Cleanup Action Plan
Northport Waterfront

Intersection of Hwy 25 and Park Rd, Northport, WA
Facility Site ID 96239, Cleanup Site ID 14874

Toxics Cleanup Program

Washington State Department of Ecology
Spokane, Washington

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Document Information

This document is available in the Department of Ecology's Northport Waterfront cleanup site webpage[1].

Related Information

- Clean-up site ID: 14874
- Facility site ID: 96239

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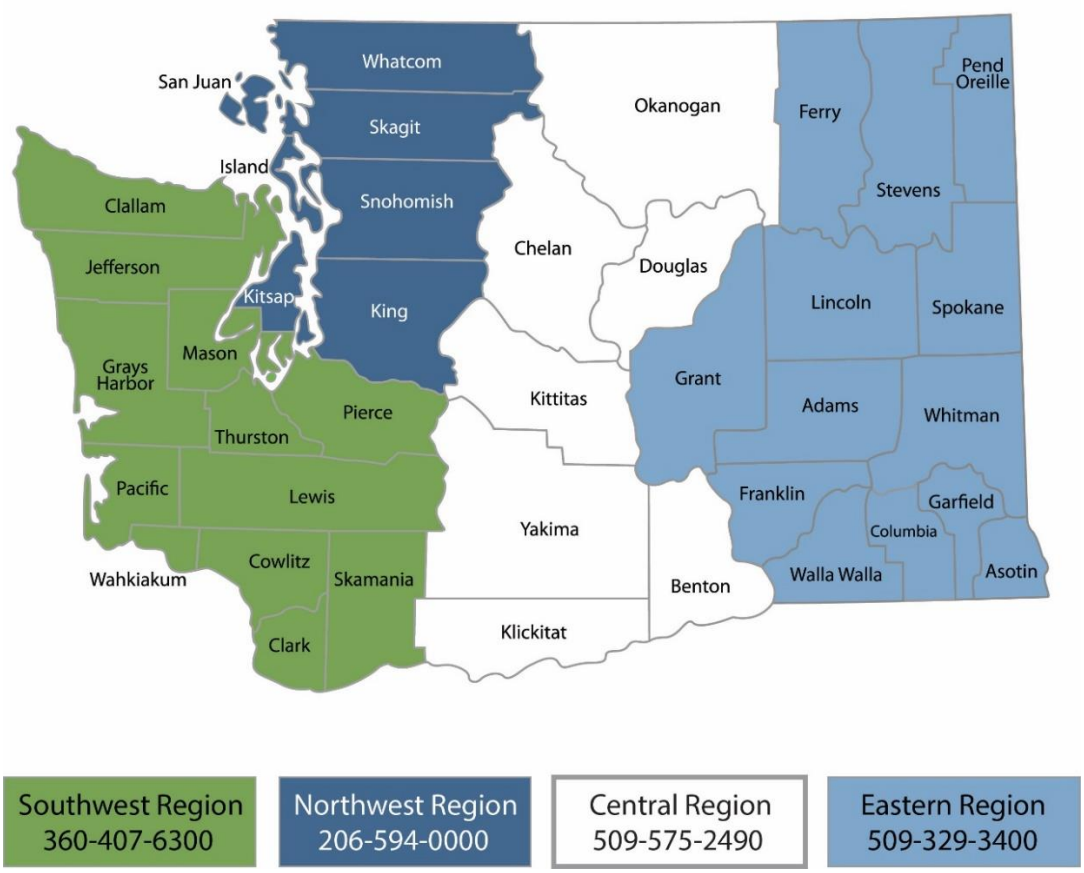
[1] https://apps.ecology.wa.gov/cleanupsearch/site/14874
[2] https://ecology.wa.gov/About-us/Who-we-are/Our-Programs/Toxics-Cleanup
[3] https://ecology.wa.gov/About-us/Accountability-transparency/Our-website/Accessibility

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. Introduction

This report presents the Washington State Department of Ecology's (Ecology) proposed cleanup action for the Northport Waterfront cleanup site (Site). The Site is along the southern bank of the Columbia River near Northport, Washington. See Figure A.1. Vicinity Map in Appendix A.

The Eastern Washington Clean Sites Initiative funds cleanup at the Site. This initiative uses public funds to clean up properties where the responsible party (land user, facility operator, or property owner) could not be found or cannot pay cleanup costs.

Ecology is responsible for selecting the cleanup action and completing the Cleanup Action Plan (CAP). The selected cleanup action is intended to fulfill the requirements of the Model Toxics Control Act (MTCA) and is a required part of the cleanup process under the following regulations and statute:

- MTCA, Chapter 70A.305 Revised Code of Washington (RCW).
- MTCA Cleanup Regulation, Chapter 173-340 of the Washington Administrative Code (WAC).

The purpose of the CAP is identifying the proposed cleanup action for the Site and providing an explanatory document for public review that:

- Describes the history of operations, ownership, and activities at the Site.
- Summarizes nature and extent of contamination.
- Summarizes the cleanup action alternatives considered in the remedy selection process.
- Identifies Site-specific cleanup levels (CULs) and points of compliance for each hazardous substance and medium of concern for the proposed cleanup action.
- Identifies applicable state and federal laws for the proposed cleanup action.
- Describes the selected cleanup action for the Site and the rational for selecting this alternative.
- Identifies residual contamination remaining on the Site after cleanup and restrictions on future uses and activities at the Site to ensure continued protection of human health and the environment.
- Discusses any required compliance monitoring and institutional controls.
- Presents the schedule for implementing the CAP.

Ecology developed the proposed cleanup action for the Site based on findings discussed in the Remedial Investigation/Focused Feasibility Study (RI/FFS), as well as other relevant documents in the administrative record. Ecology is conducting these actions under the authorities of MTCA and Sediment Management Standards (SMS), Chapter 173-204 WAC.

