. Infiltrating storm water also carried dissolved contaminants down to the water table, where they entered the groundwater body underlying the Site. Further dissolution of contaminants occurred within the smear zone, and the contaminated groundwater then discharged directly into Bellingham Bay. Sediment along the shoreline of the Haley facility also became contaminated from these release processes, and from soil erosion and transport in surface water runoff. Long-shore transport and wave activity then spread the contaminated sediment northward along the shoreline and outward into the bay. Currently, contaminant movement is occurring primarily through surface water infiltration/groundwater transport, shoreline sediment transport, and soil erosion.

The distribution of contaminants in upland media (soil and groundwater) strongly coincides with the footprint of the oil smear zone and nearshore plume of LNAPL. This contamination falls within the boundaries of the Haley Upland Unit, and overlaps with the northern portion of Cornwall Unit MU-1.

In the Haley Marine Unit, the greatest number and concentration of Haley-related contaminants occur in the nearshore area (intertidal and shallow subtidal zones) immediately adjacent to the former Haley wood treatment facility. Outside of this nearshore area, the Haley Marine Unit extends into deeper subtidal waters (Figure 3). The boundary of the Marine Unit is defined by data collected during the SSI (Appendix A) and reflects the location where dioxin/furan concentrations decline to the regional background concentration based on geospatial modeling and best professional judgment. The other Haley bioaccumulative compounds associated with historical Haley-related activities (cPAHs and PCP) have a much smaller footprint, and therefore did not play a role in establishing the boundary of the Haley Marine Unit.

3.0 CLEANUP STANDARDS

Contaminants detected in soil, groundwater, and sediment were evaluated relative to a broad range of screening levels in the RI. The list of chemicals exceeding screening levels was further condensed to a group of IHSs, which were then used in cleanup needs. IHSs varied somewhat by medium, but collectively included total petroleum hydrocarbons (TPH), several individual PAHs, cPAHs (TEQ), PCP, and dioxins/furan (TEQ).

Cleanup standards for the IHSs were then proposed in the FS. Modifications to those standards are now set in this CAP. Cleanup standards consist of: (1) chemical concentrations in environmental media that are protective of human health and the environment, and (2) the locations where the cleanup levels must be met (point of compliance). Media-specific cleanup levels and points of compliance for soil, groundwater and sediment are presented in the following sections. Cleanup levels for soil, groundwater, and sediment IHSs are summarized in Table 1, along with the basis for each value. Table 1 also includes cleanup levels for air to address soil vapor that will be vented from beneath the planned upland cap.

3.1. Soil Cleanup Standards

Soil cleanup levels are based on the protection of human health (direct contact) and the protection of groundwater (Table 1).

Potential terrestrial ecological receptors' exposure to soil, and erosion of soil to sediment were considered in the development of soil cleanup levels; however, as discussed in the FS, these exposure pathways will be addressed by the upland remedy, which will include an engineered cap and institutional controls that will prevent terrestrial ecological exposures and erosion of upland soil.

In summary, the soil cleanup levels and soil management practices established in this CAP address the following potential exposure pathways and receptors:

- Direct contact (humans and terrestrial species);
- Leaching to groundwater, which is discharging to sediment/surface water (humans and benthic/aquatic species); and
- Soil erosion and transport to sediment (humans and benthic/aquatic species).

The soil cleanup levels based on the protection of groundwater (Table 1) are lower than background concentrations associated with non-specific (diffuse) sources in some urban environments. For example, Ecology (2011) found that shallow soil in six Seattle neighborhoods had a background cPAH concentration of 390 micrograms per kilogram (µg/kg),[2] which exceeds the practical quantitation limit (PQL)-based soil cleanup levels (CUL; 7.6 µg/kg) selected for the Haley Site (Table 1). For this reason, the potential presence of urban background contamination will be considered when applying the PQL-based soil cleanup levels to the Haley Site. Empirical groundwater data also will be considered when applying these cleanup levels to the Site as described in MTCA (WAC 173-340-747(9)).

The standard point of compliance for soil based on the protection of groundwater is throughout the Site. For the protection of human health via direct contact, the standard point of compliance for soil is from ground surface to 15 feet below ground surface (bgs). See WAC 173-340-740(6)(d). Soil cleanup levels, however, will not be achieved at the standard point of compliance throughout the Site because the selected alternative for the Haley Site includes containment. MTCA recognizes that soil cleanup levels typically are not met at the standard point of compliance for cleanups involving containment, and that these cleanups still comply with cleanup standards under certain conditions (WAC 173-340-740(6)(f)). The cleanup action selected for the Haley Site meets these conditions.

In summary, the point of compliance for soil will be considered to have been met once the cleanup actions established in this CAP have been implemented.

3.2. Groundwater Cleanup Standards

Groundwater cleanup levels are based on the protection of marine surface water and sediment (Table 1). As discussed in Section 5.1.2 of the RI, Ecology has determined that groundwater beneath the Haley Site and other waterfront cleanup sites in Bellingham Bay is non-potable; therefore, use of groundwater as drinking water was not considered in the development of cleanup levels.

In summary, the groundwater cleanup levels established in this CAP address the following exposure pathways and receptors:

- Discharge to sediment (humans and benthic/aquatic species); and
- Discharge to marine surface water (humans and aquatic species).

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[2] 90th percentile value for all urban soil samples collected during Ecology's study; cPAH concentrations in all samples ranged from 1.9 to 8,900 µg/kg.

The standard point of compliance for groundwater under MTCA is throughout the site. MTCA allows use of a conditional point of compliance at sites where it can be demonstrated that it is not practicable to meet cleanup levels throughout the site within a reasonable restoration time frame, and that all practicable methods of treatment have been used in the cleanup (WAC 173-340-720(8)(c)). Ecology has determined that the cleanup action selected for the Haley Site meets the regulatory requirements for use of a conditional point of compliance for groundwater. At such sites, the conditional point of compliance must be located as close as technically possible to the source of contamination; analyses conducted during the FS indicate this is likely to be located at the point where groundwater flows into surface water. However, final location(s) will be established in the monitoring plan described in Section 6.6.

In summary, the point of compliance for groundwater will be conditional and located as close as practicable to the source of contamination.

3.3. Sediment Cleanup Standards

Cleanup levels for sediment are selected from a range of numerical values. The SMS Sediment Cleanup Objective (SCO) is the low end of the range, below which no adverse effects or unacceptable risks are anticipated to human health or the environment; the Cleanup Screening Level (CSL) is the higher end of the range, above which adverse effects or unacceptable risks would be expected to human health and the environment.

Sediment cleanup levels for individual chemicals were chosen for protection of two primary exposure pathways – direct contact and bioaccumulation:

- For the direct contact pathway, the exposure scenarios involve benthic organisms living in sediment and people engaged in beach play, clamming, or net-fishing.
- For the bioaccumulation pathway, the exposure scenarios involve people and ecological receptors (higher trophic species) consuming seafood foraged from the Site.

The final cleanup levels for sediment are in Table 1. Additional details on cleanup level derivation are provided in the following paragraphs.

Sediment cleanup levels are initially established at the SCO and may be adjusted up to, but not higher than, the CSL based on an evaluation of technical possibility and net adverse environmental impact. WAC 173-204-560(2)(a)(ii]). The Sediment Cleanup User's Manual (SCUM) (Chapter 7 Section 7.2.3.2; Ecology 2021) details how to determine whether it is technically possible to attain the SCO based on site-specific factors, including, but not limited to, the ability to:

- Achieve the SCO using available cleanup technologies, and
- Maintain the SCO after cleanup construction.

Sediment cleanup levels based on the protection of benthic organisms are set at the SCO for non-carcinogenic PAHs, benzo(a)anthracene and TPH.

The sediment cleanup levels for the three remaining sediment IHSs (dioxins/furans, cPAHs, and PCP) which are bioaccumulative compounds, are based on the following:

- Dioxins and Furans – The sediment cleanup level for dioxins and furans is set at 13 ng/kg TEQ based on the recontamination evaluation (Appendix B). The technical possibility to attain the SCO of 5 ng/kg TEQ was evaluated against site-specific factors; while the SCO can be achieved using available cleanup technologies, it cannot be maintained after cleanup construction due to numerous ongoing diffuse regional sources that are not under the authority or responsibility of the R.G. Haley potentially liable parties (PLPs).
- cPAHs – The sediment cleanup level for cPAHs is set at the risk-based SCO of 229 µg/kg TEQ based on the seafood ingestion risk-based SCO of 229 µg/kg TEQ established for the I & J Waterway Site (Ecology 2019).

