First Periodic Review
Holly Street Landfill

600 W Holly St, Bellingham, Whatcom County, WA
Facility Site ID: 2925, Cleanup Site ID: 253

Toxics Cleanup Program, Northwest Region

Washington State Department of Ecology
Shoreline, Washington

July 2024

Document Information

This document is available on the Department of Ecology's Holly Street Landfill cleanup site page.[1]

Related Information

- Facility Site ID: 2925
- Cleanup Site ID: 253

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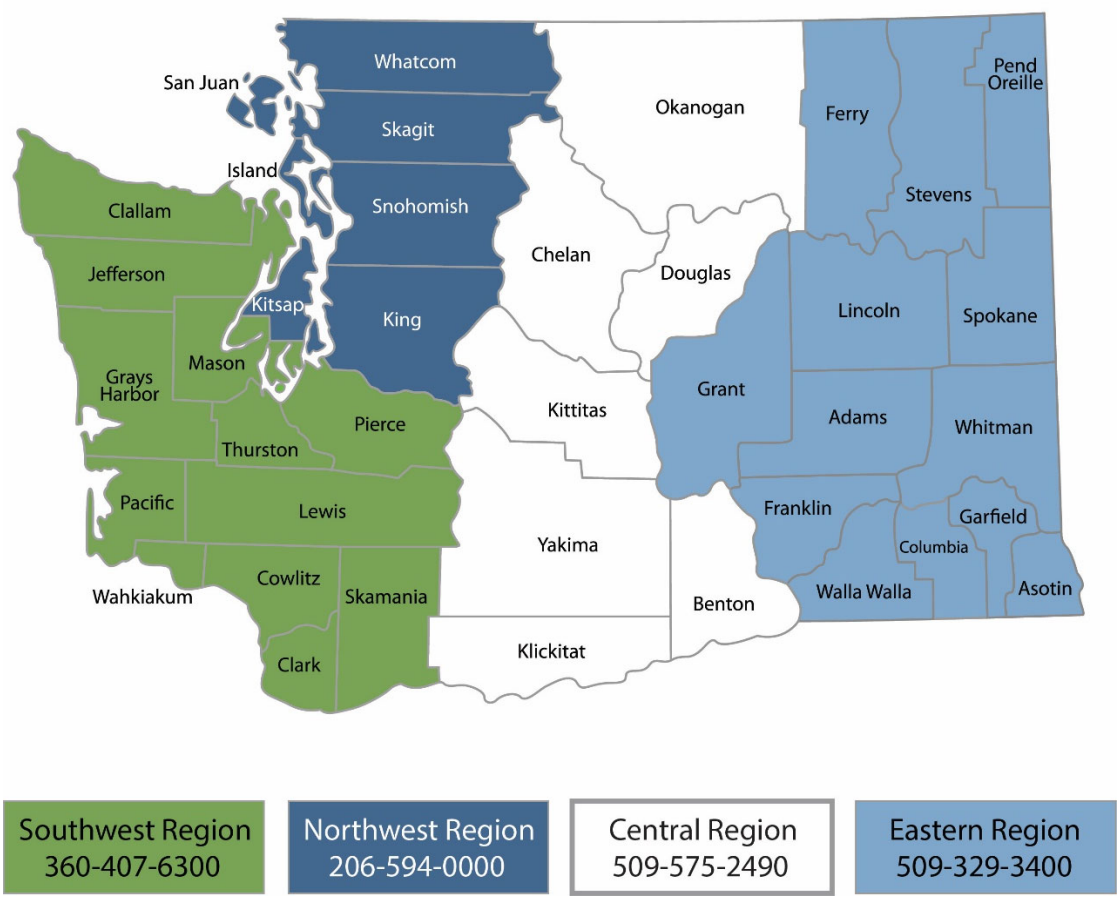
[1] https://apps.ecology.wa.gov/cleanupsearch/site/253
[2] https://ecology.wa.gov/About-us/Who-we-are/Our-Programs/Toxics-Cleanup
[3] https://ecology.wa.gov/About-us/Accountability-transparency/Our-website/Accessibility

Department of Ecology's Regional Offices

Map of Counties Served



Region	Counties served	Mailing Address	Phone
Southwest	Clallam, Clark, Cowlitz, Grays Harbor, Jefferson, Mason, Lewis, Pacific, Pierce, Skamania, Thurston, Wahkiakum	PO Box 47775 Olympia, WA 98504	360-407-6300
Northwest	Island, King, Kitsap, San Juan, Skagit, Snohomish, Whatcom	PO Box 330316 Shoreline, WA 98133	206-594-0000
Central	Benton, Chelan, Douglas, Kittitas, Klickitat, Okanogan, Yakima	1250 W Alder St Union Gap, WA 98903	509-575-2490
Eastern	Adams, Asotin, Columbia, Ferry, Franklin, Garfield, Grant, Lincoln, Pend Oreille, Spokane, Stevens, Walla Walla, Whitman	4601 N Monroe Spokane, WA 99205	509-329-3400
Headquarters	Across Washington	PO Box 46700 Olympia, WA 98504	360-407-6000

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1.0 Introduction

The Washington State Department of Ecology (Ecology) reviewed post-cleanup site conditions and monitoring data to ensure human health and the environment are being protected at the Holly Street Landfill cleanup site (Site). Site cleanup was implemented under the Model Toxics Control Act (MTCA) regulations, Chapter 173-340 Washington Administrative Code (WAC).

Cleanup activities at this Site were completed under the Consent Decree No. 03-2-02164-1. Residual concentrations of metals (arsenic, copper, cadmium, lead and mercury) and carcinogenic polynuclear aromatic hydrocarbons (cPAHs) that exceeded MTCA Methods A and B soil cleanup levels remain on the property. Shoreline seepage discharges from portions of the Site were above MTCA Methods A and B surface water cleanup levels for copper and zinc. The MTCA cleanup levels for soil and groundwater are established under WAC 173-340-740[4] and WAC 173-340-720,[5] respectively. In addition, previous investigations identified combustible methane gas concentrations in the Maritime Heritage Park portion of the Site above the Lower Explosive Levels (LEL) set by the Federal National Institute for Occupational Safety and Health (NIOSH).

Ecology determined institutional controls in the form of restrictive covenants would be required as part of the cleanup action for the Site. WAC 173-340-420(2)[6] requires Ecology to conduct a periodic review of certain sites every five years. For this Site, a periodic review is required because Ecology approved a cleanup action under a consent decree and an institutional control is required as part of the cleanup action.

When evaluating whether human health and the environment are being protected, Ecology must consider the following factors (WAC 173-340-420(4)):

a) The effectiveness of ongoing or completed cleanup actions, including the effectiveness of engineered controls and institutional controls in limiting exposure to hazardous substances remaining at the site

b) New scientific information for individual hazardous substances or mixtures present at the site

c) New applicable state and federal laws for hazardous substances present at the site

d) Current and projected site and resource uses

e) The availability and practicability of more permanent remedies

f) The availability of improved analytical techniques to evaluate compliance with cleanup levels

[4] https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-740
[5] https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-720
[6] https://app.leg.wa.gov/wac/default.aspx?cite=173-340-420

Ecology will publish a notice of this periodic review in the *Site Register* and provide an opportunity for public comment.

2.0 Summary of Site Conditions

2.1 Site description and history

In the late 1800s, the Holly Street Landfill Site (Site) was part of the original Whatcom Creek estuary and mudflat (Appendix A, Site Location). Around 1905, private property owners began filling portions of the Site with dredge spoils and other materials to increase useable upland areas. Beginning in 1937, sanitary landfills for municipal waste disposal operated on certain private tidelands under permits issued by the City of Bellingham (City) to property owners wishing to raise their properties above the tide. Also, municipal waste was used by owners to fill private tidelands within the former Whatcom Creek estuary from 1937 to 1953.

Wastes disposed at the Site included debris and scrap materials, consistent with landfill disposal practices of the time. Most of the wastes disposed at the Site included glass, concrete, household debris, metal scrap, soil, coal slag, ashes, and woody debris, consistent with landfill disposal practices of the time. The waste materials are currently covered by soil fills, gravel, buildings, building foundations and asphalt.

The Site is a 13-acre historical solid waste landfill located in the Old Town district of the City of Bellingham, Washington. Solid waste covers approximately 9.1 acres on the northwest side of Whatcom Creek and 3.8 acres on the southeast side (Maritime Heritage Park). The City currently owns 8.3 acres of the 13-acre landfill site, including all landfill properties located along the Whatcom Creek shoreline. Various private property owners own the remainder of the landfill site.

Both the northern landfill unit on the north bank, and the southern landfill unit encompassing Maritime Heritage Park and the south bank of Whatcom Creek, were listed and ranked by Ecology as contaminated sites subject to the investigation and cleanup requirements of MTCA. Since these sites are essentially one site bisected by Whatcom Creek, Ecology combined the sites into one site known as the Holly Street Landfill (Appendix A).

Previous investigations have indicated the following media and contaminants exceeding cleanup levels for unrestricted land use: soil/refuse (metals and cPAHs), soil gas (methane 30 to 300 percent of the Lower Explosive Limit), groundwater (iron and bis(2-ethylhexyl)phthalate), and shoreline seepage (dissolved copper and zinc).

2.2 Site Investigations

Initial Environmental Assessments (W.D. Purnell & Associates, 1993 and Landau, 1993)

Initial environmental Site investigations were conducted in 1993 for assessing the Sash and Door property and the Maritime Heritage Park located directly across Whatcom Creek. Apparent landfill waste materials were consistently observed within the former tide flat area, beginning at depths ranging from 1 to 20 feet below ground surface (bgs), and extending from 2 to 15 feet thick. Roughly 3 to 20 feet of soil fill was placed above waste materials in Maritime Heritage Park, generally isolating landfill materials from possible contact by park visitors. Five refuse/soil samples collected from the Site were analyzed for a range of metals, volatile and semi-volatile organic compounds, total petroleum hydrocarbons, pesticides, and polychlorinated biphenyls (PCBs).