1.1. Declaration

Ecology has selected the remedy described in this CAP because it will be protective of human health and the environment. Furthermore, the selected remedy is consistent with the State of Washington's preference for permanent solutions, as stated in RCW 70A.305.030(1)(b). However, we will consider all public input before making the CAP final.

1.2. Applicability

Cleanup standards specified in this CAP are applicable only to the Northport Waterfront Site. Ecology developed these cleanup standards as a part of an overall remediation process under Ecology oversight using the authority of MTCA and SMS, which should not be considered as setting precedents for other sites.

1.3. Administrative record

The documents used to make the decisions discussed in this CAP are on file in the administrative record for the Site. The References section lists relevant documents. The entire administrative record for the Site is available for public review by appointment at Ecology's Eastern Regional Office, located at 4601 N. Monroe Street, Spokane, Washington, 99205-1295. Results from applicable studies and reports provide background information pertinent to the CAP. These studies and reports include:

- *Establishment of Site-Specific SMS Metals Cleanup Objectives for Contaminated Sediments*, April 2019
- *Remedial Investigation*, October 2019
- *Focused Feasibility Study Report*, April 2021

1.4. Cleanup process

Cleanup conducted under the MTCA process requires the potentially liable persons (PLPs) or Ecology to prepare specific documents. The following list provides a brief description of procedural tasks and the resulting documents, along with the MTCA section requiring their completion.

- Public Participation Plan (WAC 173-340-600) — summarizes the methods that will be implemented to encourage coordinated and effective public involvement. Ecology prepares this document.
- RI/FS (WAC 173-340-350) — documents the investigations and evaluations conducted at the Site from the discovery phase to the RI/FS document. The RI collects and presents information on the nature and extent of contamination and the risks posed by the contamination. The FS presents and evaluates Site cleanup alternatives and may propose a preferred cleanup alternative. PLPs typically prepare these documents. Ecology reviews and accepts these documents and then they undergo public comment.

- CAP (WAC 173-340-380) — sets cleanup standards for the Site, and selects the cleanup actions intended to achieve the cleanup standards. Ecology issues the document, and it undergoes public comment.
- Engineering Design Report, Construction Plans and Specifications (WAC 173-340-400) — outlines details of the selected cleanup action, including any engineered systems and design components from the CAP. These may include construction plans and specifications with technical drawings. The PLPs usually prepare the document, and Ecology approves it. Public comment is optional.
- Operation and Maintenance Plan(s) (WAC 173-340-400) — summarizes the requirements for inspection and maintenance of remediation operations. They include any actions required to operate and maintain equipment, structures, or other remedial systems. The PLPs usually prepare the document, and Ecology approves it.
- Cleanup Action Report (WAC 173-340-400) — provides details on the cleanup activities along with documentation of adherence to or variance from the CAP following implementation of the cleanup action. The PLPs usually prepare the document, and Ecology approves it.
- Compliance Monitoring Plan (WAC 173-340-410) — details the monitoring activities required to ensure the cleanup action is performing as intended. The PLPs usually prepare the document, and Ecology approves it.

2. Site Background

This section summarizes the Site's history, contamination investigations, and physical characteristics.

2.1. General site setting and history

The Site is within the Northport town limits along the southern bank of the Upper Columbia River (UCR). Figure A.2. Site Plan shows key Site features.

The Site includes all permanently and seasonally exposed areas of the riverbank, shore, and hillside next to the Northport City Park and boat launch. The park has upper and lower recreational areas. The upper park is about 20 to 30 feet in elevation above the river and includes parking, picnic tables, and several trailer hook-ups. The lower park includes an access road, boat launch, and dock. A steep, vegetated bank separates the upper and lower portions of the park; another vegetated bank separates the lower park from the river and a seasonal beach area.

The Northport Site is located within the UCR, which extends downstream from the United States and Canadian border south to the Grand Coulee Dam. The UCR has been the subject of numerous investigations to assess environmental impacts of historical discharges from smelter operations. Mining and mineral processing has been occurring in the UCR, in both the U.S. and Canada, since at least the late 1800s, including at the Le Roi Smelter and at Teck Metals Ltd. Operations in Trail, British Columbia.

Ecology and the U.S. Environmental Protection Agency (EPA) have been investigating releases that have come to be located in the UCR to determine the toxicity, characteristics, transport, and deposition of discharges and emissions for decades. To date, the millions of tons of metal-heavy slag that has come to be located in the UCR, both via effluent discharges to the river and through aerial deposition of metals, has primarily been investigated and subject to emergency removal actions in conjunction with an ongoing remedial investigation and feasibility study (RI/FS). The U.S. Environmental Protection Agency (EPA) is conducting the RI/FS in response to concerns about historical discharges of hazardous substances into the Columbia River by Teck and its affiliated predecessors at the smelter in Trail, British Columbia. EPA concluded in a 2003 study that both the smelter in Trail, B.C., and the former Le Roi Smelter are sources of contamination to the UCR; however, the Trail smelter was identified as the primary source of contamination. The operators of the Trail smelter agreed to fund the RI/FS in 2006.

The Le Roi Smelter (also known as the Northport Smelter) operated from about 1896 to 1921 and refined various ores, primarily copper, gold, and lead. The facility began smelting copper and gold tellurium ores using heap roasting, which involves open burning of the ore prior to placing it in a furnace. At the peak of operation, the Le Roi Smelter processed 500 tons of ore per day using the heap roasting process until operations were temporary suspended in 1909. In 1914, the Le Roi Smelter reopened to process lead ore. Lead smelting continued intermittently until operations ceased permanently in 1921. Slag was the main byproduct of smelting operations at the Site. During operations, the Le Roi Smelter directly discharged slag to the Columbia River through sluices and other dumping methods. The waste slags contain metals that present known or potential risks to human health and the environment.