  For bioaccumulatives under the SMS, the lowest risk-based concentration is carried forward for consideration in establishing the SCO, then the highest of natural background, applicable risk-based concentrations, or PQL becomes the SCO. Since 229 µg/kg TEQ is less than the direct contact risk-based concentrations in Table 9-3 of the SCUM (Ecology 2021) (900, 320, and 680 µg/kg TEQ) and greater than natural background (21 µg/kg TEQ) or PQL (9 µg/kg), it is the SCO. The sediment cleanup level for cPAHs is therefore set at the risk-based SCO of 229 µg/kg TEQ.
- PCP: Neither a natural or regional background value is available for PCP in Bellingham Bay. The sediment cleanup level is therefore set at the PQL of 100 µg/kg, which is higher than the lowest risk-based sediment criterion for this constituent.

In summary, the sediment cleanup levels established in this CAP address the following exposure pathways and receptors:

- Direct contact (humans and benthic species); and
- Bioaccumulation through seafood consumption (humans and higher trophic species).

For marine sediment, the point of compliance for the protection of benthic organisms is the biologically active zone (BAZ), which is considered the upper 12 centimeters (cm) of sediment in Bellingham Bay. This same point of compliance addresses protection of human and higher trophic species with respect to consumption of seafood gathered from subtidal areas. The point of compliance for the protection of human health from consumption of shellfish (specifically clams) collected from the intertidal zone is the upper 45 cm (1.5 feet).

Compliance with cleanup levels based on benthic toxicity are measured on a point-by-point basis whereas compliance with seafood-consumption-based cleanup levels is assessed on an area-weighted average basis. The area-weighted basis involves weighting individual sampling results to ensure that areas with more samples are not over-represented with respect to areas with fewer samples.

Post-construction compliance monitoring will include the Haley-related chemicals for which cleanup levels have been established, and other chemicals related to the adjacent (and overlapping) Whatcom Waterway and Cornwall Avenue Landfill MTCA sites. Compliance

monitoring will also be conducted at these adjacent sites. Data collected in the overlap areas will be shared to allow all parties to evaluate whether cleanup levels pertaining to their sites are attained in the areas of overlap. In these areas, the opportunity exists to coordinate compliance monitoring programs to reduce duplication of effort.

3.4. Air Cleanup Standards

Air cleanup levels established in this CAP are based on the protection of human health (inhalation; Table 1). The standard point of compliance is ambient air throughout the Site.

Air cleanup levels were established for analytes that were detected in soil vapor samples obtained at the Site at concentrations greater than MTCA Method B sub-slab soil vapor screening levels (Ecology 2015). Ecology's sub-slab soil vapor screening levels are applicable to shallow soil vapor samples: that is, soil vapor samples obtained at depths between 0 to 15 feet bgs. The soil vapor samples at the Site were obtained at depths of 5 feet bgs.

Air cleanup levels were established for the following analytes:

- Total TPH
- Benzene
- Xylenes
- Naphthalene

4.0 AREAS REQUIRING CLEANUP

The area requiring cleanup within the Upland Unit encompasses cleanup level exceedances in soil and groundwater. The Marine Unit boundary is the location where dioxin/furan concentrations decline to the regional background level of 15 ng/kg TEQ. Cleanup of the Marine Unit will address benthic toxicity-based (see Figure 5 in the SSI report, Appendix A) and bioaccumulation-based cleanup level exceedances in sediment (see Figures 13 through 15 in the SSI report, Appendix A).

5.0 DESCRIPTION OF CLEANUP ACTION

This section summarizes the process for identifying the preferred cleanup alternatives presented in the FS, describes modifications to the preferred alternatives to account for new information and analyses available after the FS was finalized, and describes the selected cleanup action for the Site.

5.1. Cleanup Objectives

The general objective of the cleanup action is to eliminate, reduce, or otherwise control to the extent feasible and practicable, unacceptable risks to human health and the environment posed by hazardous substances in impacted media. The individual cleanup action objectives (CAOs) for the cleanup action at the Site are specific to certain contaminants, exposure

pathways and receptors. CAOs guided the development and evaluation of the remedial alternatives in the FS.

The objectives for the Upland Unit cleanup are to eliminate, reduce, or control to the extent feasible, risks from hazardous substances in soil, soil vapor, and groundwater associated with the following potential exposure routes:

- People and ecological receptors being exposed to hazardous substances in soil and groundwater by direct contact;
- People being exposed to hazardous substances by inhalation of soil vapors;
- Transport of upland contaminated soil to marine sediment as a result of erosion; and
- Leaching of contaminants from soil to groundwater and subsequent transport in groundwater to sediment or surface water.

The objectives for the Marine Unit are to eliminate, reduce, or control to the extent feasible, risks from hazardous substances in surface sediment associated with the following potential exposure routes:

- Aquatic organisms being exposed to hazardous substances in sediment within the biologically active zone (the upper 12 cm of sediment);
- People being exposed to hazardous substances in sediment by direct contact;
- People being exposed to Site-related bioaccumulative compounds by seafood ingestion; and
- Higher trophic level receptors (fish, aquatic-dependent birds and mammals) being exposed to contaminated benthic invertebrate prey via ingestion.

Other considerations for cleanup actions at the Haley Site include:

- The cleanup action should be compatible with cleanup actions currently planned at the adjacent Cornwall Avenue Landfill and Whatcom Waterway cleanup sites.

The design of the cleanup action should be cognizant of the City's plans to redevelop the Haley and Cornwall sites as a future public park. Conceptual park plans include vegetated open areas, access and use of shoreline and intertidal beach areas, enhanced/restored aquatic habitat functions, and limited park amenities. The City may design elements of the selected remedy to accommodate future end use as a park without compromising the functionality of the system.

5.2. Evaluation of Remedial Alternatives

The FS evaluated multiple cleanup alternatives for addressing contaminated media at the Site. The alternatives evaluation was divided into two parts: Upland Unit alternatives (U1 – U6) and Marine Unit alternatives (S1 – S5b). The following are the six alternatives evaluated for addressing Upland Unit contamination.

Alternative U1: Vertical shoreline barrier, passive LNAPL removal, upland cap

This alternative included LNAPL removal via skimming pumps, a low-permeability subsurface barrier wall at the shoreline to prevent LNAPL migration, and a low-permeability upland cap.

Alternative U2: Permeable reactive barrier, passive LNAPL removal, upland cap

This alternative is the same as U1, but replaced the low-permeability barrier wall with a flow-through groundwater treatment wall.

Alternative U3a: Nearshore in-situ soil solidification, upland cap

This alternative included in-situ solidification of soils containing potentially mobile LNAPL near the shoreline, and a low-permeability upland cap.

Alternative U3b: Expanded nearshore in-situ soil solidification, smear zone soil stabilization, and a low-permeability upland cap

This alternative expanded the area of soil solidification, and added soil stabilization in the rest of the smear zone and an upland cap.

Alternative U3c: Soil removal, nearshore in-situ soil solidification, smear zone soil stabilization, upland cap

This alternative added the excavation and removal of soil in the area with potentially mobile LNAPL, and kept the remainder of the expanded area of soil solidification and stabilization. This alternative also had the upland cap.

Alternative U4: Complete removal

This alternative removed all contaminated soil and disposed of it off-Site.

The following are the six alternatives evaluated for addressing contamination in the Marine Unit.

Alternative S1: Containment

This alternative included an amended sand cap over the intertidal and shallow subtidal area, with enhanced natural recovery (ENR) and monitored natural recovery (MNR) in deeper water.

Alternative S2: Partial removal of LNAPL-impacted sediment, and containment

This alternative has S1 elements, but modified the amended sand cap to include removal of the upper three feet of LNAPL-impacted sediment.

Alternative S3: Full removal of LNAPL-impacted sediment, and containment

This alternative modified S2 to include complete removal of the LNAPL-impacted sediment and use of a conventional sand cap.

Alternative S4: Partial removal of LNAPL-impacted and deeper intertidal sediment, and containment

This alternative modified S2 to include removing the upper 3 feet of sediment in the deeper intertidal zone (including the LNAPL-impacted sediment).

Alternative S5a: Full intertidal and shallow subtidal contaminated sediment removal, placement on upland part of Site

This alternative removed all sediment exceeding cleanup levels within the intertidal and shallow subtidal zone (to approximately -10 feet elevation NAVD88), and placed as much of it as possible on the upland part of the Site beneath the low-permeability cap.

Alternative S5b: Full intertidal and shallow subtidal contaminated sediment removal, disposal off-Site

This alternative is the same as S5a, except that excavated sediment is disposed of off-Site.

Each of the alternatives was then evaluated with respect to the criteria outlined in MTCA's regulation. This regulation sets forth the minimum requirements and procedures for selecting a cleanup action. A cleanup action must meet each of the minimum requirements specified in WAC 173-340-360(2), and other requirements, as outlined below.

Threshold Requirements

The cleanup action must:

- Protect human health and the environment;
- Comply with cleanup standards (*see* Section 3.0);
- Comply with applicable state and federal laws (*see* Sections 6.2 and 6.3); and
- Provide for compliance monitoring.