Groundwater samples were collected from three groundwater monitoring wells (L-MW-1 through L-MW-3) installed on the southeastern portion of the Site. The samples were analyzed for metals, total petroleum hydrocarbons (TPH), and volatile organic compounds (VOCs). An additional groundwater sample was collected from standing water in a test pit installed at the Sash and Door property in 1993.

Detectable methane levels (LFG) were reported during these initial site assessments. The highest concentrations of 45 percent were in monitoring wells installed at the Maritime Heritage Park in 1990.

Remedial Investigation/Feasibility Study (Anchor and Aspect, 2001)

The City contracted with Anchor Environmental, LLC and its subcontractors to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the Site. The work was performed with funding from the Bellingham EPA Brownfields Assessment Demonstration Pilot Program for the Holly Street Landfill Redevelopment Project, consistent with an agreement with the US EPA. Ecology also provided oversight of the work through the Voluntary Cleanup Program.

RI/FS Sampling and Analysis

Environmental samples were collected during the RI/FS from potentially affected media within and immediately adjacent to the Site. Following review of the initial RI results, a workplan was developed for a supplemental RI to further delineate the extent of solid waste deposits in both the northwest and southeast margins of the Site, and further characterize solid waste, soil gas, and groundwater quality in the southeast portion of the Site.

Between April 2000 and January 2001, environmental samples were collected from previous and new locations including: 18 upland soil borings (6 completed as monitoring wells), 9 groundwater monitoring wells, 5 shoreline well points (seep samples), and 8 surface sediment locations.

Samples collected from these locations were submitted for laboratory analysis for the following:

- Soil/waste samples were analyzed for total metals, semivolatile organic compounds (SVOCs), TPH, pesticides, polychlorinated biphenyls (PCBs), and conventional parameters including total solids, grain size, and total organic carbon (TOC).
- Groundwater samples were analyzed for total and dissolved metals, SVOCs, VOCs, TPH, fecal coliform, and conventional parameters.
- Shoreline seep samples were analyzed for total and dissolved metals, SVOCs, VOCs, TPH, fecal coliform, and conventional parameters.
- Surface sediment samples were analyzed for total solids, grain size, TOC, salinity, and pesticides.

Combining with earlier Site investigation data, the RI provided an evaluation of where contaminants of concern (COCs) concentrations at the Site exceeded prospective cleanup levels.

A figure of environmental sample locations from the RI/FS, supplemental RI, and the initial site assessment investigations discussed above are presented in Appendix B.

Summary of RI/FS Results

Site Topography and Bathymetry

Site topographic and bathymetric conditions were evaluated within the vicinity of the Site using existing City of Bellingham maps, supplemented with surveys from previous investigations and the RI/FS. The data was used to construct a generalized composite topographic/bathymetric of the Site.

Geology

Five primary stratigraphic units were identified from top (youngest) to bottom (oldest) and included:

- **Fill:** Includes the final landfill cover of variable thickness, asphalt, and/or landscaping. The thickness of this unit varies across the Site from 4-8 feet (northwest) to up to 25 feet (southeast).
- **Refuse:** Both sides of Whatcom Creek consist of silt, sand, gravel, cobble mixture with glass, bottles, rusted metal, ash-like material, black sludge, brick and wood debris. This unit is present to approximately 40 feet bgs on the southeast and approximately 18 feet bgs on the northwest. Groundwater is present at the base of this unit with a saturated thickness ranging from 2 to 6 feet at the northwest lobe and 4 to 12 feet in the southeast lobe.
- **Recent Alluvium:** Comprised of silt and silty sands with silt interbeds with shells, wood, and organic debris derived from shallow marine waters, Whatcom Creek, and the Nooksack River. This unit tends to be the thickest toward Whatcom Creek and was generally not encountered in soil borings installed in the southeast lobe. This unit was saturated through its full thickness in all soil boring completed during the 2000 RI.
- **Bellingham Drift:** This deposit is characterized as glaciomarine till.

- **Chuckanut Formation:** The oldest geologic unit encountered during subsurface explorations at approximately 50 feet bgs at the northwest lobe and 27 to 35 feet bgs at the southeast lobe.

A figure depicting a cross-section of the Site and these geologic units is presented in Appendix C.

Soil Quality

A total of 7 soil/refuse samples were collected from the Site during the 2000 RI and previous Site assessment investigations in the early 1990s. Based on the comparison to MTCA Method A of B cleanup levels, the following COCs were identified: metals (arsenic, cadmium, lead, and mercury) and cPAHs.

Soil Gas

Methane concentrations measured during the RI ranged from 4 percent (A-MW-3) to approximately 300 percent (A-MW-4) of the Lower Explosive Limit (LEL). Soil gas levels were well below the LEL near the margins of the Park and throughout the northwest portion of the Site.

Hydrogeology

Groundwater flow at the Site consists of a shallow unconfined aquifer within alluvial sediments and within refuse units. Depth to groundwater at the Site ranges from approximately 7 feet in the northwest refuse area to about 25 feet in the southeast lobe of the Site. The differences are largely a function of surface topography. Saturated thickness of the aquifer ranges from 6 feet at inland locations to more than 30 feet near Whatcom Creek. Groundwater flow within the unconfined aquifer is generally from upland areas toward Whatcom Creek. The figure in Appendix B depicts the generalized groundwater flow at the Site.

Groundwater Quality

Chemical concentrations detected in groundwater samples were compared to MTCA risk-based screening criteria to identify groundwater COCs. Besides iron, manganese, and bis(2-ethylhexyl)phthalate, no other COCs were detected in groundwater at the Site. The identification of bis(2-ethylhexyl)phthalate as a COC was considered questionable due to its detection in only 1 out of 7 samples, and it being a common laboratory contaminant. The 2003 RI/FS recommended further confirmation that bis(2-ethylhexyl)phthalate and TPH were not COCs at the Site.

Shoreline Seepage Quality

Wellpoint samples collected during pre-construction (April and August 2000) were analyzed for conventional parameters (temperature, pH, dissolved oxygen, salinity, and total suspended

solids) and dissolved metals (arsenic, cadmium, copper, lead, and zinc). Wellpoint sample results indicated exceedances of cleanup values for dissolved copper and zinc.

Metals such as copper and zinc present in landfill refuse are mobilized by tidal processes affecting the shoreline landfill zone. These processes result in seepage to Whatcom Creek along a localized reach of the northern landfill unit shoreline that poses a potential risk to sensitive aquatic species in this area.

Based on the Site investigation findings, institutional and engineered controls were recommended at the Site to prevent future human and environmental exposure to buried (subsurface) refuse and associated soil contaminants.

Sediment Quality

A total of eight sediment samples were collected, including six (SD-1 through SD-6) from along the shoreline of Whatcom Creek, in April 2000 during the Holly Street Landfill RI/FS.

Analytical results for surface sediment samples were compared to SMS chemical criteria. Because pore water salinity in these sediments ranged from 2.4 to 6.1 parts-per-thousand, and given prior SMS within this area, these "low salinity" sediments were compared with marine sediment quality standards. The SMS includes two sets of criteria for the protection of biological resources. The more stringent set of criteria, the sediment quality standards (SQS), correspond to a concentration below which no adverse biological effects should occur. The less stringent set of criteria, the cleanup screening level (CSL), corresponds to a concentration above which more than minor adverse impacts may occur.

No exceedances were observed in the sediment samples collected adjacent to the Site, except for SD-6 that was collected upstream of the Site as a background sample. The exceedances at SD-6 were likely due to upstream sources unrelated to the Site. Mid-channel sediment samples were also below the SQS chemical criteria. Therefore, no sediment COCs was identified at the Site.

2.3 Remedial Actions

Draft Final 100 Percent Design Submittal Holly Street Landfill Cleanup/Whatcom Creek Estuary Restoration Project (Anchor and Aspect, 2004)

In 2005, the City, with Ecology oversight, implemented a Cleanup Action Plan (CAP, Ecology, 2003) for the Site which addressed the physical presence of solid waste, methane production, and contaminant impacts to Whatcom Creek. Refuse along the northern shoreline of Whatcom Creek was excavated along with construction of an engineered cap, and material was placed along the southern shoreline to stabilize the bank. The northern shoreline excavation and cap system was designed to control releases of copper and zinc to Whatcom Creek that occur when estuary water mixes with the solid waste in the bank. The cleanup also included long term protection through legal restrictions on property use and monitoring of the cleanup action.

The cleanup removed about 12,400 tons of solid waste, primarily from the northern bank, prior to cap construction. The excavated materials were transported and disposed of at a permitted,

off-site landfill. The cleanup also restored historically lost habitat at the mouth of Whatcom Creek. The project converted about 0.3 acres from upland to intertidal elevations, created side channel habitat, placed large woody debris, removed invasive vegetation, and re-introduced native plants. Along with these activities, the City constructed a boardwalk and viewpoints/overlooks along the estuary to improve public access to the shoreline.

The selected cleanup alternative for the Site was a cap constructed along the northern landfill area (adjacent to the Restore Building and the former Sash and Door property) and localized upland areas, in conjunction with institutional controls and monitoring of localized surface water seeps corresponding to Years 5 to 9 following completion of the remedial action (2010 thru 2014). Based on a consideration of geochemical processes controlling copper and zinc mobility at the Site, the identified shoreline capping system was designed to restrict tidal mixing and associated oxygen transfer into nearshore refuse deposits of the northwest landfill lobe. The cap system was expected to be effective in controlling the release of copper and zinc into Whatcom Creek. Furthermore, it offered a concurrent opportunity to improve the quality of intertidal habitat in this area.

This project involved combining habitat restoration, public access, and land use elements into a single integrated cleanup remedy (also incorporating source control elements as discussed above). While the habitat restoration component is not necessary to achieve cleanup goals, it is consistent with remedial action objectives and the Bellingham Bay Comprehensive Strategy (Ecology 2000). The integrated plan included:

- Excavating shoreline solid waste from the north bank, within and adjacent to the "B" Street right-of-way, and along localized portions of the south bank (Maritime Heritage Park).
- Backfilling the excavation areas with a clean cap material, graded to relatively flat slopes, concurrently providing slope stabilization and restoring historically lost aquatic habitat in this important estuary.
- Enhancing the existing soil cap in portions of the Maritime Heritage Center to be consistent with other landfill areas already capped to ensure that humans and the environment are protected from buried solid waste.
- Incorporating a public access boardwalk into the overall project design to address existing community open space goals and planning objectives.