The Teck facility in Trail, B.C., is located on the Columbia River approximately 10 miles upstream from the U.S. – Canadian border. Smelter operations have been underway in Trail for over a century. Major operations at the facility have included primary smelting of zinc and lead concentrates and secondary smelting for production of a variety of metal products (for example, antimony, bismuth, cadmium, cobalt, copper, germanium, gold, indium, mercury, silver, and thallium), arsenic products, granular and crystallized ammonium sulfate fertilizers, sulfur, sulfuric acid, sulfur dioxide, and ferrous granules (granulated slag). Fertilizer plants, a foundry, a machine shop, a copper-rod mill, and heavy water plants have also been operated at the Trail facility.

EPA conducted preliminary assessments, site inspections, and a removal site evaluation in Northport starting in 1993. In August 1999, the Colville Confederated Tribes petitioned EPA to conduct an assessment of environmental contamination in the UCR. The petition expressed concerns about risks to people's health and the environment from contamination in the river.

In 2001, EPA collected samples of river sediment to learn more about the types and amounts of pollution that exists. The results showed that contamination is present in the lake and river sediments, and that a more detailed investigation is needed to evaluate possible risks to human health and the environment.

In 2003, the EPA concluded that hazardous substances (lead and arsenic) were in soil at the former Le Roi Smelter site and on surrounding properties. The EPA oversaw an emergency response action at the upland smelter area in 2004. Removal assessment activities included

sampling of residential and commercial properties in and around the Northport community, sampling of public areas, and collecting drinking water samples from the municipal well located near the former smelter site.

Northport residential and commercial properties with lead concentrations in soil greater than removal action limits were identified in 2003 and 2004 for a Time Critical Removal Action. Further and/or additional soil cleanup activities in these areas will likely be necessary. In 2014, EPA conducted a removal action on the Le Roi property and residential areas within the town of Northport. Contaminated soils were consolidated at the smelter site (11-acre area), covered with a protective barrier sheet and clean soil, and vegetated.

BNSF Railway, owner of the Northport City Park property, completed an independent cleanup action at the park to address arsenic- and lead-contaminated soil associated with the former smelter. However, cleanup actions to date have not addressed the nearshore sediments and the riverbank affected by smelter waste and debris.

2.2. Investigations

Environmental studies completed at the Site include:

- *Preliminary Assessment Report, LeRoi Company Smelter*, 1993: URS Consultants, Inc. assessment to determine the potential threat to public health or the environment from the site, determine the potential release of hazardous constituents into the environment, and evaluate the need for additional investigative action.
- *Site Inspection Report, LeRoi Company Smelter*, 1993: URS Consultants, Inc. assessed potential exposure pathways and collected background, city park, and on-site surface soil samples.
- *Work Plan for State Remedial Investigation (RI), LeRoi Smelter Site*, 1996: Washington Department of Ecology plan to collect, develop, and evaluate the nature and extent of releases of hazardous substances, and gather data for a feasibility study.
- *Preliminary Assessments and Site Inspections*, 2002: Ecology & Environment (E&E) assessment and inspection included collecting nine near-shore sediment samples.
- *Beach Sediment Study Filed Sampling and Data Summary Report*, 2014: Teck, operating under Teck American, Inc., collected sediment samples from 34 recreational beach locations along the upper Columbia River and Lake Roosevelt. Samples included composite surface sediment samples and coring samples.
- *Remedial Investigation*, 2019: GeoEngineers, Inc. (GeoEngineers) conducted RI activities. Section 3 describes the RI.
- *Focused Feasibility Study*, 2021: GeoEngineers completed an FFS that presented potential remedial actions.
- *Response to Comments: Draft Remedial Investigation and Feasibility Study*, 2021: Ecology held a comment period May 3 through June 2, 2021, for the draft RI/FFS. We also held an online public meeting on May 19, 2021.

2.3. Physical characteristics

In accordance with MTCA and Part V of the SMS, and for the purpose of this CAP, material from the Site includes both soil and sediment potentially impacted by smelter waste. The steep vegetated slope separating the shoreline and park from the river and seasonal beach generally sits above the Columbia River's ordinary high water mark. As such, MTCA 173-340-200 defines the material on this hillside as soil. Part V of the SMS defines sediment as particulate matter at or below the ordinary high water mark (OHWM) where the water is present for a minimum of six consecutive weeks and biota, including benthic infauna, or humans may be exposed. For this Site, the material near the shoreline classifies as sediment.

Columbia River flow conditions influence surface water levels at the Site. The Grand Coulee Dam is downstream of the Site, and Lake Roosevelt forms behind the dam. Water levels at Lake Roosevelt indirectly influence water levels at the Site as well. When water levels in Lake Roosevelt are high and river flows are low, the Site takes on a low-velocity, lake-like appearance with most of the Site submerged underwater. Surface water elevations during high water levels can be greater than 1,300 feet above mean sea level (AMSL). When river flows are low to moderate, or water levels in Lake Roosevelt are low, the shoreline bank and beach areas are generally exposed. Surface water elevations during low water levels can be less than 1,280 feet AMSL. In general, the OHWM as defined by RCW 90.58.030(2)(c) is near 1,295 feet AMSL. Sediment intermixed with slag particles are disturbed during periods of high river flows. Although rates of accretion and erosion across the Site have not been quantified, observations indicate that sediment at the Site is generally stable with localized erosion and deposition.

2.3.1. Topography and climate

Topography surrounding the Site includes relatively flat valley floors rising to steep mountain terrain. Elevations at the Site range from approximately 1,280 AMSL along the shoreline to about 1,325 feet AMSL at the top of the hillside.

The Site is in a semi-arid region of the Okanogan Highlands. The Northport climate station (Service Station USC00455946) provides local, continuous weather data and is three miles from the Site. The average precipitation near the Site from 1899 to 2016 is 19.40 inches. Precipitation primarily occurs from late fall to spring.

2.3.2. Regional hydrogeology

Surface geology along the UCR, north of the Kettle River, is gravel, sand, and clay deposited by glacial streams. Groundwater occurs in pore spaces between sand and gravel particles, and in fractures or voids of bedrock aquifers. Movement of water between the Columbia River and the adjacent geologic strata largely depends on river levels, bank storage and discharge, and regional discharge of groundwater from deeper aquifers (Thompson 1977).