Other Requirements

In addition, the cleanup action must:

- Use permanent solutions to the maximum extent practicable;
- Provide for a reasonable restoration time frame; and
- Consider public concerns.

WAC 173-340-360(3) describes the specific requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable. A permanent solution is defined as one where cleanup levels can be met without further action being required at the Site other than the disposal of residue from the treatment of hazardous substances. To determine whether a cleanup action uses permanent solutions to the maximum extent practicable, a disproportionate cost analysis (DCA) is conducted. This analysis compares the costs and benefits of the cleanup action alternatives and involves the consideration of several factors, including:

- Protectiveness;
- Permanent reduction of toxicity, mobility and volume;

- Cost;
- Long-term effectiveness;
- Short-term risk;
- Implementability; and
- Consideration of public concerns.

The comparison of benefits and costs may be quantitative, but will often be qualitative and require the use of best professional judgment.

WAC 173-340-360(4) describes the specific requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame.

Cleanup Action Expectations

WAC 173-340-370 sets forth expectations for the development of cleanup action alternatives and the selection of cleanup actions.

The cleanup action for the Haley Site was selected in accordance with the MTCA requirements described above, and as described in detail in the final RI/FS report. The remedy selection process included several steps:

- Identified and evaluated remedial technologies: Remedial technologies and process options potentially applicable to the cleanup of Haley contaminants and media were identified and screened as the basis for choosing those most appropriate for the Site. Screening criteria included relative cost, implementability, and effectiveness. Technologies not selected in this process were eliminated from further consideration.
- Assembled alternatives: Retained technologies were assembled to develop separate remedial alternatives for the Haley Upland and Marine Units. Six alternatives were developed for the Upland Unit and six alternatives were developed for the Marine Unit, as noted above.
- Evaluated alternatives: The alternatives were evaluated in accordance with procedures set forth in MTCA and SMS to determine the preferred alternatives for the upland and marine units. All alternatives were determined to meet the threshold requirements (*see* WAC 173-340-360(2)(a) and WAC 173-204-570(3)) and were carried forward to the DCA to identify the most permanent remedy in accordance with WAC 173-340-360. A separate DCA was performed for each of the units.

The DCA identified upland Alternative U3a ("Nearshore In-Situ Soil Solidification, Upland Cap") and sediment Alternative S3 ("Upper Intertidal Sediment Removal and Sand Cap") as the alternatives that were permanent to the maximum extent practicable (having the highest degree of benefit per unit cost compared to all the remedial alternatives evaluated). Therefore, these alternatives were identified as the Preferred Alternatives in the FS.

Since completion of the RI/FS report additional data and analyses, as described in Appendix A and in the EDR, results in the following changes to Alternatives U3a and S3:

- The boundary of the area subject to MNR within the Marine Unit was clarified with respect to Haley contamination. The footprint of dioxins/furans encompasses that of other Haley-related bioaccumulative compounds, as described in Appendix A.
- The boundary of the area subject to capping within the Marine Unit was expanded offshore and northward to the Pine Street Beach area (see Figure 5).
- The boundary of the area of the low-permeability cap within the Upland Unit was extended northward (see Figure 5).
- A new permeable soil cap was added in the Upland Unit adjacent to the Pine Street Beach (see Figure 5).

A new DCA is not necessary to confirm that the updated version of Alternatives U3a and S3 remains permanent to the maximum extent practicable. This is because the expansion of the areas requiring cleanup and the associated costs would equally effect the first four alternatives but would increase the cost of the fifth alternative—complete removal. The result would be no relative change in the cost/benefit ratios for the first four alternatives, and an increase in the cost/benefit ratio for the fifth alternative. The updated version of Alternatives U3a and S3 would therefore remain permanent to the maximum extent practicable. As a result, the updated version of Alternatives U3a and S3 comprise the selected cleanup action for the Site.

5.3. Overview of the Selected Cleanup Action

The components of the selected cleanup action are discussed below and presented in Figures 5 and 6.

1. In-situ soil solidification will be performed within the area of potentially mobile LNAPL near the shoreline.
2. A low-permeability cap will be constructed throughout most of the Upland Unit, at locations where soil exceeds cleanup levels. The low-permeability cap will need to be vented to prevent the buildup of soil gases. A permeable soil cap will also be constructed adjacent to the Pine Street Beach. Additionally, drainage improvements will be implemented along the eastern boundary of the Haley Site to reduce surface water infiltration. The potential need for additional stormwater management actions on the BNSF property to reduce infiltration may be considered in the future as a contingency action.
3. LNAPL-impacted sediment in the intertidal zone immediately adjacent to the shoreline will be excavated. Sediment remaining at the base of the excavation will be capped with amended sand and armored as necessary to prevent erosion. The excavated sediment will be consolidated under the upland cap.
4. Outside of the sediment removal area, an armored sediment cap will be placed in remaining intertidal and shallow subtidal areas where surface sediment concentrations exceed cleanup levels. This includes areas immediately west of the former Haley wood treatment operation where sediment concentrations exceed

benthic criteria, and locations further north (Pine Street Beach area) where bioaccumulative IHSs exceed cleanup levels.

5. Natural recovery will be used in areas where contaminants in surface sediment exceed cleanup levels but would be expected to achieve cleanup levels within 10 years as a result of ongoing natural deposition of clean sediment. This primarily consists of MNR over the expanded footprint of the marine unit.

The most significant change to the selected remedy since publication of the FS is the expansion of MNR over a significantly larger area to address dioxin/furan concentrations in sediment, as noted previously in Section 5.2. In addition, nearshore sediment capping, and upland capping is expanded.

Components of the selected cleanup action for the Haley Site are described in further detail in the following sections.

5.3.1. Upland Soil Solidification

In-situ soil solidification methods will be used to treat potentially mobile LNAPL and associated contaminated soil near the shoreline.

This component of the upland remedy will reduce LNAPL mobility and contaminant leaching to groundwater. The treated soil mass also will have a significantly reduced hydraulic conductivity, thereby causing groundwater to preferentially flow deeper through cleaner soil. This will enhance natural attenuation processes, resulting in reduced contaminant flux from the upland to bay.

5.3.2. Upland Capping

A low-permeability, multi-layer cap will be constructed over most of the Upland Unit to address soil that exceeds cleanup levels. The cap will reduce stormwater infiltration and the risk of direct contact exposure. The low-permeability cap layers will include (bottom to top) a gas-collection layer, a low-permeability geomembrane, a drainage layer, and at least 2 feet of imported fill or topsoil that may be seeded or paved depending on Site redevelopment plans.

The upland low-permeability cap will provide passive subsurface vapor collection and venting to mitigate the accumulation of volatile compounds from subsurface contamination or landfill gases from refuse associated with the Cornwall site. Stormwater also will be managed to minimize infiltration.

A permeable soil cap will be constructed in the upland adjacent to the Pine Steet Beach to eliminate direct contact with soil that exceeds cleanup levels. The permeable cap layers will include (bottom to top) a geotextile separation and demarcation layer and at least 2 feet of imported fill or topsoil that will be seeded or planted with bushes and trees.

5.3.3. Intertidal Sediment Removal

LNAPL-impacted sediment will be excavated and removed from the upper intertidal zone (above 0.0 foot NAVD88). Contaminated sediment remaining below the excavated sediment will be capped (*see* below). The excavated sediment will be consolidated in the Upland Unit

beneath the low-permeability cap. The excavated sediment will require the addition of amendments to enhance its structural properties prior to consolidation under the low-permeability upland cap.

5.3.4. Sediment Capping

Sediment exceeding cleanup levels in nearshore areas of the Marine Unit will be capped both within and outside of the sediment removal area. In areas not expected to recover naturally, the cap will be constructed in the intertidal and shallow subtidal zones, down to an elevation of approximately -20 feet NAVD88. The sediment cap will isolate underlying contaminants and be armored to withstand physical erosion processes. The sediment cap will range in thickness from approximately 1 to 5 feet. The thickest cap sections will be located in the sediment removal area. Cap thickness and the nature of armoring materials will be further evaluated during remedial design and may vary from the concepts reflected in this CAP.

5.3.5. Natural Recovery

MNR will be utilized to address deeper subtidal areas where Site-related bioaccumulative compounds at the Site exceed cleanup levels. The area of MNR was selected using a sediment recovery model that incorporated several factors such as contaminant concentration, depositional rate, depth of the biologically active zone and restoration time frame. MNR will be utilized in subtidal areas where exceedances of bioaccumulative-based cleanup levels are expected to naturally recover within 10 years. The outer-most extent of the MNR area coincides with the location where concentrations of dioxins/furans are estimated to be at or below regional background for this contaminant group (Figures 3 and 5).