The habitat restoration component of this project included conversion of approximately 0.3 acres of existing uplands to aquatic habitat via excavation and removal of refuse. This restored critical estuarine riparian buffers, marsh, and mudflat banks that existed historically in this area of Bellingham Bay was designed to provide a park-like setting allowing trail access along this stretch of Whatcom Creek to the Maritime Heritage Center.

Groundwater monitoring has been conducted at the Site in November 1990 (Landau, 1990), September 1993 (W.D. Purnell, 1993), during a Focused Remedial Investigation in April 2000 (Anchor Environmental L.L.C., 2000), and during the Holly Street Landfill RI (Anchor Environmental, L.L.C, 2001).

2.4 Restrictive Covenants

Ecology determined that institutional controls would be required as part of the cleanup action to document the remaining contamination, protect the cleanup action, and protect human health and the environment. Institutional controls in the form of 23 Restrictive Covenants[7][8] (Covenants) covering 34 tax parcels within the landfill footprint were recorded for the Site, including:

- Whatcom County Recording No. 2040701276 recorded on July 8, 2004 for Carl L. Akers and Audrey M. Akers, Trustees of the Akers Family Revocable Living Trust (Grantor). The Covenant was transferred with the property to the Whatcom County Historical Society.
- No. 2040704006 recorded on July 23, 2004 for Whatcom County (Grantor). Ownership of the county property and associated Covenant was transferred to the City of Bellingham.
- No. 2040904485 recorded on September 27, 2004 for Sands Enterprises, LLC (Grantor).
- Nos. 2040904900 thru 2040904916 recorded on September 29, 2004 for the City of Bellingham (Grantor).
- No. 2050502785 recorded on May 16, 2005 for Northwest Recycling, Inc. (Grantor).
- No. 2050502786 recorded on May 16, 2005 for Parberry Family LP (Grantor).
- No. 2050502787 recorded on May 16, 2005 for Parberry, Inc.

The Covenants differ, but generally impose the following restrictions:

- **Section 1.** Future use of the Property shall be limited to those uses defined in and allowed under the City of Bellingham zoning and Shoreline Management regulations codified in the City of Bellingham Municipal Code as of the date of this Restrictive Covenant and as they may be amended from time to time. No groundwater may be withdrawn from the property for any use that is inconsistent with the remedial action implementation. The Property shall not be used for ground floor residential or day care center uses.
- **Section 2.** Pursuant to the CAP, Owner must maintain the integrity of the Remedial Action. Specifically, Owner must maintain two feet of soil cap or equivalent structural cover (e.g., building or two-inch paving layer overlying ballast) over the Property. For building structures within the Maritime Heritage Park portion of the Site, Owner must conduct supplemental soil gas monitoring and/or use engineered passive gas venting systems as required under the CAP and described in the *Compliance Monitoring and Contingency Response Plan,* which is Exhibit E to the Consent Decree. Any activity on the Property that may interfere with the integrity of the Remedial Action and continued protection of human health and the environment is prohibited. These activities include those that may result in the release or exposure to the environment of the municipal-type

[7] https://apps.ecology.wa.gov/cleanupsearch/document/22
[8] https://apps.ecology.wa.gov/cleanupsearch/document/23

waste or contaminated soil, soil-gas and shoreline seepage that was contained as part of the Remedial Action, or that create an exposure pathway, unless such activities are authorized by the CAP or this Restrictive Covenant. Where utility or other work at the Property requires excavation, Owner must comply with state and City standards, and must provide one foot of over excavation or use geofabric lining to provide a clean perimeter around the excavation. All refuse materials excavated from the Property must be disposed off-site at a permitted solid waste disposal facility or contained on-site below an engineered cap meeting the specifications outlined in the CAP or subsequent Remedial Design (RD) documents (i.e., two feet of soil cap or equivalent structural cover). Personnel performing excavation at the Property should be familiar with the applicable health and safety training requirements and should take the necessary precautions to minimize direct contact with municipal type waste and contaminated soils that are above state standards and are contained at the Site as part of the Remedial Action. Excavations conducted in accordance with the above conditions shall not constitute activities that interfere with the Remedial Action or continued protection of human health and the environment.

- **Section 3**. Any activity on the Property that may interfere with the integrity of the Remedial Action, operation and maintenance, or monitoring and continued protection of human health and the environment is prohibited without prior written approval from Ecology, which approval shall not be unreasonably withheld. Details about the compliance monitoring requirements to ensure continued protection of human health and the environment are contained in EXHIBIT E of the Consent Decree.
- **Section 4.** The Owner of the Property must give thirty (30) day advance written notice to Ecology of the Owner's intent to convey any title or easement interest in the Property. No conveyance of title, easement, lease, or other interest in the Property shall be consummated by the Owner without adequate and complete provision for continued monitoring, operation, and maintenance of the Remedial Action.
- **Section 5.** The Owner must restrict leases to uses and activities consistent with the Restrictive Covenant and notify all lessees of the restrictions on the use of the Property.
- **Section 6**. The Owner must notify and obtain approval from Ecology prior to any use of the Property that is inconsistent with the terms of this Restrictive Covenant. Ecology may approve any inconsistent use only after public notice and comment.
- **Section** 7. The Owner shall allow authorized representatives of Ecology the right to enter the Property at reasonable times for the purpose of evaluating the Remedial Action; to take samples, to inspect remedial actions conducted at the property, and to inspect records that are related to the Remedial Action. Ecology will provide Owner advance notice of its entry onto the Property when feasible.
- **Section 8.** The Owner reserves the right under WAC 173-340-440 to record an instrument that provides that this Restrictive Covenant shall no longer limit use of the Property or be of any further force or effect. However, such an instrument may be recorded only if Ecology, after public notice and opportunity to comment, concurs.

2.5 Cleanup standards

Cleanup standards include cleanup levels, the location where these cleanup levels must be met (point of compliance), and any other regulatory requirements that apply to the Site. WAC 173-340-704[9] states MTCA Method A may be used to establish cleanup levels at sites that have few hazardous substances, are undergoing a routine cleanup action, and where numerical standards are available for all indicator hazardous substances in the media for which the Method A cleanup level is being used. Method B may be used at any site and is the most common method for setting cleanup levels when sites are contaminated with substances not listed under Method A. Method C cleanup levels may be used to set soil and air cleanup levels at industrial sites.

Soil and groundwater cleanup levels for the COCs were developed based on the protection of surface water and propagation of aquatic life, and the protection of human health from the consumption of potentially contaminated marine organisms and exposure to landfill gases. The points of compliance for each media from the CAP are described below. The restoration timeframe in the CAP to meet the remedial action objectives was 10 years.

2.5.1 Soil/Refuse

The determination of adequate soil containment was based on the remedial action's ability to comply with the groundwater/surface water cleanup standards for the Site at the points of seep discharges (further discussed in Section 2.6.3), and to meet performance standards designed to minimize human and environmental exposure to soils above cleanup levels. The following cleanup levels are applicable from 0 to 15 bgs.

Soil Cleanup Levels

Contaminant	Soil Cleanup Level (mg/kg)
Arsenic	20
Cadmium	2
Copper	2,960
Lead	250
Zinc	24,000
Benzo(a)pyrene (cPAH)	0.14
Methane (soil gas)	Lower Explosive Limit (NIOSH)

[9] https://app.leg.wa.gov/WAC/default.aspx?cite=173-340-704

2.5.2 Groundwater

Only iron was retained as a verified groundwater COC at the Site. No human health risks are likely to be associated with potential drinking water consumption of groundwater at the Site (in addition, no existing or future drinking water use has been identified). However, total iron concentrations detected in groundwater at the Site may exceed secondary drinking water standards based on taste/odor and aesthetic considerations.

The groundwater cleanup strategy focused on shoreline soil areas affected by tidal exchange for the protection of surface water and its ecosystem (Compliance Monitoring & Contingency Response Plan, 2003). Groundwater cleanup was determined to not be necessary at the inland portion of the Site, and therefore groundwater cleanup levels were not developed. Because of the landfill seeps at the shoreline, surface water cleanup levels were developed.

The conditional point of compliance for groundwater is located at the downgradient edge of the landfill at the surface water interface where tidal influence interacts with the upland refuse. Compliance is based on seep monitoring along the shoreline (further discussed in Section 2.6.3).

Iron did not exceed surface water quality criteria in the surface water seeps; therefore, a surface water cleanup level was not developed for iron.

2.5.3 Surface Water

Compliance with groundwater and surface water cleanup levels at the Site are measured at the conditional point of compliance located at the downgradient edge of the landfill. The point of compliance for surface water at the Site is the point at which hazardous substances are released to waters of the state, which corresponds to seepage discharges along the landfill shoreline. According to the CAP, the conditional point of compliance for these seeps is within the biologically active zone of shoreline sediments, or between approximately 0 and 12 centimeters below mud line, for protection of aquatic life and human health and the environment. (It should be noted that the conditional point of compliance is typically set at the bottom of the biologically active zone, rather than within the biologically active zone.)

MTCA surface water/seep cleanup levels are summarized in the following table. Seepage samples collected adjacent to the northwest landfill lobe substantially exceeded cleanup levels for copper and zinc. The large dilution potential of Whatcom Creek restricted such exceedances to the immediate shoreline area of the estuary. No exceedance of surface water quality criteria was identified in any seepage sample collected adjacent to the southeast landfill lobe. Shoreline capping systems were designed to restrict tidal mixing and associated oxygen transfer into nearshore refuse deposits of the northwest landfill lobe.

Surface Water Cleanup Levels

Contaminant	Surface Water Cleanup Levels micrograms per liter (µg/L)
Cadmium	9.3
Copper	3.1
Lead	8.1
Zinc	81.0
Benzo(a)pyrene (cPAH)	0.031

2.5.4 Sediments

No sediment cleanup was proposed for the Site. However, because groundwater at the Site discharges its hazardous substances as surface water seeps along the landfill shoreline, the conditional point of compliance for these seeps is within the biologically active zone of the shoreline sediments, or between approximately 0 to 12 centimeters below mud line.