The geology near the Site is glacial outwash deposits. The outwash deposits are massive or thickly bedded, fine-to-coarse sand with rounded gravel, cobbles, and boulders. Local inclusions of silt and clay are also present. Limited local aquifers are within the glacial outwash deposit, and the coarse nature of the deposits generally results in high permeability. The local aquifer at

the Site provides the water supply for the Town of Northport. Northport's water supply wells are less than a quarter mile from the Site. Static groundwater levels observed in these wells range from about 50 to 75 feet below ground surface (bgs).

3. Remedial Investigation

Under Ecology's oversight, GeoEngineers completed an RI at the Site to assess the nature and extent of smelter waste. Ecology determined the investigation would not have a probable significant adverse impact on the environment. As a result, Ecology issued a Determination of Non-Significance under WAC 197-11-340(2). Ecology submitted a request to the Department of Archaeological and Historical Preservation (DAHP) to evaluate historic features associated with the former smelter in 2018. DAHP's evaluation noted that pre-contact cultural resources were not recorded inside the project area. The RI included collecting sediment and soil samples from 26 test pits excavated to 4 feet bgs, three hand samples dug to 2 feet bgs, and 109 surface samples collected from about 0 to 0.5 feet bgs. In total, GeoEngineers screened 329 samples in the field using a hand-held x-ray fluorescence (XRF) instrument.

In addition to XRF screening, Eurofins TestAmerica (TestAmerica) analyzed 61 soil samples for Target Analyte List (TAL) metals:

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Cadmium
- Calcium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Magnesium
- Manganese
- Mercury
- Nickel
- Potassium
- Selenium
- Silver
- Sodium
- Thallium
- Vanadium
- Zinc

The RI reviewed statistical correlations for the metals frequently detected (arsenic, barium, chromium, copper, iron, lead, manganese, and zinc) to evaluate how well the XRF estimated the magnitude of a metal in a given sample and how well it predicted an exceedance of the screening level. Correlation coefficients for paired XRF and lab data are provided in Table III of the RI. Based on the RI results, XRF screening results are appropriate to use to evaluate the extent of copper, iron, lead, manganese and zinc. For other metals, laboratory data should be used.

The RI identified screening levels for a subset of the TAL metals, listed in Table B.1 in Appendix B. Screening levels used in the RI are derived from MTCA Method A cleanup levels, MTCA Method B cleanup levels where there is no Method A value, SMS freshwater sediment cleanup objectives, and the Upper River Basin risk-based screening levels Ecology developed (Ecology 2019). Metals that were not carried forward in the data evaluation process were either not detected in any samples, not identified as primary river sediment contaminants of concern, or serve as essential nutrients.

Although a number of metals are in soil and sediment at the Site, the RI showed that copper, lead, and zinc are the most widespread at elevated concentrations. The RI investigation detected arsenic in 33 percent of samples, copper in 82 percent of samples, lead in 99 percent of samples, and zinc in 93 percent of samples field screened. The RI used the distribution of copper, lead, and zinc to evaluate the nature and extent of contamination from smelter waste. The summaries below provide a generalized overview of contamination findings from the investigation.

3.1. Metals contamination

The RI divided the Site into five geographic areas to aid in the discussion and analysis of the distribution of metals (Seasonal Beach, Jetty, Bay and Public Dock, Bayshore, and Hillside). Figure A.2 shows the areas, which are generally described as follows:

1. Seasonal Beach – the exposed sand and cobble sediment between the Highway 25 Bridge, the hillside, the main channel flow of the Columbia River and the Jetty.
2. Jetty – the manmade jetty near the boat launch.
3. Bay and Public Dock – sediments in the area between the jetty and boat launch.
4. Bayshore – exposed sediment northeast of the boat dock that includes sediment near the shore and at the riverbank.
5. Hillside – the upland soil south of the Seasonal Beach.

The following sections discuss RI activities and findings for each area.

3.1.1. Seasonal Beach

RI activities included collecting sediment samples from 18 test pits and 70 surface locations in the Seasonal Beach area. The Seasonal Beach has the largest area with the greatest metal contaminant impacts. Based on sample results observed at 4 feet bgs during investigations, metal contaminants likely extend beyond this depth to depths greater than the 4 feet bgs observed during investigations. The upper 2 feet of material have the highest contaminant concentrations from apparent smelter waste.

A summary of arsenic, copper, lead, and zinc concentrations detected in samples collected from the Seasonal Beach follows:

- **Arsenic:** Detected at concentrations greater than the screening level of 12.9 milligrams per kilogram (mg/kg) in 16 out of the 42 samples TestAmerica analyzed. The mean arsenic concentration detected was 14.6 mg/kg, and the median concentration detected was 10 mg/kg. The maximum and minimum concentrations detected were 67 mg/kg and 2.4 mg/kg, respectively.
- **Copper:** Detected at concentrations greater than the screening level of 143 mg/kg in 160 out of the 214 samples analyzed in the field using the XRF. The mean copper concentration detected was 628 mg/kg, and the median concentration detected was 274 mg/kg. The maximum and minimum concentrations detected were 2,872 mg/kg and 22 mg/kg, respectively.

- **Lead:** Detected at concentrations greater than the screening level of 250 mg/kg in 107 of the 214 samples analyzed in the field using the XRF. The mean lead concentration detected was 1,117 mg/kg, and the median concentration detected was 189 mg/kg. The maximum and minimum concentrations detected were 60,200 mg/kg and 11 mg/kg, respectively.
- **Zinc:** Detected at concentrations greater than the screening level of 3,200 mg/kg in 88 out of the 214 samples analyzed in the field using the XRF. The mean zinc concentration detected was 5,596 mg/kg, and the median concentration detected was 1,218 mg/kg. The maximum and minimum concentrations detected were 54,500 mg/kg and 21 mg/kg, respectively.