5.4. Institutional Controls

Institutional controls are included as a component of the remedy to ensure its long-term protectiveness. As noted in WAC 173-340-440(4), institutional controls are required where contamination is left in place or conditional points of compliance are used; both conditions apply to the Haley Site. WAC 173-340-440(4)(a), (e). These controls limit or prohibit activities that may interfere with or impair the integrity of a cleanup action, its maintenance or monitoring, or any other activity necessary to ensure protection of human and environmental health.

For the selected remedy, the City and Port will record an Ecology approved environmental covenant (MTCA refers to this legal instrument as a "restrictive covenant") with Whatcom County Assessor's Office for the property owned by the City and Port to ensure that all restrictions are implemented and the integrity of the remedies is maintained. Aquatic use restrictions for state-owned lands that are part of the Site may also be required (e.g., leases or easements for constructed cap areas). Any use restrictions affecting the Port Management Area will be coordinated with the Port of Bellingham and DNR. All restrictions will apply, regardless of transfer of property ownership, lease, or operation. Any conveyance of title, easement, lease, or other interest in the properties associated with the Site will require written notice to Ecology of such conveyances or changes. Any proposed activity that is inconsistent with the restrictive covenant and permanently modifies an activity or use restriction at the Site will require Ecology approval, and public notice and an opportunity for public comment.

Environmental covenants may include, but not be limited to:

- Restrictions on withdrawal of groundwater for use as drinking water or for irrigation;
- Identification and use of engineering controls to prevent contaminant release during any construction, maintenance or repair activity (or any intrusive activity) in the upland or along the shoreline; and
- Limits on boat activities (e.g. size, speed or anchoring) to minimize disturbance in sediment cap areas.

The Institutional Control Plan (part of the Operations, Maintenance and Monitoring Plan described in Section 6.6) will describe the restrictions and other requirements associated with institutional controls. DNR will include any restrictions affecting state-owned property on maps and within their databases used to track ownership and use activities.

5.5. Types, Levels and Amounts of Hazardous Substances to Remain in Place

Contaminated media will remain at the Site at concentrations exceeding cleanup levels after construction of the selected remedy. It is estimated that approximately 187,000 cubic yards of contaminated upland soil will remain at the Site, contained by approximately 7.7 acres of low-permeability cap. This volume includes approximately 15,000 cubic yards of upland soil that will be treated by in-situ solidification. Approximately 8,000 cubic yards of marine sediment will be excavated from the near-shore intertidal zone and consolidated beneath the low permeability cap.

The selected remedy contains treatment and containment technologies that will limit contaminant mobility and cut off exposure pathways to reduce risks to people and ecological receptors. Soil containing the greatest contaminant concentrations (LNAPL plume area) will be treated by in-situ solidification. This action, combined with upland capping, will reduce LNAPL mobility and contaminant leaching to groundwater throughout the Upland Unit. The most heavily impacted sediment will be removed from the Marine Unit and consolidated beneath the upland low permeability cap. The nearshore sediment cap will isolate contaminated sediment to reduce the risks to the benthic community.

5.6. Restoration Time Frame

Cleanup standards will be achieved for the Haley Site as follows:

- Haley Upland Unit – When construction is completed.
- Marine Unit, Sediment removal and capping portions – When construction is completed. Biological communities, specifically benthic invertebrates, will likely become re-established in sediment removal or capping areas within 3 years of completing construction. Restoration of eelgrass beds, where disturbed, may require a longer time frame.
- Marine Unit, MNR area – Within 10 years.

5.7. Compatibility with Adjacent Cleanup Sites

Portions of the Haley Upland and Marine Units overlap with the Cornwall upland and marine units. In addition, the Haley Marine Unit overlaps with Whatcom Waterway sediment Units 6 and 9 (Figure 4). The selected alternative for the Haley site will be compatible with the Cornwall and Whatcom Waterway remedies in the areas of overlap. To be compatible, however, direct coordination of the engineering design work will be required.

The Haley and Cornwall cleanups utilize several common elements in the area of overlap that will be compatible and for which design will be coordinated and optimized. These elements include low-permeability caps, landfill/soil gas collection system, stormwater drainage improvements, sediment capping and erosion control (or "shoreline stabilization" in the case of Cornwall). The Haley MNR area also would be compatible with future Cornwall cleanup actions, if required, outside of Cornwall unit MU-2. Cornwall remedial actions in this area, if required, are anticipated to be MNR (Ecology 2014). The Haley MNR area is also totally encompassed by Whatcom Waterway units 6A, 6B, 6C and 9, which are also slated for MNR except for a portion of the barge dock area, which will be capped (Anchor QEA et al. 2015).

The conceptual profiles for the Haley and Cornwall upland caps differ somewhat; however, either conceptual design may be suitable for use in the overlap area. The nearshore sediment cap in the Haley Marine Unit also differs in profile and function from the Cornwall shoreline stabilization system. Coordination will be required to match grades and other design elements of the cleanup actions in these areas of overlap while assuring that the CAOs for both sites are met.

5.8. Coordination with Site Redevelopment

The City has completed a master plan for the Cornwall Beach Park (Anchor QEA 2014), a proposed 17-acre waterfront park that will be constructed in the upland and intertidal areas of the Cornwall and Haley sites. The conceptual park master plan was developed with input from City departments, the Port, cleanup consultants involved with the Haley and Cornwall sites, and the public.

The park will include construction of on-site structures, access roads, a parking lot, and landscaping, the design of which will be integrated with the Haley upland cap. Design and construction of the Haley cleanup and future City park are proceeding concurrently.

6.0 IMPLEMENTATION OF THE CLEANUP ACTION

The cleanup action will be implemented based on this final CAP. Implementation elements are described below and include remedial design, compliance with applicable state and federal laws, permitting, other pre-construction submittals, coordination with adjacent cleanup actions, compliance monitoring and operation and maintenance, and schedule.

6.1. Remedial Design

An EDR was completed in 2022. The EDR will serve as the basis for developing permit applications, construction plans and specifications, and compliance monitoring plans. The

construction plans and specifications will guide construction of the cleanup action and serve as the basis for bidding the work to contractors.

6.2. Applicable, Relevant and Appropriate Requirements (ARARs)

The primary law governing cleanup of the Haley site is the MTCA (Chapter 70A.305 Revised Code of Washington [RCW]). According to MTCA's regulations, cleanup actions must comply with all state and federal laws (WAC 173-340-710(1)) that are applicable or that Ecology determines may apply to the cleanup (i.e., are relevant and appropriate). Collectively these laws, implementing regulations, standards, limitations, or other requirements are referred to as Applicable or Relevant and Appropriate Requirements (ARARs). ARARs regulate specific components of the cleanup, including standards for construction, cleanup of sediment, disposal of hazardous waste, and management of stormwater during construction. Other applicable laws and their implementing regulations include, but are not limited to:

- Washington Chemical Contaminants and Water Quality Act implemented by the Sediment Management Standards (Chapter 173-204 WAC).
- Washington Water Pollution Control Act implemented by Washington State Water Quality for Surface Waters (Chapter 173-201A WAC).
- Clean Water Act, with respect to water quality criteria for surface water (Bellingham Bay) and in-water work associated with dredging or sediment capping.
- Dredge and fill requirements under Code of Federal Regulations (CFR) 320-330 implementing Section 404 of the Clean Water Act and Washington State Hydraulic Code Rules under Chapter 220-110 WAC.
- Washington Hazardous Waste Management Act (RCW 70A.300) and Dangerous Waste Regulations (Chapter 173-303 WAC), to the extent that any dangerous wastes are discovered during implementation of the cleanup action.
- Washington State Clean Air Act and air quality regulations (Chapter 173-400 WAC) for point source emissions.
- Shoreline Management Act, with respect to construction activities during the cleanup action.
- Endangered Species Act (ESA), due to listing of Puget Sound Chinook and the potential listing of Coastal/Puget Sound bull trout. Additional ARARs may be identified during the cleanup design and permitting process.

Construction projects are subject to environmental impact review under State Environmental Policy Act (SEPA), National Environmental Policy Act (NEPA) or both. For most projects in Washington, this review consists of a SEPA checklist, although an environmental impact statement is sometimes required. Ecology has completed a SEPA review for the Haley Site cleanup, and has made a Determination of Non-Significance (DNS). The NEPA review will be completed by the U.S. Army Corps of Engineers (USACE) through the Section 404 permit process.

Shoreline Master Plan requirements apply to projects located within 200 feet of the shoreline. In addition to any local compliance review, Ecology conducts site-specific review of cleanup actions conducted under MTCA, provided that those actions are consistent with the substantive requirements of the Shoreline Master Program.

6.3. Permits

Most of the requirements associated with ARARs are specified as regulatory permit conditions. However, cleanup actions conducted under a MTCA Order or Consent Decree are exempt from the procedural requirements of most state and local permits including the Washington State Clean Air Act, Solid and Hazardous Waste Management Act, Hydraulic Code Rules, Water Pollution Control Act, State Environmental Policy Act and local regulations. Regardless of the permit exemptions, all cleanup actions must meet the substantive requirements of the subject regulations/permits. Lead agencies for the exempted permits will be consulted to identify their substantive requirements during the design phase of the cleanup.