3.0 Periodic Review

3.1 Effectiveness of Completed Cleanup Actions

Requirements for compliance monitoring and adaptive management/contingency response for the Site are provided in Exhibit E of the Consent Decree (#032021641) for the Site. The objective of compliance monitoring is to confirm that cleanup standards have been achieved and to confirm the long-term effectiveness of the cleanup actions at the Site. Specific performance and confirmation monitoring activities were performed between 2006 and 2014 and included:

- Detailed bathymetric surveys of the shoreline action area
- Collection of well point seepage samples from the shoreline action area
- Collection of representative samples of epibenthic and benthic infauna from the shoreline action area
- Observation of fisheries utilization within the shoreline action area
- Documentation of data collection and contingency/adaptive management activities (as necessary)

3.1.1 Direct Contact

The cleanup actions were intended to eliminate exposure to contaminated soil at the Site. Exposure pathways to contaminated soils by ingestion and direct contact were reduced by

enhancing the existing soil cap in portions of the Maritime Heritage Center, excavation and off-site disposal of shoreline solid waste, construction of a shoreline capping system, and maintenance of soil caps throughout the upland/inland landfill area.

Post-construction bathymetric monitoring has confirmed the integrity of the shoreline cap constructed at the Site, and the cap thickness continues to exceed the requirements specified in the CAP.

3.1.2 Protection of Groundwater

No groundwater was sampled during the post construction compliance monitoring since it was not required in the CAP. Groundwater has a conditional point of compliance, which is based on seep monitoring along the shoreline.

However, the 2003 RI/FS recommended confirmation that bis(2-ethylhexyl)phthalate and TPH were not COCs at the Site based on groundwater sampling data (as discussed in Section 2.1). This does not appear to have been addressed. Therefore, bis(2-ethylhexyl)phthalate and TPH should be evaluated at the surface water seeps (the conditional point of compliance for groundwater).

3.1.3 Protection of Surface Water Quality

Post-construction water quality performance monitoring was performed at the Site in Year 1 (May 2006), Year 5 (May 2010), Year 6 (August 2011), Year 7 (August 2012), and Year 9 (August 2014) to verify compliance of seepage discharges with cleanup levels. Post-construction monitoring focused on two representative wellpoint locations (WP-2 and WP-3), completed within the intertidal landfill cap seepage pathway. An additional wellpoint location, WP-4, was installed in between WP-2 and WP-3 adjacent to a stormwater outfall along the northwest shoreline of Whatcom Creek. The location of these seep monitoring locations are identified in the figure in Appendix D.

Year 1 (May 2006): Metal concentrations measured at wellpoints WP-2 and WP-3 were below surface water cleanup levels, confirming the protectiveness of the shoreline cap. However, a wellpoint sample WP-4 contained a dissolved copper concentration of 4.7 micrograms per liter (µg/L), which exceeded the cleanup level of 3.1 µg/L. Copper at this location appeared to have been mobilized by tidal mixing processes in the localized outfall erosional area. To ensure the long-term integrity of the cleanup action and reduce the potential for future localized erosion, in 2006 the City redirected a portion of the stormwater flow away from the Site into the C Street stormwater system.

Year 5 (May 2010): WP-2 and WP-3 exceeded the cleanup level for dissolved copper at concentrations of 10 µg/L and 11.0 µg/L, respectively. Location WP-4 had insufficient water to collect a representative sample.

Year 6 (August 2011): WP-2 and WP-4 were below cleanup levels for all dissolved metals. WP-3 exceeded the cleanup level for dissolved copper with a concentration of 4.0 µg/L. However,

the analyte was detected in the quality control field sample of rinse water used to clean the sample apparatuses.

Year 7 (August 2012): WP-4 was below cleanup levels for all dissolved metals. Locations WP-2 and WP-3 both exceeded the cleanup level for dissolved copper with concentrations of 4.8 µg/L and 4.0 µg/L, respectively. However, again the analyte was detected in field quality control rinseate samples.

Year 9 (August 2014): Only location WP-3 had sufficient water to collect a representative sample. Dissolved metal concentrations at WP-3 were all below cleanup levels.

It is unknown whether dissolved copper currently meets cleanup standards, given it exceeded the cleanup level at some of the surface water seep monitoring locations during the 2006 to 2014 performance monitoring events. The restoration timeframe in the CAP to meet the remedial action objectives was 10 years. The cleanup actions were completed in 2005.

It is also unknown whether the cleanup standard for cPAHs has been met, as performance monitoring did not evaluate cPAHs.

3.1.4 Sediment Quality

No sediment samples were collected during the post-construction compliance monitoring since it was not required in the CAP.

3.1.5 Soil to Air

No landfill gas was sampled during post-construction compliance monitoring.

3.1.6 Habitat Quality

The overall biological monitoring objective for the integrated habitat restoration and cleanup remedy implemented by the City is to verify that more productive biological communities become established in the project area. This objective was addressed by documenting recolonization of epibenthic and benthic macroinvertebrates in the area (relative to 2002 pre-construction baseline conditions) and documenting general utilization of the Site area by juvenile salmonids. Post-construction epibenthic and benthic macroinvertebrate sampling was conducted in Year 1 (July 2006) and Year 5 (July 2010).

Observations were made from five sampling locations in the project area along the north and south banks of the estuary from the Whatcom Creek Fish Hatchery (also known as the Maritime Heritage Park Fish Hatchery) to the Holly Street Bridge. Relative to pre-construction baseline conditions, the post-construction epibenthic invertebrate taxonomic metrics (e.g., significantly increased species diversity and evenness) document that more productive and stable epibenthic communities have now become established in the Site area. A total of five juvenile salmonids were observed in Year 1 (May 2006 survey) near habitat restoration features, including anchored

woody debris. Together, the Year 1 and 5 fish monitoring data document that juvenile salmonids are successfully utilizing the Site area for feeding and rearing.

3.1.7 Surface Water Hydrology

Whatcom Creek is the outlet of the City's drinking water reservoir, Lake Whatcom. Several parameters control the flow of Whatcom Creek, including precipitation in the Lake Whatcom watershed (including Whatcom Creek), diversions from the middle fork of the Nooksack River, municipal water withdrawals, and outlet flows controlled by adjusting gates at the dam. Currently, there are relatively limited opportunities to manage outflows from the dam by storing peak runoff in the lake, as Lake Whatcom management protocols do not allow water surface elevations to exceed the maximum lake level set by court order. However, the City's current protocols attempt to better optimize peak flows and lake levels. Another opportunity to control peak flows in Whatcom Creek, and thus minimize the potential for erosion of silty sand sediments in the channel adjacent to the Site, is to divert peak flows into the former Georgia-Pacific large capacity industrial supply pipeline that discharges into Bellingham Bay downstream of the Site.

3.1.8 Institutional Controls

Institutional controls in the form of multiple Covenants were implemented at the Site in 2004 and 2005. The Covenants remain active and discoverable through the Whatcom County Auditor's Office. Ecology found no evidence a new instrument has been recorded that limits the effectiveness or applicability of the Covenants. These Covenants prohibit activities that will result in the release of contaminants contained as part of the cleanup action and prohibit any use of the property that is inconsistent with the Covenants, unless approved by Ecology in advance. These Covenants ensure the long-term integrity of the cleanup action will be protected.

3.1.9 Site Visit

Ecology conducted a Site visit on March 9, 2023. During the Site visit, Ecology was accompanied by personnel from the City of Bellingham. The Site is currently the Maritime Heritage Park that includes an amphitheater, fish hatchery, multipurpose fields, native plant trail, and other associated city park features. The Park entrance is located at 500 West Holly Street, Bellingham, Washington. A photo log is in Appendix G.

3.2 New scientific information for individual hazardous substances or mixtures present at the Site

Since completion of the Site cleanup, Ecology has calculated background concentrations of dioxin/furan (D/F) compounds for Bellingham Bay, and new data are available regarding the presence of D/F compounds in surface sediment downstream and adjacent to the Site.

Bellingham Bay Regional Background Sediment Characterization (Ecology, 2015)

Ecology calculated natural background and regional background concentrations of D/F compounds for Bellingham Bay surface sediment. The natural background concentration of D/F compounds in Puget Sound is applicable to Bellingham Bay and is calculated at 4 nanograms per kilogram (ng/kg). The regional background concentration of D/F compounds in Bellingham Bay is calculated at 15 ng/kg.

Whatcom Waterway Phase 1 Site Areas, Post-Construction Monitoring (Anchor, 2019, 2020 and 2022)

As part of the cleanup of Whatcom Waterway Phase 1 Site Areas, a partial dredge and cap occurred at the mouth of Whatcom Creek downstream of the Holly Street Landfill site. During the Year 1 (2017), Year 3 (2019) and Year 5 (2021) post-construction monitoring events, sediment deposited on top of the caps was found to contain D/F concentrations exceeding natural background concentrations (see Appendix E).

Whatcom Waterway Pre-Remedial Design Investigation (PRDI) Data Report (Anchor, 2021)

During 2020, data were collected in Whatcom Creek to assess the potential source of these elevated D/F concentrations (see Appendix F).

Surface sediments were collected at a total of 11 locations at the head of Whatcom Waterway and within Whatcom Creek: 5 between the Roeder Street and Holly Street bridges (WC-01-SS through WC-05-SS); 4 above the Holly Street bridge (WC-06-SS through WC-09-SS); and 2 upstream of the Dupont Street bridge (WC-12-SS and WC-13-SS). The locations did not target specific stormwater outfall locations, but rather were intended to provide information on the spatial distribution of D/F compounds throughout the transition area between Whatcom Creek and the head of Whatcom Waterway.

The 2020 sediment data identified elevated D/F concentrations in two locations immediately upstream and downstream of the former Astor Street outfall. The D/F concentrations from these two locations WC-06-SS and WC-08-SS were 562 ng/kg and 63.7 ng/kg, respectively.