3.1.2. Jetty

RI activities included collecting eight surface samples from the Jetty area. A summary of arsenic, copper, lead, and zinc concentrations detected in samples collected from the Jetty follows:

- **Arsenic:** Detected at concentrations greater than the screening level of 12.9 mg/kg in two out of the three samples TestAmerica analyzed. The mean arsenic concentration detected was 18 mg/kg, and the median concentration detected was 13 mg/kg. The maximum and minimum concentrations detected were 31 mg/kg and 10 mg/kg, respectively.
- **Copper:** Detected at concentrations greater than the screening level of 143 mg/kg in eight out of the eight samples analyzed in the field using the XRF. The mean copper concentration detected was 796 mg/kg, and the median concentration detected was 652 mg/kg. The maximum and minimum concentrations detected were 1,378 mg/kg and 355 mg/kg, respectively.
- **Lead:** Detected at concentrations greater than the screening level of 250 mg/kg in one out of the eight samples analyzed in the field using the XRF. The mean lead concentration detected was 168 mg/kg, and the median concentration detected was 164 mg/kg. The maximum and minimum concentrations detected were 292 mg/kg and 79 mg/kg, respectively.
- **Zinc:** Detected at concentrations greater than screening level of 3,200 mg/kg in 5 out of the 8 samples analyzed in the field using the XRF. The mean zinc concentration detected was 4,361 mg/kg, and the median concentration detected was 3,331 mg/kg. The maximum and minimum concentrations detected were 7,891 mg/kg and 1,413 mg/kg, respectively.

RI activities did not include test pit excavations in the Jetty area to avoid creating stability issues. Because the jetty was constructed of material sourced from the Seasonal Beach area, the RI concluded that contamination extends to greater depths.

3.1.3. Bay and Public Dock

RI activities included collecting sediment samples from four test pits and three surface locations in the Bay and Public Dock area. Sediments within the Bay and Public Dock area exhibit metal contamination to at least 4 feet bgs.

A summary of arsenic, copper, lead, and zinc concentrations detected in samples collected from the Bay and Public Dock area follows:

- **Arsenic:** Detected at concentrations greater than the screening level of 12.9 mg/kg in three out of the nine samples TestAmerica analyzed. The mean arsenic concentration detected was 19.2 mg/kg, and the median concentration detected was 11 mg/kg. The maximum and minimum concentrations detected were 58 mg/kg and 5.8 mg/kg, respectively.
- **Copper:** Detected at concentrations greater than the screening level of 143 mg/kg in 18 out of the 35 samples analyzed in the field using the XRF. The mean copper concentration detected was 329 mg/kg, and the median concentration detected was 387 mg/kg. The maximum and minimum concentrations detected were 2,966 mg/kg and 19 mg/kg, respectively.
- **Lead:** Detected at concentrations greater than the screening level of 250 mg/kg in nine of the 35 samples analyzed in the field using the XRF. The mean lead concentration detected was 1,150 mg/kg, and the median concentration detected was 236 mg/kg. The maximum and minimum concentrations detected were 22,800 mg/kg and 10 mg/kg, respectively.
- **Zinc:** Detected at concentrations greater than the screening level of 3,200 mg/kg in nine out of the 35 samples analyzed in the field using the XRF. The mean zinc concentration detected was 4,492 mg/kg, and the median concentration detected was 3,250 mg/kg. The maximum and minimum concentrations detected were 58,700 mg/kg and 37 mg/kg, respectively.

3.1.4. Bayshore

RI activities included collecting sediment samples from two test pit excavations, five surface locations, and three hand dug excavations in the Bayshore area. Based on sample results, sediments within the Bayshore exhibit metal contamination to the excavation bottom of at least 4 feet bgs.

A summary of arsenic, copper, lead, and zinc concentrations detected in samples collected from the Bayshore follows:

- **Arsenic:** Detected at concentrations greater than the screening level of 12.9 mg/kg in two out of the 10 samples TestAmerica analyzed. The mean arsenic concentration detected was 11.8 mg/kg, and the median concentration detected was 10 mg/kg. The maximum and minimum concentrations detected were 43 mg/kg and 5.7 mg/kg, respectively.
- **Copper:** Detected at concentrations greater than the screening level of 143 mg/kg in 13 out of the 34 samples analyzed in the field using the XRF. The mean copper

concentration detected was 126 mg/kg, and the median concentration detected was 259 mg/kg. The maximum and minimum concentrations detected were 690 mg/kg and 15 mg/kg, respectively.

- **Lead:** Detected at concentrations greater than the screening level of 250 mg/kg in 10 of the 34 samples analyzed in the field using XRF technology. The mean lead concentration detected was 344 mg/kg, and the median concentration detected was 188 mg/kg. The maximum and minimum concentrations detected were 2,410 mg/kg and 12 mg/kg, respectively.
- **Zinc:** Detected at concentrations greater than the screening level of 3,200 mg/kg in five out of the 34 samples analyzed in the field using XRF technology. The mean zinc concentration detected was 1,541 mg/kg, and the median concentration detected was 1,218 mg/kg. The maximum and minimum concentrations detected were 7,008 mg/kg and 33 mg/kg, respectively.

3.1.5. Hillside

RI activities included collecting soil samples from two test pits and 22 surface locations. The Hillside area exhibits mature vegetation, and as such, investigation in this area was limited to not disturb the vegetation. The known extent of impacted soils within the Hillside is limited to high-use areas and areas where visible slag is present.