Permits administered by the State of Washington but granted authority under federal regulations—the Clean Water Act (CWA), National Pollutant Discharge Elimination System (NPDES), and treatment, storage or disposal of hazardous waste under the RCRA— must still be obtained, as do all federally required permits. Requirements governing cleanup of sediment under federal regulation will be addressed through the Joint Aquatic Resource Permit Application (JARPA). The JARPA coordinates information applicable to the USACE-issued CWA Section 10 and Section 404 permits (Nationwide 38 or Individual 404 permit) and Ecology-issued CWA Section 401 Water Quality Certifications. A state-issued NPDES permit may be required for any on-Site water treatment or discharge of stormwater from the cleanup site during implementation of the remedy as well as a DNR Use Authorizations for State-Owned Aquatic Lands.

The federal permitting process includes review of issues relating to wetlands, Tribal treaty rights, threatened and endangered species, habitat impacts, and other factors. The USACE will consult with natural resource trustees regarding potential project impacts on species and habitats protected under the ESA and related requirements. In addition, the USACE will consult with the State Historic Preservation Office to determine the effects of the cleanup under Section 106 of the National Historic Preservation Act.

The USACE will also be responsible for approval of the project under Nationwide Permit 38 or Section 404 permit, following ESA consultation with the federal natural resource trustees, and also incorporating Ecology's 401 Water Quality Certification.

6.4. Other Pre-Construction Submittals

Other documents will need to be prepared prior to construction including bid documents, contractor submittals required by the specifications, those required by permitting agencies, and others yet to be specified. All of these need to be provided to Ecology for review and for project records; some may also need to be approved by Ecology. A determination of whether approval is needed will be made by Ecology when it is notified that a document is being prepared.

6.5. Coordination with Adjacent Cleanup Actions

Compatibility and coordination of the Haley and adjacent cleanup sites was discussed from a design perspective in earlier sections. This section focuses on coordination from an implementation perspective. Regardless of Haley and Cornwall being considered separate sites from an administrative perspective, it is likely that the cleanup construction actions will be undertaken concurrently. Less coordination will be required between the Haley and Whatcom Waterway sites because they primarily overlap in an area slated for MNR. A few key coordination issues for the Haley and Cornwall sites are summarized below.

- Certain Haley actions (e.g. upland soil solidification and nearshore sediment removal) should be completed before beginning capping actions in overlapping portions of Cornwall units MU-1 or MU-2.
- Haley sediment removal actions must occur before construction of the upland cap on Cornwall (and Haley) because the excavated sediment will be consolidated beneath the upland cap.
- Construction of the upland caps, including the associated landfill gas/soil gas collection and stormwater drainage systems, will need to provide seamless coverage and function across both sites.
- Construction equipment and techniques will likely be the same for certain components of both cleanups (e.g. upland and marine capping) and should be completed as one action to reduce construction costs. The same could apply to the Haley MNR area if it is determined in the future that MNR is required for Cornwall unit MU-3.

Construction actions at these overlapping cleanup sites will need to be carefully sequenced, and these plans should be specified in construction documents.

6.6. Compliance Monitoring and Operations and Maintenance

Three types of compliance monitoring are required under MTCA for site cleanup: protection, performance, and confirmation (WAC 173-340-410(1)). The purpose of each type of monitoring is the following:

Protection monitoring will be conducted during construction to assure that human health and the environment are protected.

Performance monitoring will be conducted during construction to confirm compliance with permit and substantive requirements and that design specifications and cleanup standards have been achieved.

Confirmation monitoring will be conducted to confirm the long-term effectiveness of the remedy.

The following specific MTCA monitoring plans will therefore be prepared for the Haley Site:

- Compliance Monitoring Plan. This plan will be prepared as part of construction documents, as the requirements in this plan will need to be implemented during and checked immediately after construction.

- **Operations, Maintenance and Monitoring Plan.** This plan will be prepared for the post-construction period to track MNR in areas that do not meet cleanup standards immediately after construction, and to confirm that the cleanup continues to be effective in areas that do meet cleanup standards immediately after construction. This plan will include consideration of contingency response measures.

These plans and revisions to these plans will be submitted to Ecology for review and approval, either as part of another deliverable or as stand-alone documents.

6.7. Schedule

Construction of the Haley cleanup should begin shortly after permitting is completed (anticipated late 2024), and will require phasing the upland and sediment activities, plus coordination with the Cornwall site cleanup. The schedule for in-water work will be limited to permit-specified fish windows to minimize effects to migrating juvenile salmonids and other aquatic species. Because of the phasing and coordination needs, and in-water work windows, construction is expected to take approximately two full calendar years. The City and/or Port will perform post-construction monitoring for a duration and frequency to be identified during remedial design.

The schedule and set of deliverables is an exhibit to the Consent Decree between Ecology and the City and the Port.

7.0 REFERENCES

Anchor QEA 2014, "Cornwall Beach Park Master Plan Report". Prepared for City of Bellingham, October 2014.

Anchor QEA 2015, "Final Engineering Design Report, Whatcom Waterway Cleanup in Phase 1 Site Areas," Prepared for Port of Bellingham, February 2015.

Ecology 2005. Agreed Order DE 2186 between Washington State Department of Ecology and Douglas Management Company, for the R.G. Haley International Site, April 5, 2005.

Ecology 2011. Urban Seattle Area Soil Dioxin and PAH Concentrations Initial Summary Report. September 2011.

Ecology 2014. Consent Decree No. 14-2-02593-5. Washington Department of Ecology vs City of Bellingham, Port of Bellingham, and Washington State Department of Natural Resources. 2014. Cornwall Avenue Landfill. December 2, 2014. Whatcom County Superior Court.

Ecology 2015. CLARC Master Spreadsheet. July 2015.

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Ecology 2021. Sediment Cleanup User's Manual (SCUM). Guidance for Implementing the Cleanup Provisions of the Sediment Management Standards, Chapter 173-204 WAC. December 2021.

GeoEngineers 2016. “Final Remedial Investigation/Feasibility Study Report, R.G. Haley Site.” Prepared for the City of Bellingham. February 1, 2016.

GeoEngineers 2023. “Updated Supplemental Sediment Investigation Report, R.G. Haley Site.” Prepared for the City of Bellingham. December 28, 2023.

GeoEngineers 2022. “Final Engineering Design Report, R.G. Haley International Corporation Site.” Prepared by the City of Bellingham. May 13, 2022.

Table 1

Summary of Cleanup Levels

R.G. Haley International Site

Bellingham, Washington

Indicator Hazardous Substance	Soil	Groundwater	Sediment		Air	Basis for Cleanup Level
			Organic Carbon (0.5% to 3.5%)	Organic Carbon (<0.5% or >3.5%)		
Dioxins/Furans						
Dioxin TEQ	13 ng/kg	32 pg/L	13 ng/kg dw	13 ng/kg dw	na	**Soil:** Human health - based on direct contact **GW:** Protection of surface water (bioaccumulative risks to people), adjusted up to the derived PQL **Sed:** Human and ecological health - bioaccumulative risks to people and ecological receptors, adjusted up from the PQL-based SCO based on recontamination evaluation (see Appendix B)
PAHs						
1-Methylnaphthalene	42 µg/kg	15 µg/L	na	na	na	**Soil:** Protection of groundwater - based on protection of sediment (benthic organism toxicity) **GW:** Protection of sediment based on benthic organism toxicity (using 2-methylnaphthalene as a surrogate)
2-Methylnaphthalene	41 µg/kg	15 µg/L	38 mg/kg oc	670 µg/kg dw	na	**Soil:** Protection of groundwater - based on protection of sediment (benthic organism toxicity) **GW:** Protection of sediment based on benthic organism toxicity **Sed:** Benthic organism toxicity (SMS SCO)
Acenaphthene	na	5.3 µg/L	16 mg/kg oc	500 µg/kg dw	na	**GW:** Protection of sediment based on benthic organism toxicity **Sed:** Benthic organism toxicity (SMS SCO)
Fluoranthene	na	na	160 mg/kg oc	1,700 µg/kg dw	na	**Sed:** Benthic organism toxicity (SMS SCO)
Naphthalene	na	na	99 mg/kg oc	2,100 µg/kg dw	0.074 µg/m^3	**Sed:** Benthic organism toxicity (SMS SCO) **Air:** Human health - inhalation
Phenanthrene	na	na	100 mg/kg oc	1,500 µg/kg dw	na	**Sed:** Benthic organism toxicity (SMS SCO)
Benzo(a)anthracene	na	0.01 µg/L	110 mg/kg oc	1,300 µg/kg dw	na	**GW:** Protection of surface water (bioaccumulative risks to people), adjusted up to the PQL **Sed:** Benthic organism toxicity (SMS SCO). Potential bioaccumulative risks addressed by the cPAH TEQ sediment cleanup level
cPAH TEQ	7.6 µg/kg	0.02 µg/L	229 µg/kg dw	229 µg/kg dw	na	**Soil:** Protection of groundwater - based on protection of surface water (bioaccumulative risks to people), adjusted up to the derived PQL **GW:** Protection of surface water (bioaccumulative risks to people); adjusted up to the derived PQL **Sed:** Human and ecological health - bioaccumulative risks to people and ecological receptors (risk-based SCO)
SVOCs						
Pentachlorophenol	6.3 µg/kg	0.04 µg/L	100 µg/kg dw	100 µg/kg dw	na	**Soil:** Protection of groundwater - based on protection of surface water (bioaccumulative risks to people), adjusted up to the PQL **GW:** Protection of surface water (bioaccumulative risks to people) **Sed:** Human and ecological health - bioaccumulative risks to people and ecological receptors (PQL-based SCO)
VOCs						
Benzene	na	na	na	na	0.32 µg/m^3	**Air:** Human health - inhalation
m- and p-Xylenes	na	na	na	na	46 µg/m^3	**Air:** Human health - inhalation
o-Xylene	na	na	na	na	46 µg/m^3	**Air:** Human health - inhalation
Petroleum Hydrocarbons						
TPH Sum	1,534 mg/kg	na	260 mg/kg dw	260 mg/kg dw	na	**Soil:** Human health - based on direct contact **Sed:** Benthic organism toxicity (site-specific SCO)
Total TPH	na	na	na	na	140 µg/m^3	**Air:** Human health - inhalation[1]