Whatcom Waterway PRDI Work Plan Addendum No. 4 Data Report (Anchor, 2022)

In 2021, nine surface sediment samples (WC-01-OF, WC-06-SS through WC-18-SS) were collected within Whatcom Creek (see Appendix F). The sampling targeted the area upstream of the Holly Street bridge adjacent to the Holly Street Landfill Site to better characterize the area of sediments containing elevated D/F concentrations. The 2021 sediment data identified elevated D/F concentrations at two locations: WC-06-SS (86.4 ng/kg) and WC-10-SS (27 ng/kg).

In addition to the sediment sampling effort, the Astor Street outfall was evaluated. A wet weather stormwater inspection found no discharge during rain events and a review of plan drawings documented that the Astor Street outfall had been abandoned. Stormwater formerly discharged at the Astor Street outfall now discharges into the stormwater conveyance running beneath C Street. That conveyance discharges to Bellingham Bay at the south end of C Street.

The source of the elevated D/F concentrations in Whatcom Creek surface sediments adjacent to the Holly Street Landfill has not been identified. But based on the proximity to the Holly Street Landfill Site, the landfill may be a source.

3.3 New applicable state and federal laws for hazardous substances present at the Site

3.3.1 Climate Change Impacts

Since completion of the Site cleanup, Ecology has issued guidance (Ecology, 2023) for increasing the resiliency of cleanups to climate change impacts. Since a climate vulnerability assessment has not previously been conducted for the Site, the TCP Maps Climate Change analytical tool was used to assess potential vulnerabilities, per the guidance. Potential vulnerabilities identified at the Site include sea level rise and flooding during 100-year storm events.

3.3.2 Protection of Surface Water

The state water quality criteria (WQC) were updated in 2016. Since groundwater at the Site discharges to Bellingham Bay, this pathway was evaluated to determine if the remedy is protective of surface water. The following table provides a summary of screening levels that are considered protective of surface water. These SLs are for comparison purposes to assist in this evaluation.

Seep Screening Levels for Protection of Surface Water

Chemical	Seep SL (µg/L)	Basis for SL	Seep CUL (µg/L) from CAP
Cadmium	7.9	WQC-AL	9.3
Copper	3.1	WQC-AL	3.1
Lead	5.6	WQC-AL	8.1
Zinc	81	WQC-AL	81
cPAH TEQ	1.60E-05	WQC-HH	0.031

WQC – water quality criteria
State WQC are in WAC 173-201A-240, Table 240
Clean Water Act WQC are in Section 304
HH – human health (consumption of water & fish)
AL – aquatic life (chronic)
SL – screening level
TEQ – toxicity equivalent concentration

The CAP cleanup levels for cadmium and lead are higher than the 2016 WQC screening levels that are now considered protective of surface water. However, concentrations of cadmium and lead in seep monitoring from 2006 to 2014 are below the 2016 WQC screening levels.

The CAP cleanup level for cPAHs (benzo(a)pyrene) is higher than the 2016 WQC screening level that is now considered protective of surface water and human health. However, the current practical quantitation limit (PQL) for cPAHs is 0.02 µg/L TEQ (see Section 3.6).

3.4 Current and projected Site and resource uses

The Site includes the Maritime Heritage Park, Whatcom Creek estuary habitat restoration, nature trails and viewpoints, a salmon hatchery, and multiple city blocks of commercial and industrial buildings (many of which are vacant). The Holly Street Landfill footprint is in the Old Town District, which is an area of the City of Bellingham downtown core slated for development to transition from industrial to more commercial and residential uses. The proposed change in Site use is not likely to have a negative impact on the protectiveness of the cleanup action, as long as the Covenant restrictions are followed. The Covenants prohibit the Site from being used for ground floor residential or day care center uses.

3.5 Availability and practicability of more permanent remedies

The remedy implemented included containing hazardous substances, and it continues to be protective of human health and the environment. While more permanent remedies may be available, they are still not practicable at this Site.

3.6 Availability of improved analytical techniques to evaluate compliance with cleanup levels

The analytical methods used at the time of the cleanup action were capable of detection below the selected MTCA cleanup levels.

The current PQL for cPAHs is 0.02 µg/L TEQ, and this value would be the applicable seep cleanup level for protection of surface water (see Section 3.3.2). However, the CAP cleanup level (0.031 µg/L) is only slightly higher than the current PQL.

4.0 Conclusions

The periodic review concluded that more information is needed to determine if the cleanup is protective of human health and the environment. The findings include:

- Dissolved copper exceeded the cleanup level (3.1 µg/L) at some of the surface water seep monitoring locations during the performance monitoring events completed between 2006 and 2014. No seep monitoring has occurred since 2014. The restoration timeframe in the CAP to meet the remedial action objectives was 10 years (the cleanup actions were

completed in 2005). Additional seep monitoring to evaluate compliance with cleanup standards is required.

- Surface water seep performance monitoring completed between 2006 to 2014 did not include cPAHs. Seep monitoring to evaluate cPAHs (achieving a PQL of 0.02 µg/L TEQ) is required.
- Recent sampling of surface sediment in Whatcom Creek adjacent to the Site identified concentrations of dioxin/furan (D/F) compounds that were above the natural background concentration for Bellingham Bay of 4 ng/kg. An evaluation to determine if the elevated D/F concentrations are associated with the Site is warranted.
- The RI/FS recommended confirmation of whether bis(2-ethylhexyl)phthalate and TPH were COCs at the Site based on groundwater data. This does not appear to have been addressed. Therefore, bis(2-ethylhexyl)phthalate and TPH should be evaluated at the conditional point of compliance for groundwater, which is the seeps along the shoreline.
- To understand the sensitivity, exposure, and adaptive capacity of the Site to climate change impacts, a climate change vulnerability assessment is warranted.
- The Covenants for the properties are in place and appear to be effective in protecting human health and the environment from exposure to hazardous substances on the properties covered by the Covenants. It appears that the requirements in the Covenants are being followed.
- The Site is in the Old Town District of Bellingham, which is an area slated for development to transition from industrial to more commercial and residential uses. The proposed change in Site use is not likely to have a negative impact on the protectiveness of the cleanup action, as long as the Covenant restrictions are followed. The Covenants prohibit the properties from being used for ground floor residential or day care center uses. The Covenants also prohibit activities that may result in the release or exposure of contaminants that remain on the properties (such as excavation or redevelopment), unless Ecology's approval is obtained in advance. The property owner is responsible for continuing to inspect the Site to ensure the integrity of the cleanup action is maintained, such as the surface cover/cap.

Ecology has determined that further assessment of current Site conditions (including collecting new data) is necessary to determine if the completed cleanup is protecting human health and the environment, and to evaluate whether additional remedial actions are necessary.

4.1 Next review

Ecology will schedule the next review for the Site five years from the date of this periodic review. If additional cleanup actions or institutional controls are required, the next periodic review will be scheduled five years after those activities are completed.

5.0 References

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Restrictive Covenant. July 23, 2004. Whatcom County Recording Nos. 2040704006

Restrictive Covenant. September 27, 2004. Whatcom County Recording Nos. 2040904485

Restrictive Covenants. September 29, 2004. Whatcom County Recording Nos. 2040904900 – 2040904916.

Restrictive Covenants. May 16, 2005. Whatcom County Recording Nos. 2050502785 – 2050502786.