A summary of concentrations of metals contamination (arsenic, copper, lead, and zinc) detected in samples collected from the Hillside follows:

- **Arsenic:** Concentrations greater than the screening level of 12.9 mg/kg were not detected in samples TestAmerica analyzed. The mean arsenic concentration detected was 5.1 mg/kg, and the median concentration detected was 11 mg/kg. The maximum and minimum concentrations detected were 11 mg/kg and 4.2 mg/kg, respectively.
- **Copper:** Detected at concentrations greater than the screening level of 143 mg/kg in 21 out of the 38 samples analyzed in the field using XRF technology. The mean copper concentrations detected was 419 mg/kg, and the median concentration detected was 411 mg/kg. The maximum and minimum concentrations detected were 4,057 mg/kg and 58 mg/kg, respectively.
- **Lead:** Detected at concentrations greater than screening level of 250 mg/kg in 13 of the 38 samples analyzed in the field using XRF technology. The mean lead concentration detected was 845 mg/kg and the median concentration detected was 251 mg/kg. The maximum and minimum concentrations detected were 23,100 mg/kg and 14 mg/kg, respectively.
- **Zinc:** Detected at concentrations greater than screening level of 3,200 mg/kg in two out of the 38 samples analyzed in the field using XRF technology. The mean zinc concentration detected was 2,197 mg/kg, and the median concentration detected was 2,366 mg/kg. The maximum and minimum concentrations detected were 48,900 mg/kg and 41 mg/kg, respectively.

3.2. Risks to human health and environment

Smelter waste contains a number of metals that are the contaminants of concern for the Site. Previous investigations found that arsenic, chromium, copper, lead, and zinc were elevated above risk-based screening levels in sediment and soil at the Site. In addition, benthic bioassay testing results in the UCR project area and surrounding reaches demonstrate that metals in sediments are bioavailable and create human health and aquatic ecological risks. Previous studies that demonstrate the metal's bioavailability in sediments at the Site and UCR project area are summarized in Ecology's Upper River Basin risk-based screening levels memo (Ecology 2019) and include:

- *Beach Sediment Study Field Sampling and Data Summary Report* (Teck 2014)
- *Summary and evaluation of Phase 1 (2005) sediment toxicity tests Upper Columbia River site* (CH2M Hill 2012)
- *Evaluation and interpretation of the sediment chemistry and sediment toxicity data for the Upper Columbia River* (MacDonald et al 2012)
- *Characterizing toxicity of meta-contaminated sediments from the Upper Columbia River, Washington USA, to benthic invertebrates* (Besser, et al 2018)

Potential receptors to Site contaminants include park visitors, park maintenance workers, wildlife, and terrestrial and aquatic organisms. Potential exposure routes include:

1. Direct human contact with exposed or near-surface contaminated soil, sediment, and surface water by visitors and park workers.
2. Aquatic life exposure to sediments or associated surface and pore water.
3. Incidental ingestion of soil, sediment, or surface water by higher trophic order ecological receptors.
4. Bioaccumulation from consumption of contaminated food or prey.

The RI includes a conceptual site model (CSM) to describe surface and subsurface conditions, define the nature and extent of known contamination, and identify potential exposure pathways from site sources of contaminants to potential receptors. Figure A.3 presents the CSM for the Site.

4. Cleanup Standards

MTCA requires the establishment of cleanup standards for individual sites. SMS requires the establishment of cleanup standards for sediments that are consistent with MTCA. The two primary components of cleanup standards are CULs and points of compliance. CULs determine the concentration at which a substance does not threaten human health or the environment. A cleanup remedy addresses all media exceeding a CUL to prevent exposure to the contaminated material. Points of compliance represent the locations on the site where CULs must be met.

4.1. Overview

MTCA and SMS provide the process for establishing soil and sediment cleanup values, respectively.

4.1.1. Soil cleanup levels

The process for establishing soil CULs involves the following:

- Determining if methods A, B, or C are applicable;
- Developing CULs for individual contaminants in each media;
- Determining which contaminants contribute the majority of the overall risk in each media (indicators); and
- Adjusting the CULs downward for carcinogenic substances based on total site risk of 1×10^{-5}, and for a hazard index of 1 for non-carcinogenic substances, if necessary.

MTCA provides three options for establishing CULs: methods A, B, and C.

- Method A may be used to establish CULs at routine sites or sites with relatively few hazardous substances.
- Method B is the standard method for establishing CULS and may be used to establish CULs at any site.
- Method C is a conditional method used when a cleanup level under Method A or B is technically impossible to achieve or may cause significantly greater environmental harm. Method C also may be applied to qualifying industrial properties.

MTCA defines the factors used to determine whether a substance should be retained as an indicator hazardous substance for the Site. When defining CULs at a site contaminated with several hazardous substances, Ecology may eliminate those contaminants contributing a small percentage of the overall threat to human health and the environment. WAC 173-340-703(2) provides a substance may be eliminated from further consideration based on:

- The toxicological characteristics of the substance which govern its ability to adversely affect human health or the environment relative to the concentration of the substance;
- The chemical and physical characteristics of the substance which govern its tendency to persist in the environment;
- The chemical and physical characteristics of the substance which govern its tendency to move into and through the environment;
- The natural background concentration of the substance;
- The thoroughness of testing for the substance;
- The frequency of detection; and
- The degradation by-products of the substance.

4.1.2. Sediment cleanup levels

SMS provides numerical chemical criteria as well as methods to determine sediment CULs that include protecting the benthic community in freshwater sediment (WAC 173-204-563) and

higher trophic-level species (WAC 173-204-564). Ecology, when promulgating the SMS, determined the numerical chemical criteria values established as a part of the rule did not reliably predict benthic community toxicity for metals mining-, milling-, or smelting-impacted sediment sites. The SMS established that for freshwater sediment sites impacted by metals smelting, such as this Site, the chemical numerical criteria would not apply and that chemical site-specific numerical criteria would need to be developed using site-specific bioassays (WAC 173-204-563(2)(o)(iii)).

To identify sites of potential concern and to develop site-specific numerical chemical criteria, the SMS uses two main benthic invertebrate species (*Hyalella azteca* and *Chironomus dilutus*) to conduct bioassays with endpoints of growth and mortality. SMS identifies performance standards and criteria for assigning toxic response for each endpoint. In addition, SMS recognizes the application of biomass as a third biological endpoint (WAC 173-204-56(3)(g)).