Notes:

[1] Petroleum Vapor Intrusion (PVI): Updated Screening Levels, Cleanup Levels, and Assessing PVI Threats to Future Buildings; Implementation Memorandum No. 18; January 18, 2018; Ecology Publication No. 17-09-043.

cPAH = carcinogenic polycyclic aromatic hydrocarbon

CSL = cleanup screening level

dw - dry weight

GW = groundwater

mg/kg = milligram per kilogram

na = compound is not an indicator hazardous substance for this medium, therefore, no cleanup level is needed.

ng/kg = nanogram per kilogram

oc = organic carbon

PAH = polycyclic aromatic hydrocarbons

PQL = practical quantitation limit

SCO = sediment cleanup objective

SVOC = semivolatile organic compound

Sed = sediment

SMS = Sediment Management Standards

TEQ = toxic equivalent concentration

TPH SUM = total petroleum hydrocarbons; sum of diesel- and lube oil-range

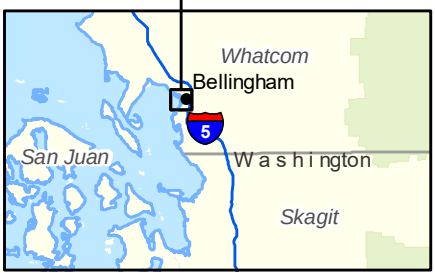
Total TPH = total petroleum hydrocarbons; sum of c5 to c8 aliphatics, c9 to c12 aliphatics, c9 to c10 aromatics, benzene, toluene, ethylbenzene, xylenes and naphthalene

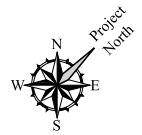
µg/kg = microgram per kilogram

µg/L = microgram per liter

µg/m^3 = microgram per cubic meter

VOC = volatile organic compound





2,000 0 2,000

Feet

Reference: Whatcom County GIS, City of Bellingham GIS, Aerial from Esri, 2013.

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. can not 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.
3. It is unlawful to copy or reproduce all or any part thereof, whether for personal use or resale, without permission.

Projection: NAD 1983 UTM Zone 10N

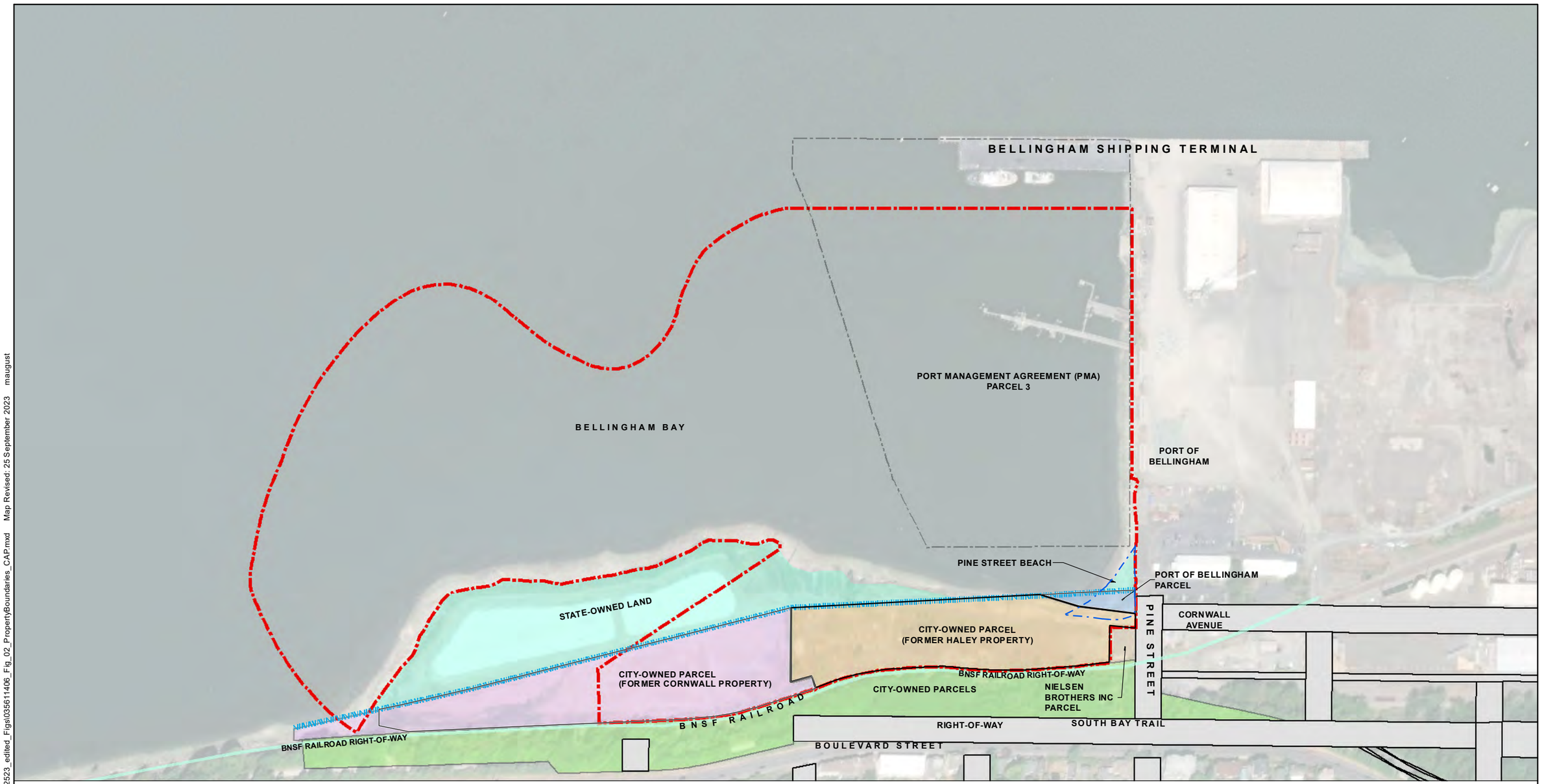
Vicinity Map

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 1

Path: P:\00356114\GIS\MXDs\Fig_1-1_VicinityMap.mxd Map Revised: 09 January 2018 maugust



True North
W
S
N
E
Project North

0 100 200
Feet

Legend

- Haley Cleanup Area Boundary
- Inner Harbor Line

Reference: Aerial from Esri, 2013.

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.
3. The estimated extent of the upland portion of the Haley Site is based on existing RI data, although that data does not fully delineate the extent of all Site contaminants. The upland Site boundaries will be further evaluated in the future as a separate action.