Appendix A. Site Vicinity Map

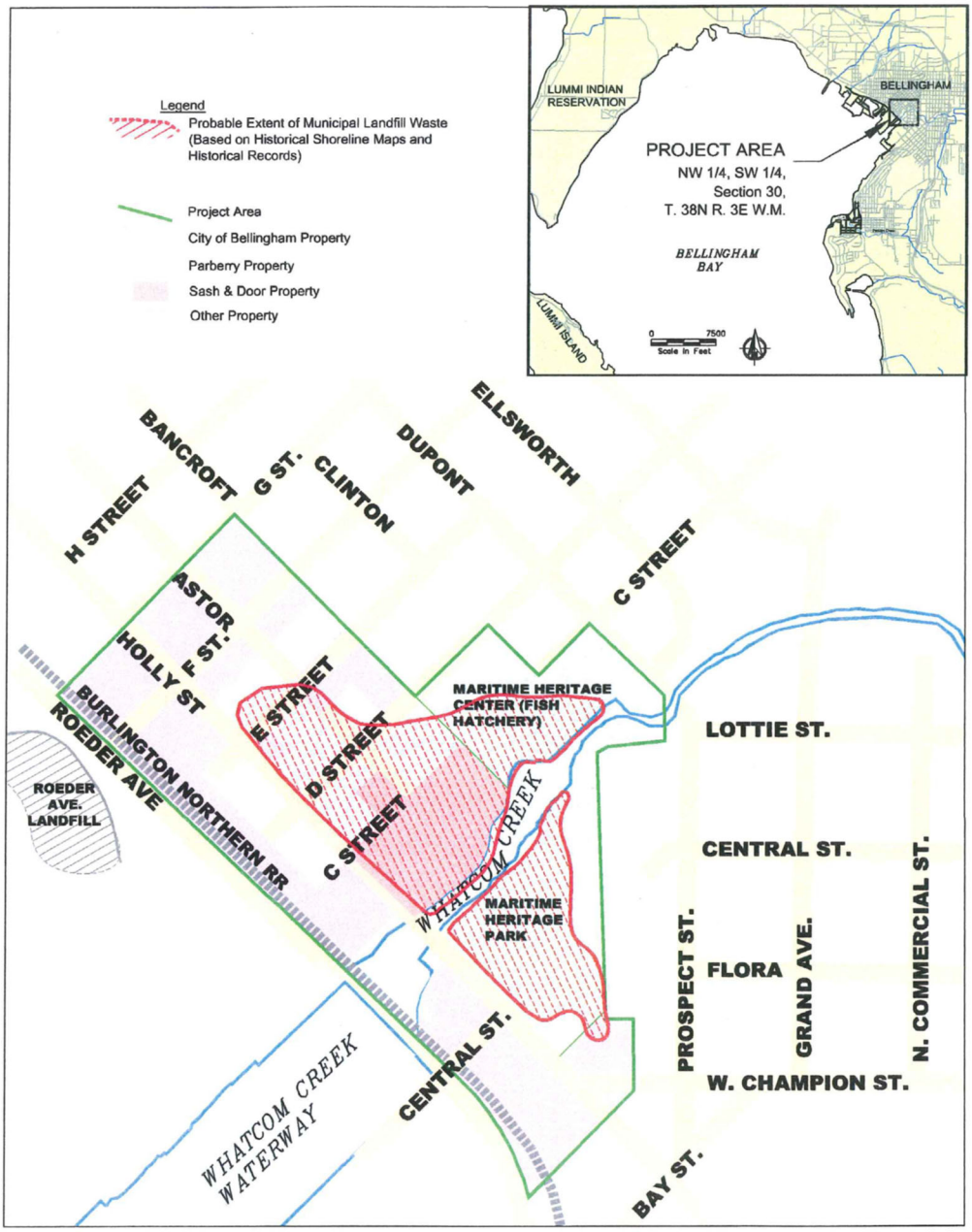
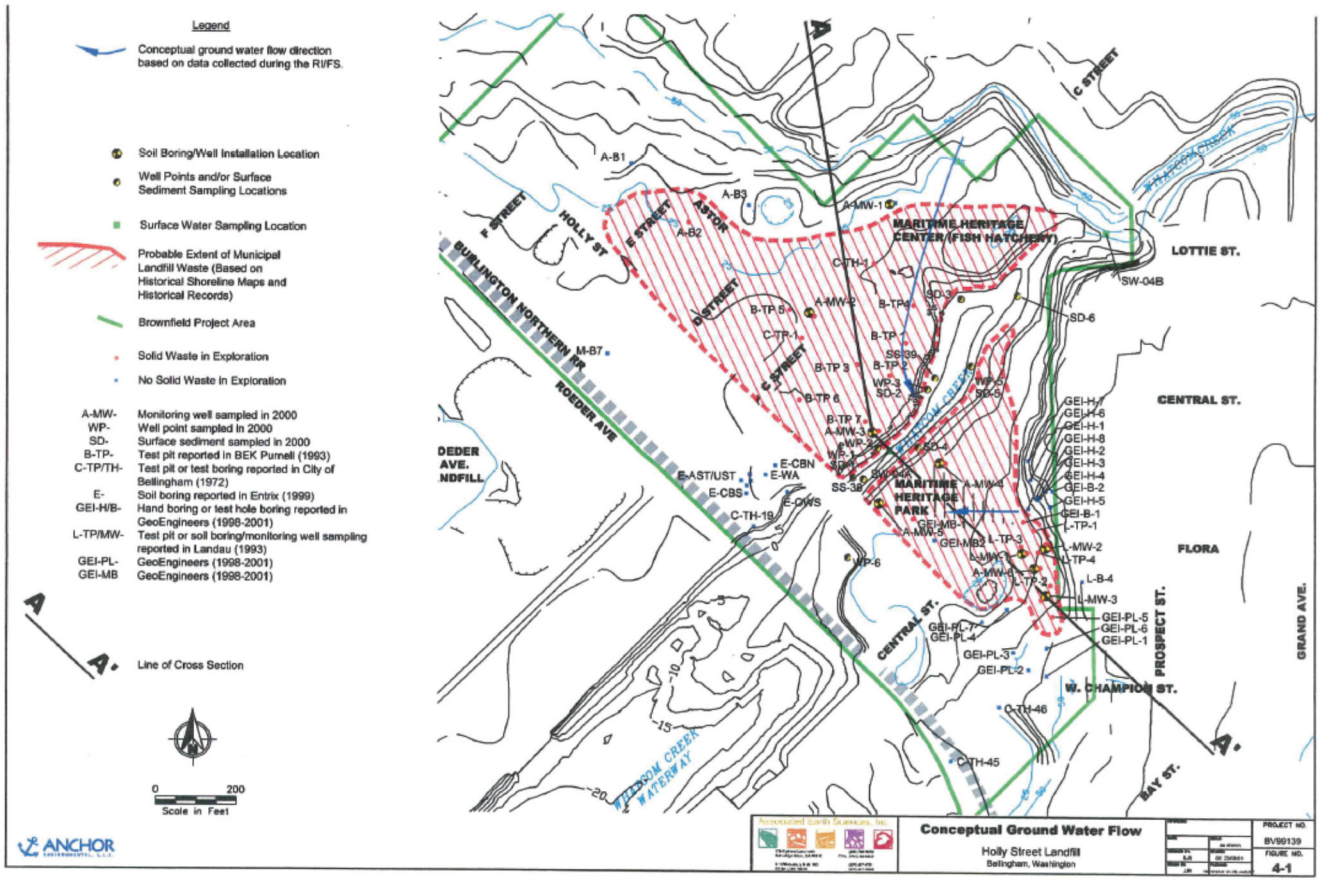
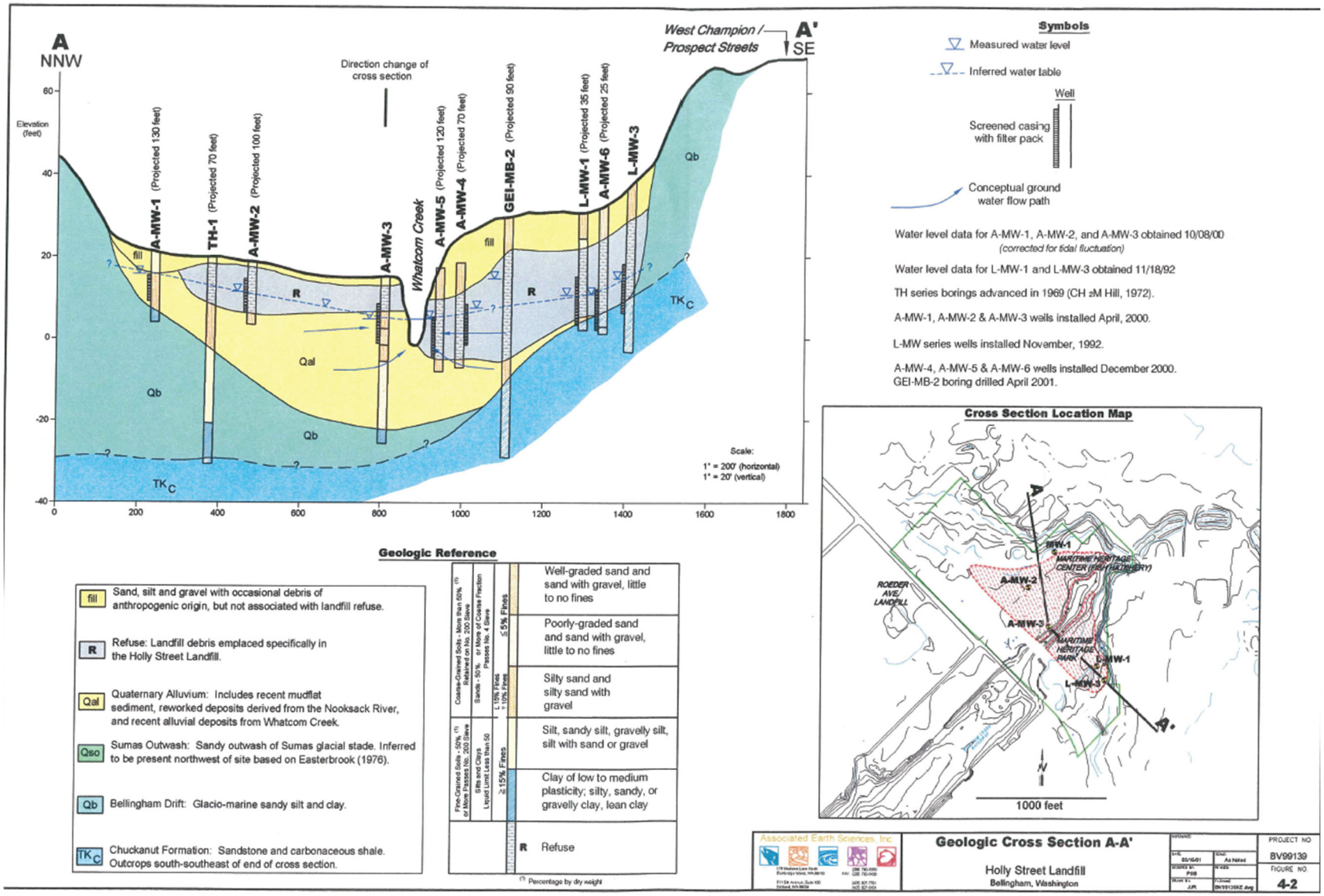