4.2. Site use

Evaluating CULs and ecological exposures depends on the Site use. Options under MTCA are an unrestricted property or an industrial property. The Site is next to the Northport City Park that includes public parking, picnic tables, shelters, and several recreational vehicle hook-ups. Considering the existing land uses and that recreational activities will likely continue to be the main use well into the future, unrestricted land use is applicable for the Site.

4.3. Terrestrial ecological evaluation

WAC 173-340-7490 requires that site managers perform a terrestrial ecological evaluation (TEE) to determine the potential effects of soil contamination on ecological receptors. MTCA excludes a site from a TEE if it meets any of the following criteria:

- All contaminated soil is or will be located below the point of compliance;
- All contaminated soil is or will be covered by physical barriers such as buildings or pavement;
- The site meets certain requirements related to the nature of on-site and surrounding undeveloped land; or
- Concentrations of hazardous substances in soil do not exceed natural background levels.

This Site does not meet any of the exclusionary criteria. MTCA requires sites that do not qualify for a TEE exclusion complete a site-specific TEE if any of the following criteria apply:

- The site is located on, or directly adjacent to, an area where management or land use plans will maintain or restore native or semi-native vegetation.
- The site is used by a threatened or endangered species; a wildlife species classified by the Washington state department of fish and wildlife as a “priority species” or “species of concern” under Title 77 RCW; or a plant species classified by the Washington state department of natural resources heritage program as “endangered,” “threatened,” or “sensitive” under Title 79 RCW. For plants, “used” means that a plant species grows at the site or has been found growing at the site. For animals, “used” means that individual of a species have been observed to live, feed, or breed at the site.

- The site is located on a property that contains at least ten acres of native vegetation within 500 feet of the site, not including vegetation beyond the property boundaries.
- The department determines that the site may present a risk to significant wildlife populations.

This Site does not meet any of the criteria for a site-specific TEE. As such, a simplified terrestrial ecological evaluation as described under WAC 173-340-7492 is applicable. The simplified TEE process provides several options, including chemical concentrations the site can use as CULs. MTCA Table 749-2 provides concentration levels for priority contaminants of ecological concern for sites that qualify for the simplified TEE procedure.

4.4. Site cleanup levels

For this Site, CUL development centers on metal contaminants in soil and sediment. Site investigations identified arsenic, copper, lead, and zinc as indicator hazardous substances in sediment and soil. As discussed in Section 2.3, soil is generally limited to the Hillside area. The Seasonal Beach, Bay and Public Dock, Bayshore, and Jetty areas are sediment. This CAP develops separate CULs for the four metals identified as indicator substances for both Site soil and sediment.

This CAP uses MTCA Method B to develop soil CULs at the Site with the exception of lead. Cleanup values for lead cannot be calculated using the equations in MTCA; therefore, MTCA Method A soil CULs for lead are used. Initial Site CULs are then adjusted downward using the simplified TEE table values found in MTCA Table 749-2. Table B.2 summarizes soil CULs for the Site.

Using data from sediment toxicity studies conducted in the direct vicinity of the Site, Ecology developed preliminary Site-specific sediment CULs using the Floating Percentile Model (FPM) as described in Ecology Publication No. 11-09-054. Ecology used the FPM process to develop freshwater sediment CULs. As noted previously, the numerical criteria are not applicable to the Site; therefore, Site-specific sediment CULs were developed. The Site-specific CULs are based on known or suspected primary toxicity drivers to the benthic macroinvertebrates at the Site. Ecology memorandum, "Establishment of Site-Specific SMS Metals Cleanup Objectives for Contaminated Sediments – Northport Waterfront and Nearshore State Cleanup Site," describes the process Ecology used to create the Site-specific sediment CULs (Ecology 2019).

This CAP establishes sediment CULs using the Site-specific sediment cleanup values calculated using the FPM as described above, with the exception of zinc. Ecology adjusted copper, lead, and zinc concentrations downward to establish a value protective of human health and terrestrial ecological receptors. Table B.3 summarizes sediment CULs for the Site.

4.5. Point of compliance

MTCA defines the point of compliance as the points or point where CULs established in accordance with WAC 173-340-720 through 173-340-760 shall be attained (WAC 173-340-200). For soil, WAC 173-340-740(6) governs the definition of the point of compliance. For soil cleanup levels based on human exposure via direct contact or other pathways where contact with the

soil is required to complete the pathway, the general point of compliance is throughout the site, from ground surface to 15 feet bgs. For any terrestrial remedy, a conditional point of compliance may be set at the biologically active soil zone. Ecology assumes this zone extends to a depth of 6 feet. However, Ecology recognizes that for cleanup actions that involve containing hazardous substances, soil CULs will typically not be met at the point of compliance. In these cases, the cleanup action may be determined to comply with cleanup standards, provided:

- The selected remedy is permanent to the maximum extent practicable using the procedures in WAC 173-340-360;
- The cleanup action is protective of human health;
- The cleanup action is demonstrated to be protective of terrestrial ecological receptors under WAC 173-340-7490 through 173-340-7494;
- Institutional controls are put in place under WAC 173-340-440 that prohibit or limit activities that could interfere with the long-term integrity of the containment system;
- Compliance monitoring under WAC 173-340-410 and periodic reviews under WAC 173-340-430 are designed to ensure the long-term integrity of the containment system; and
- The types, levels and amount of hazardous substances remaining on-site and the measures that will be used to prevent migration and contact with those substances are specified in the CAP.

For this Site, the soil point of compliance will be throughout the site from ground surface to 15 feet bgs.

SMS specifies that Ecology develop the point of compliance for sediment at a location that protects aquatic life and human health. Ecology generally applies the point of compliance for sediment to the extent of the biologically active zone, generally 6 to 12 inches bgs. For this Site, the sediment point of compliance is from ground surface to 1-foot bgs.