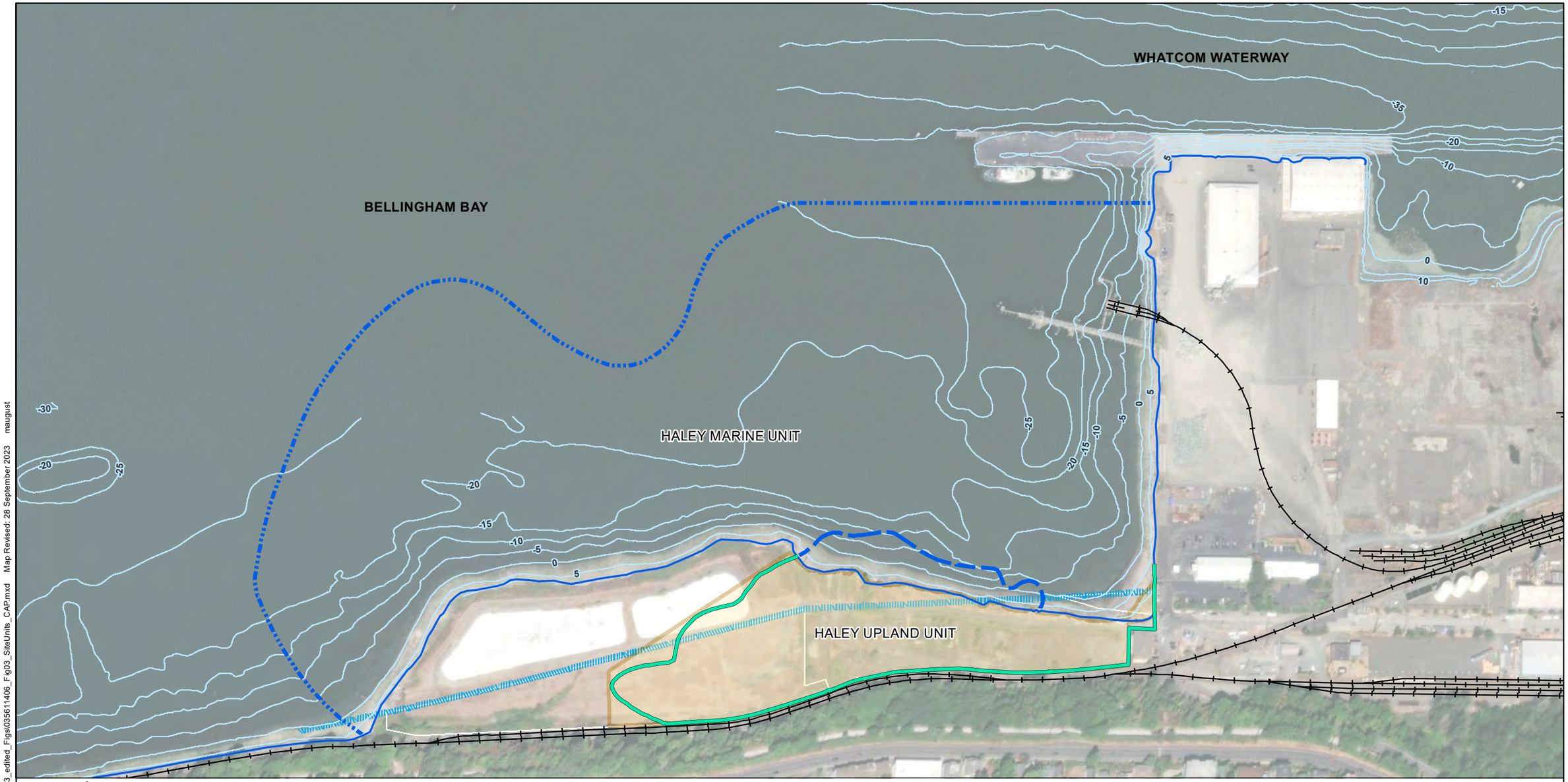
Site and Property Ownership

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 2

Path: P:\0\0356114\GIS\MXDs\SedimentFinals\0616\092523_edited_Figs\0356114l06_Fig_02_PropertyBoundaries_CAP.mxd Map Revised: 25 September 2023 maugust



W True North N E S

Project North

0 150 300

Feet

- Cleanup area exceeding soil and/or groundwater cleanup levels.
- Cleanup area exceeeding sediment cleanup levels based on benthic toxicity.
- Cleanup area exceeding sediment bioaccumulation-based cleanup levels.
- BNSF Railroad
- Bathymetric Contour (5-ft interval)
- Inner Harbor Line

Reference: Aerial from Google Earth, August 2011.
Contour elevation displayed is referenced to NAVD88 vertical datum.

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.
3. The estimated extent of the upland portion of the Haley Site is based on existing RI data, although that data does not fully delineate the extent of all Site contaminants. The upland Site boundaries will be further evaluated in the future as a separate action.

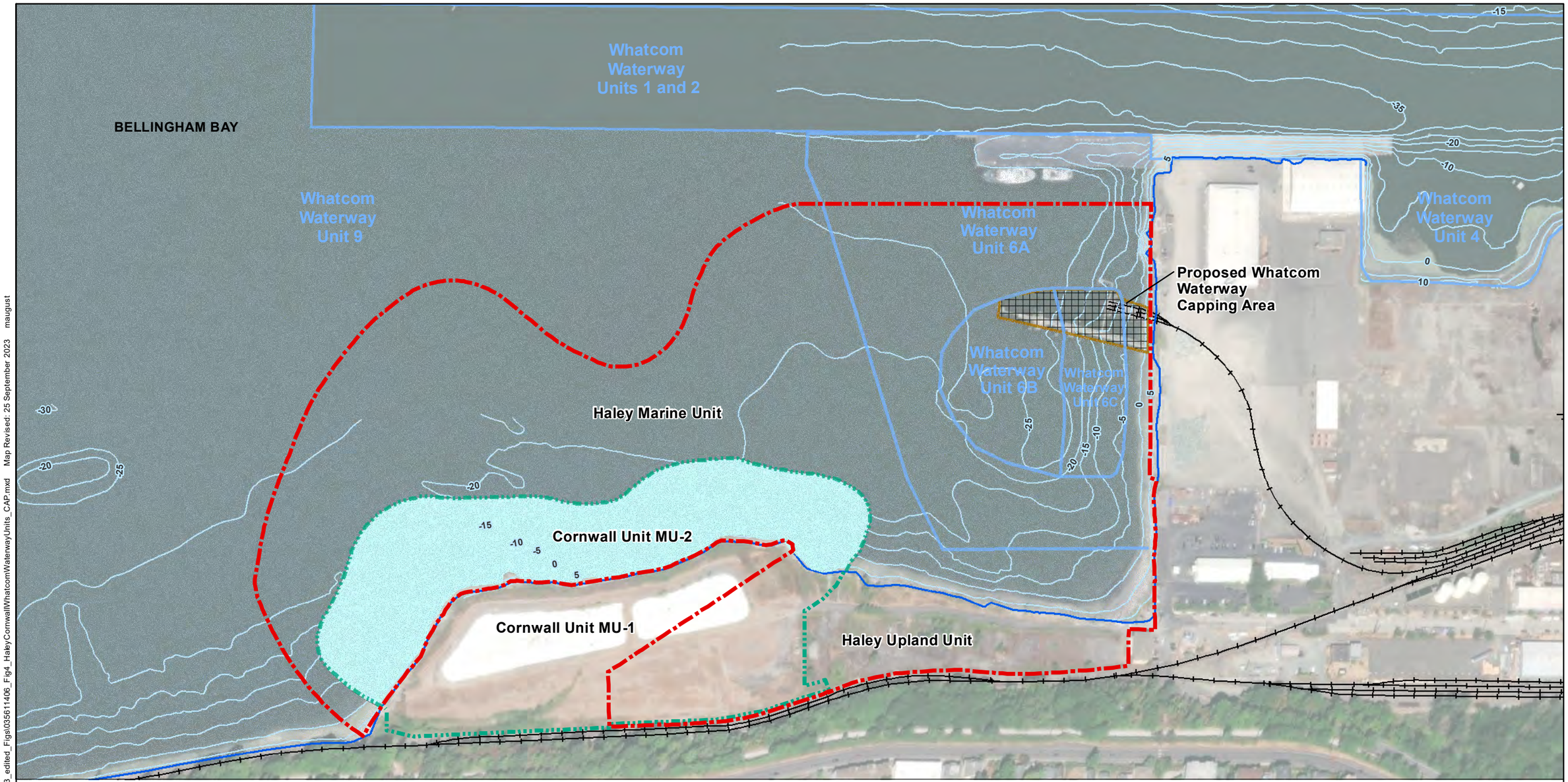
Site Units

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 3

Path: P:\00356114\GIS\MXDs\SedimentFinals\0616\092523_edited_Figs\0356111406_Fig03_SiteUnits_CAP.mxd Map Revised: 28 September 2023 maugust



W True North S N Project North E

0 150 300

Feet

Legend

- Haley Cleanup Area Boundary
- Boundary of Cornwall Units MU-1 and MU-2
- BNSF Railroad
- Current Shoreline
- Bathymetric Contour (5-ft interval)

Reference: Aerial from Google Earth, August 2011.
Contour elevation displayed is referenced to NAVD88 vertical datum.

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.
3. The estimated extent of the upland portion of the Haley Site is based on existing RI data, although that data does not fully delineate the extent of all Site contaminants. The upland Site boundaries will be further evaluated in the future as a separate action.