Figure 2-1
Holly Street Landfill
Project Area

Appendix B. Historical Sample Locations



Appendix C. Site Cross Section and Geologic Units



Appendix D. Well Point Locations for Seep Monitoring

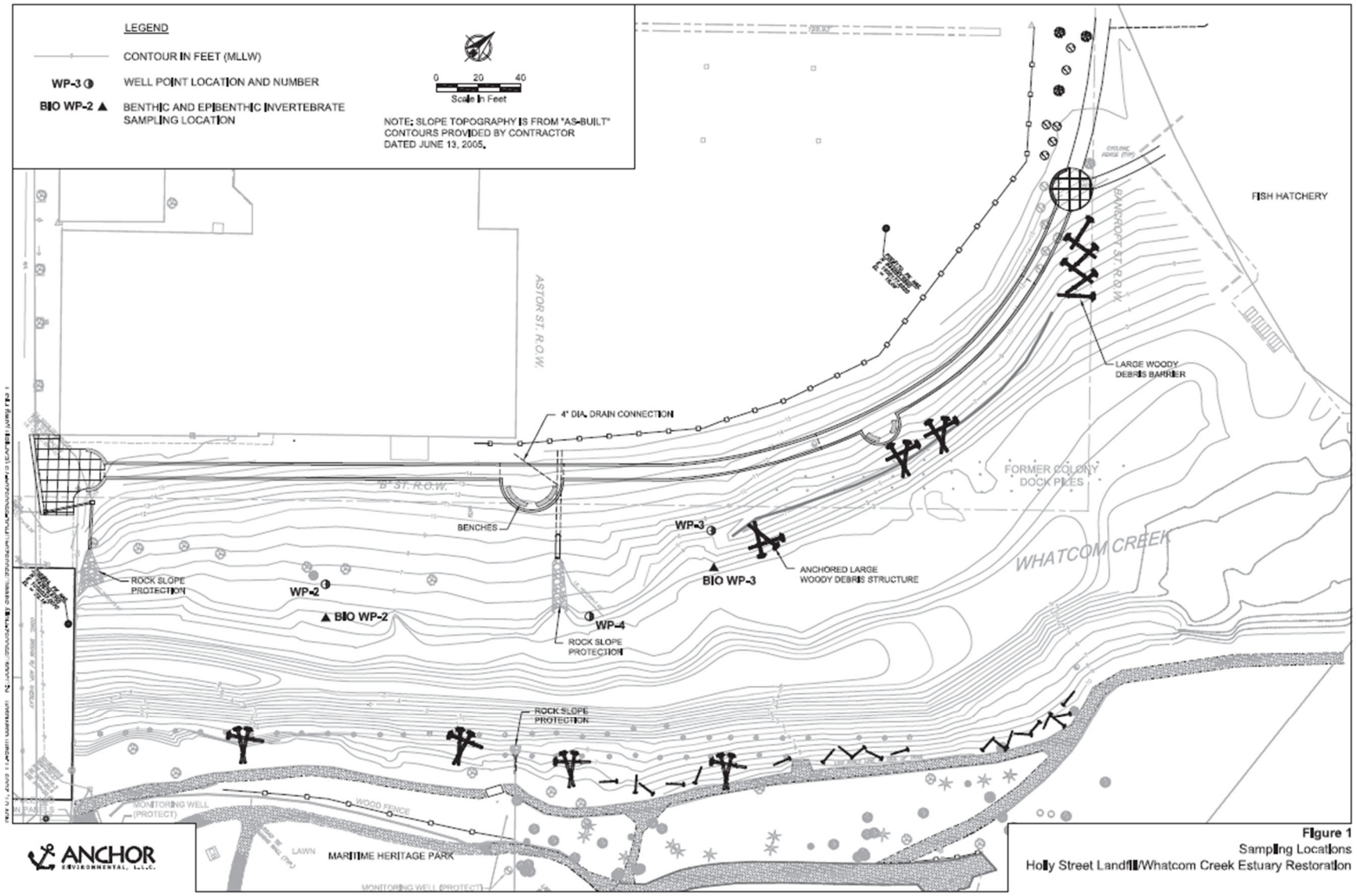
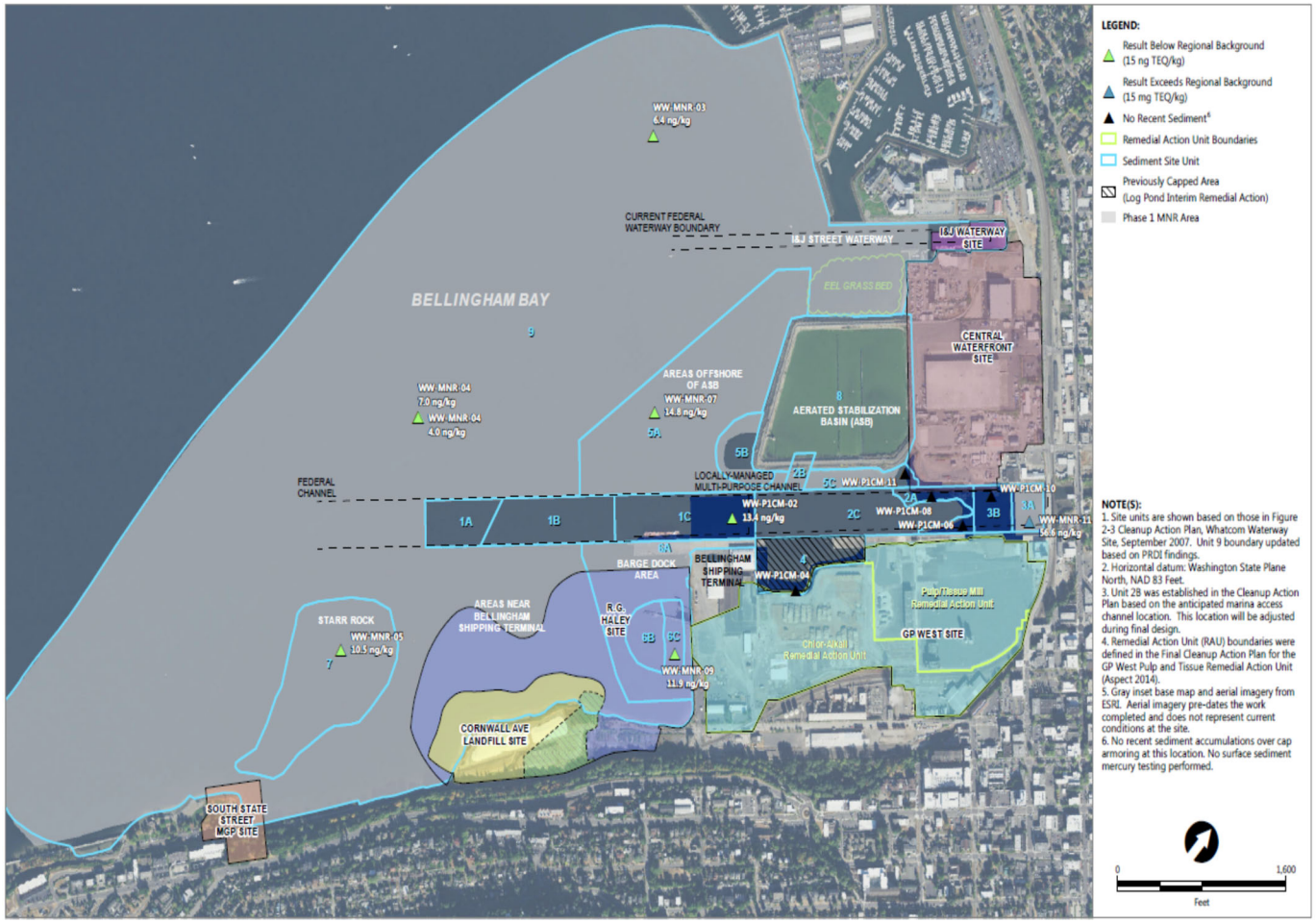


Figure 1
Sampling Locations
Holly Street Landfill/Whatcom Creek Estuary Restoration

Appendix E. Whatcom Waterway – Compliance Monitoring D/F Sediment Results – Years 1, 3, 5



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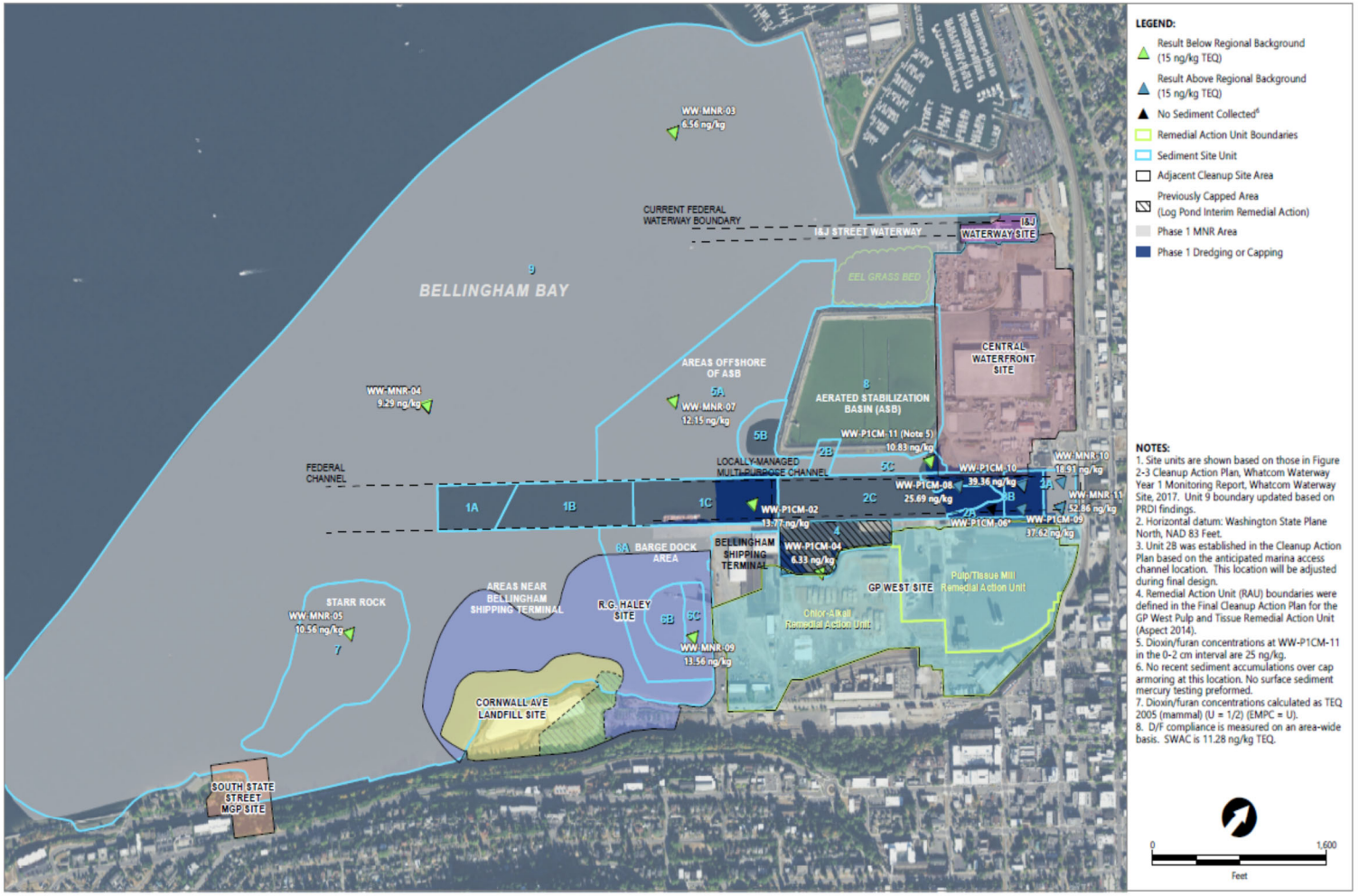
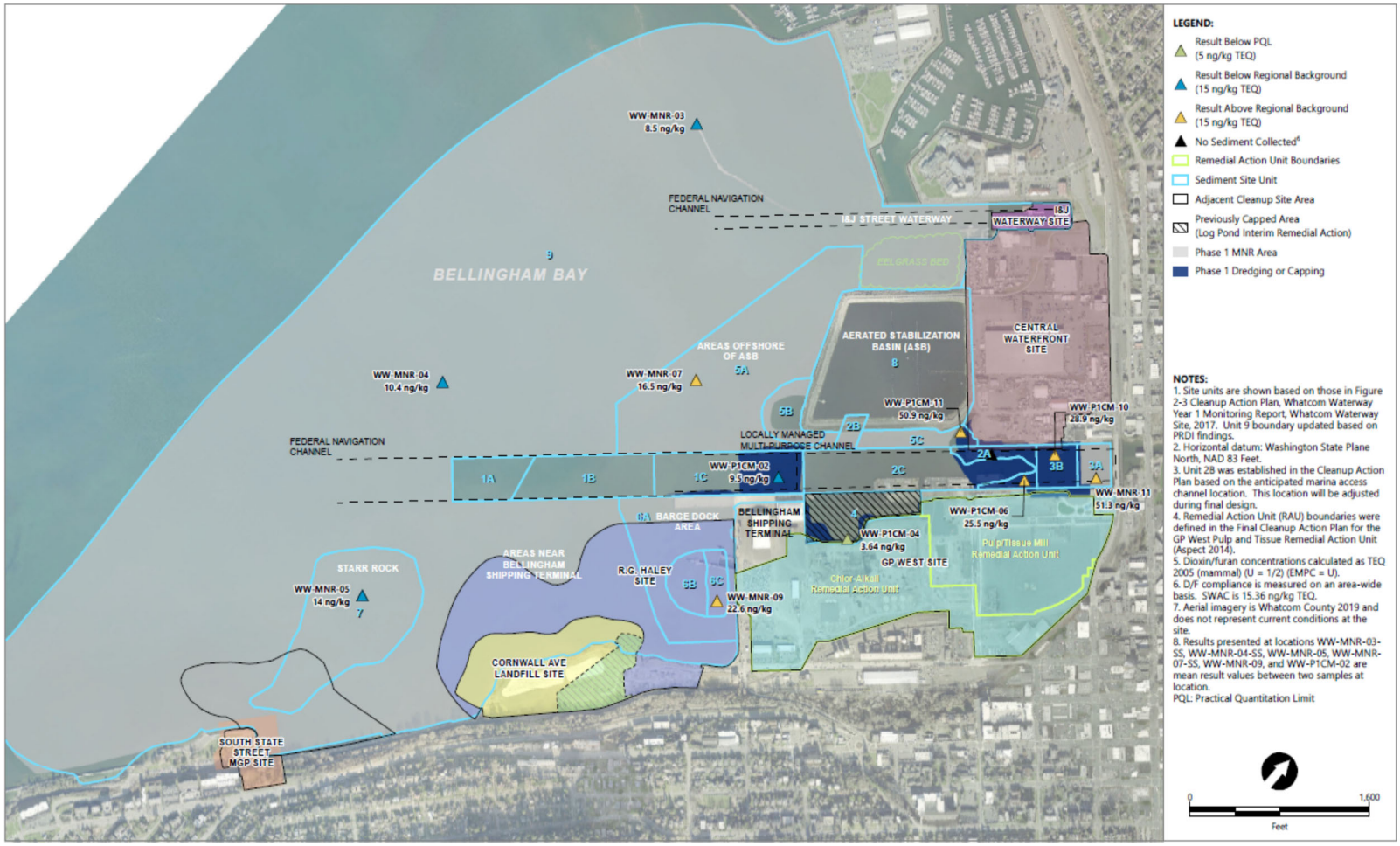
ANCHOR QEA

Figure 10
Surface Sediment Dioxin/Furan Testing Results
Year 1 Compliance Monitoring Report
Whatcom Waterway Cleanup Phase 1 Site Areas



ANCHOR QEA

Figure 10
Surface Sediment Dioxin/Furan Testing Results
Year 3 Compliance Monitoring Report
Whatcom Waterway Cleanup Phase 1 Site Areas



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ANCHOR QEA

Figure 10
Surface Sediment Dioxin/Furan Testing Results
Year 5 Compliance Monitoring Report
Whatcom Waterway Cleanup Phase 1 Site Areas

Appendix F. Whatcom Waterway Site - PRDI D/F Sediment Results

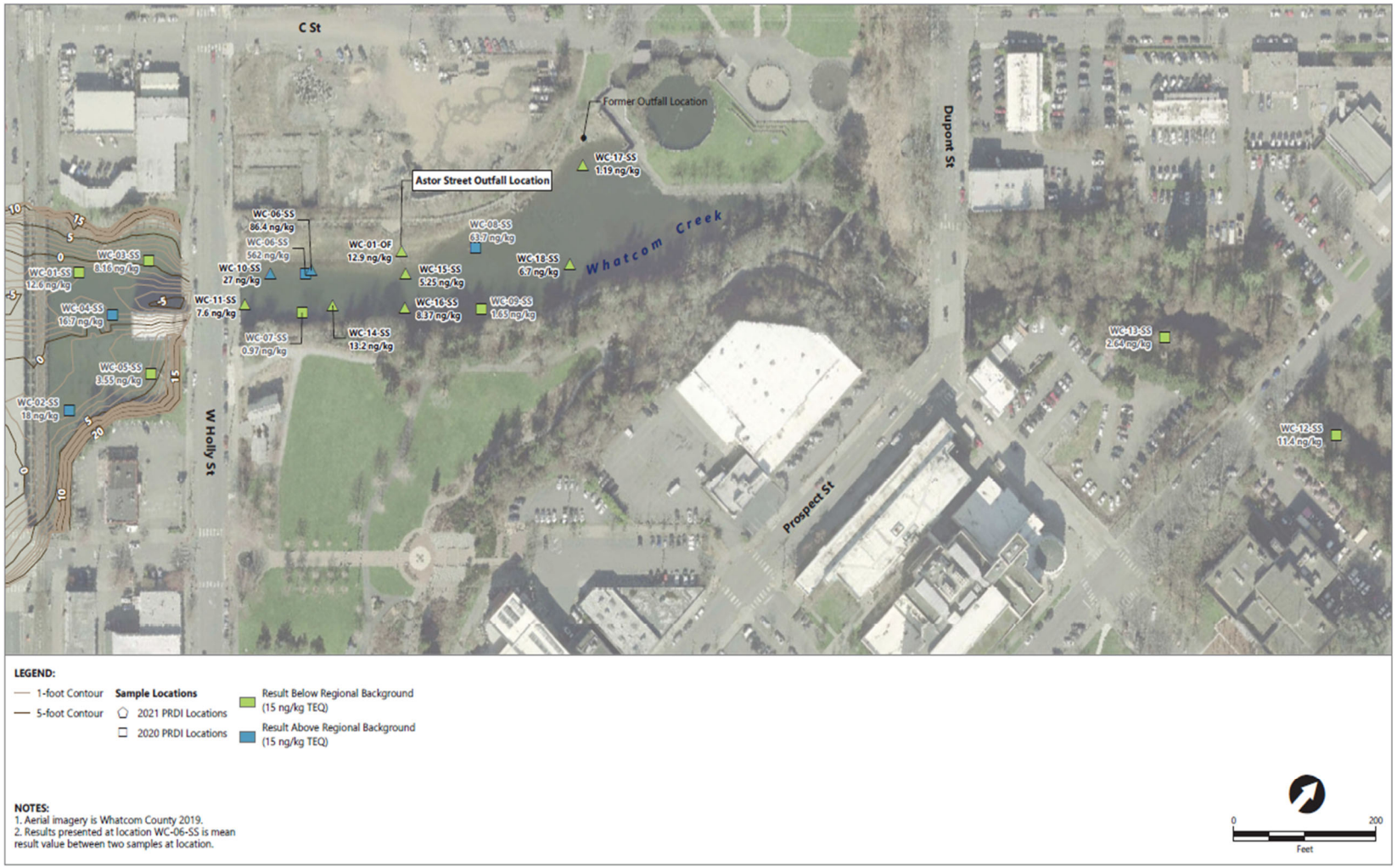

Figure 1 – Whatcom Creek Locations
PRDI Work Plan Addendum #4 Data Report
Whatcom Waterway Cleanup Site Areas

Appendix G. Photo Log

Photo 1: Looking north at Maritime Heritage Park open space with trails (former Holly Street Landfill southern lobe).

Photo 2: Looking south south-east at Maritime Heritage Park public park open spaces and trails (former Holly Street Landfill southern lobe).

Photo 3: Looking northeast along the nature trail and habitat restoration along the southeast bank of Whatcom Creek.

Photo 4: Looking northeast at upper Maritime Heritage Park and Whatcom Creek fish ladder below Dupont Street bridge.

Photo 5: Looking southwest at upper Maritime Heritage Park and Whatcom Creek channel northeast bank and former Holly Street Landfill northern lobe.

Photo 6: Looking northwest at upper Maritime Heritage Park and Salmon Hatchery (former Holly Street Landfill northern lobe).

Photo 7: Looking southeast at Whatcom Creek channel with decommissioned Astor Street outfall.

Photo 8: Looking northeast on the north side of Whatcom Creek outside of the Maritime Heritage Park in the north lobe of the Holly Street Landfill in the Brownfield Project area.

Photo 9: Looking northeast at urban development along C Street in the north lobe of the Holly Street Landfill in the Brownfield Project area.

Photo 10: Looking north at the approximate intersection of Holly Street and E Street where the former Holly Street Landfill northern lobe boundary terminates.