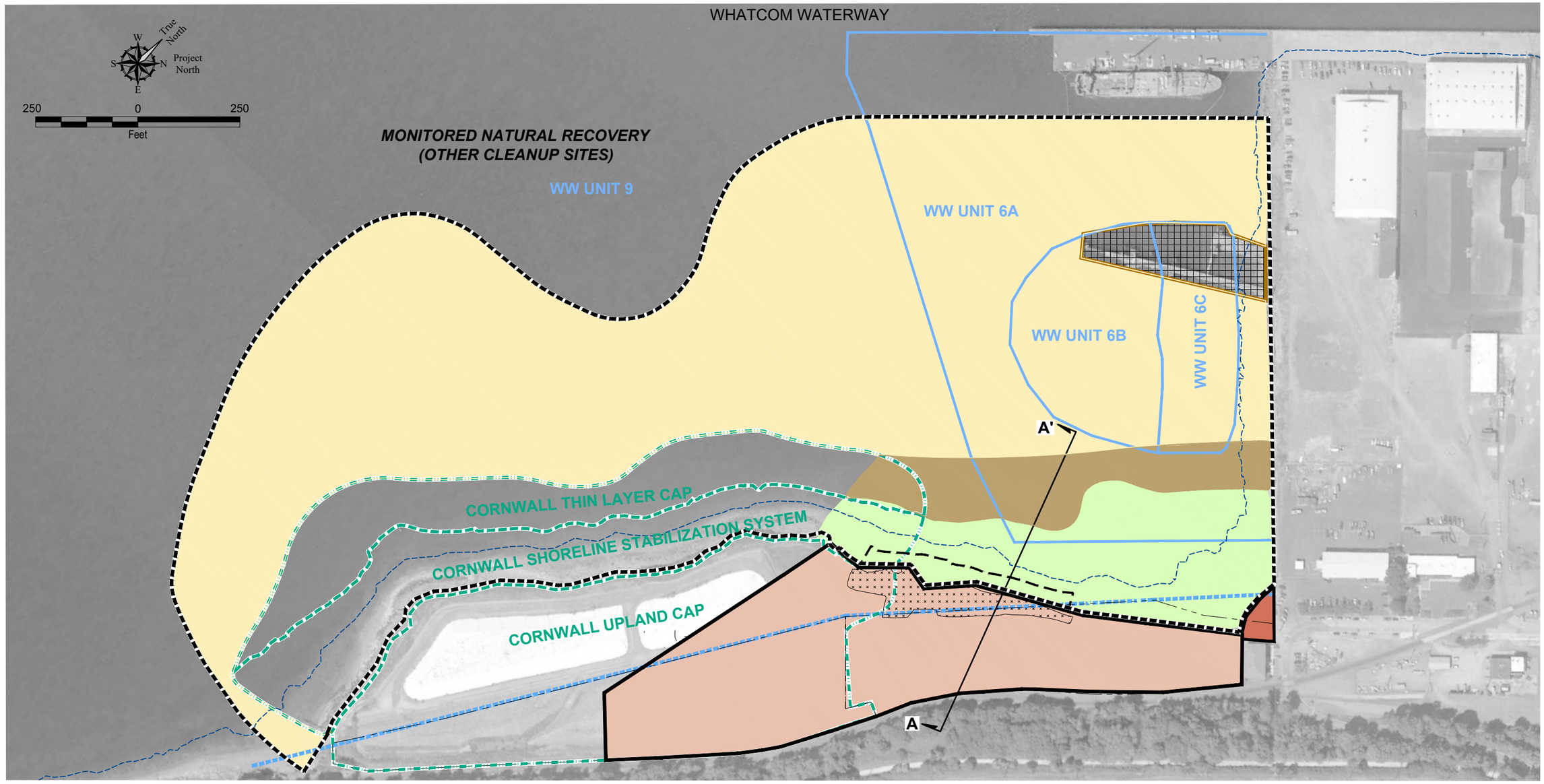
Haley, Cornwall and Whatcom Waterway Site Units

R.G. Haley Site
Bellingham, Washington

GeoEngineers

Figure 4

Path: P:\0\0356114\GIS\MXDs\SedimentFinals\0616\092523_edited_Figs\0356114\06_Fig4_HaleyCornwallWhatcomWaterwayUnits_CAP.mxd Map Revised: 25 September 2023 maugust



Legend

- A A' — Cross Section Location
- Cornwall Cleanup Action Components
- "WW Unit" Designation (Whatcom Waterway Units Slated for MNR)
- Inner Harbor Line
- Lower Limit of Intertidal Zone (-4ft NAVD88)

HALEY CLEANUP ACTION COMPONENTS

- Low-Permeability Upland Cap
- Permeable Soil Upland Cap
- In-Situ Soil Solidification
- Sand Cap (2-Feet to 5-Feet Thick)
- Thin Layer Cap
- Monitored Natural Recovery
- Extent of Sediment Removal
- Haley Upland Unit Boundary
- Haley Marine Unit Boundary
- Whatcom Waterway Capping and Armoring

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.

Reference: Base aerial photo from Google Earth Pro dated 7/24/2017.

Cleanup Action Components

R.G. Haley Site
Bellingham, Washington

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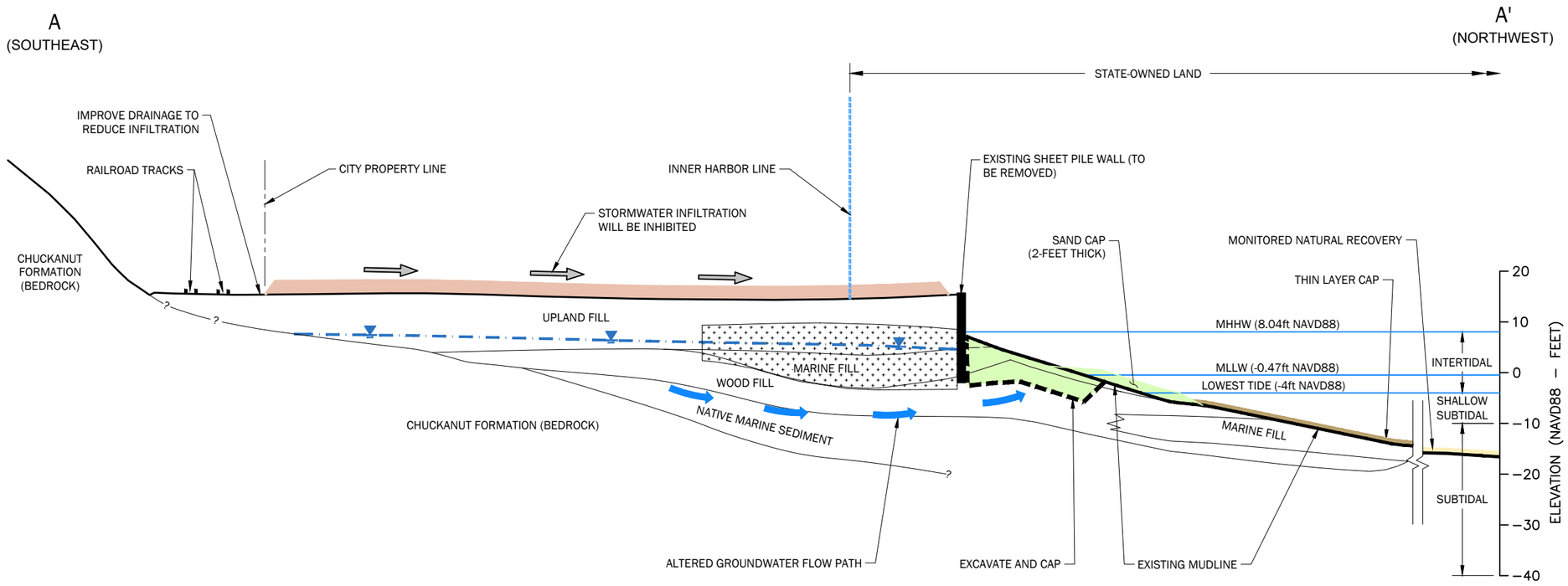
Figure 5



Legend

- Low-Permeability Upland Cap
- In-Situ Soil Solidification
- Sand Cap (Ranges from 2 Feet to 5 Feet Thick)
- Thin Layer Cap
- Monitored Natural Recovery

HORIZONTAL SCALE: 1"= 50'
VERTICAL SCALE: 1"= 25'
VERTICAL EXAGGERATION: 2X

50 0 50
FEET

Notes

1. Directions given on cross section line refer to Project North.
2. 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.
3. Details regarding the shoreline slope in the bank transition area, and post-cleanup upland grades and bathymetry will be determined during remedial design.
4. This figure is for informational purposes only. It is intended to assist in the identification of features discussed in a related document.

Selected Cleanup Action
Cross Section A-A'

R.G. Haley Site
Bellingham, Washington

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Figure 6