5. Cleanup Action Selection

5.1. Remedial action objectives

Remedial action objectives (RAOs) describe the actions necessary to protect human health and the environment by eliminating, reducing, or otherwise controlling risks posed through each exposure pathway and migration route. RAOs consider the characteristics of the contaminated media, the characteristics of the hazardous substances present, migration and exposure pathways, and potential receptor points.

Potential exposure pathways based on Site use include direct human contact with exposed or near-surface contaminated soil and sediments via dermal contact and inhalation/ingestion of dust and contaminants. Given the identified potential exposure pathways, preventing direct contact, ingestion, or inhalation of contaminated soil and sediment by humans and ecological receptors are the RAOs for the Site.

5.2. Cleanup action alternatives

The FFS evaluated potential cleanup action alternatives to meet Site RAOs (GeoEngineers 2021). Cleanup alternatives focused on the Seasonal Beach area. As demonstrated in the RI, a significant portion of smelter waste contamination is on the Seasonal Beach. The FFS considered three cleanup alternatives for the Seasonal Beach and one remedial action for each of the other areas (Hillside, Jetty, Bay and Public Dock, and Bayshore). A summary for the alternatives follows.

5.2.1. Alternative 1

This alternative combines capping the portion of the Seasonal Beach near the main river channel edge and excavating contaminated material to 2 feet bgs in the areas not capped, which are closer to the shoreline. This alternative also proposes to address up to six select areas to be excavated an additional 4 feet to remove deeper pockets of contaminated material.

The excavated area will be backfilled with about 2 feet of imported fill material to its current elevation. The fill will consist of an 80/20 mixture of 12-inch stream-bed-consistent sediment material. This alternative includes capping the main channel edge from approximate elevation of 1,280 to 1,285 feet AMSL with 2 feet of the 80/20 mixture material. This alternative includes grading the boundary between the capped and excavated/backfilled areas to transition the change in elevation.

The excavation area assumed under this alternative is 222,100 square feet (sf), and the capping-only area is 63,500 sf. About 17,600 cubic yards (cy) of contaminated material would be removed from the excavation area.

5.2.2. Alternative 2

Like Alternative 1, this alternative is a combination of capping and excavation. Relative to Alternative 1, capping expands to the longitudinal crest of the outer bar in the downstream half of the sub-area and the northeast portion of the Seasonal Beach. This alternative also considers removing contaminated soil to construct a more prominent side channel through the area. The FFS assumed the minimum flowing elevation of the channel to be 1,275 feet AMSL, requiring up to 10 feet of excavation from current conditions. The channel edges would be sloped back to provide stability and channel form. This alternative also caps the area between the side channel and main river channel.

This alternative considered removing contaminated soil to 2 feet bgs from areas not capped and in six select areas excavating an additional 4 feet. Backfill and capping occurs as described in Alternative 1.

The approximated excavation area under this alternative is 163,300 sf, and the approximate capping-only area is 130,000 sf. About 21,800 cy of contaminated material would be removed from the excavation area.

5.2.3. Alternative 3

This alternative combines capping and excavating contaminated material similar to Alternative 1 with the modifications of no action in an area near the main river channel at the downstream end of the beach and a larger capped area near the downstream end of the beach. Excavation and capping occurs as described in the previous alternatives. This alternative also includes excavating up to six select areas to 6 feet bgs. The excavation area assumed under this alternative is 153,500 sf, and the approximate capping-only area is 98,400 sf. About 12,500 cy of contaminated material would be removed from the excavation area.

5.2.4. Jetty, Bay and Public Dock, Bayshore and Hillside area alternatives

The following is a summary of the remedial actions considered in the FFS for the Jetty, Bay and Public Dock, Bayshore, and Hillside areas.

- **Jetty:** Capping with imported fill to limit public exposure to the contaminated material and assure durability. The FFS assumed capping the Jetty with 2 feet of 12-inch loose riprap armoring keyed into the toe of the slope. The FFS includes capping the top of the Jetty with 2 feet of the 80/20 mixture used in the Seasonal Beach area.
- **Bay and Public Dock**: Capping with 1.5 feet of imported streambed sediment and excavating the area around the dock to 6 feet below existing grade.
- **Bayshore**: Capping with 1.5 feet of imported fill.
- **Hillside**: A combination of removal, capping, and trail enhancements to limit direct contact with contaminated soil. The FFS focused removal and capping to select areas and along the existing trail to avoid impacts to the well-established vegetation. The remedial action included removing easily accessible surface debris and contaminated soil and slag debris from select areas. The FFS assumed contaminated soil excavation depths between 2 and 4 feet bgs. Excavated areas will be backfilled with common borrow. The FFS includes new infill planting and rail fencing along the trail and picnic areas to discourage public use off the established trails and picnic areas. The FFS also presented enhanced recreational elements to the Hillside remedial action.

5.3. Regulatory requirements

MTCA 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), including certain threshold and other requirements. The following sections outline these requirements.

5.3.1. Threshold requirements

WAC 173-340-360(2)(a) requires that the cleanup action shall:

- Protect human health and the environment;
- Comply with cleanup standards (see Section 4);

- Comply with applicable state and federal laws (see Section 5.3.4); and
- Provide for compliance monitoring.

5.3.2. Other requirements

In addition, WAC 173-340-360(2)(b) states the cleanup action shall:

- 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. MTCA defines a permanent solution as one that meets CULs without further action being required at the Site other than the disposal of residue from the treatment of hazardous substances. A disproportionate cost analysis (DCA) determines whether a cleanup action uses permanent solutions to the maximum extent practicable. 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.

5.3.3. Cleanup action expectations

WAC 173-340-370 sets forth the following expectations for the development of cleanup action alternatives and the selection of cleanup actions. These expectations represent the types of cleanup actions Ecology considers likely results of the remedy selection process; however, Ecology recognizes that there may be some sites where cleanup actions conforming to these expectations are not appropriate.

- Treatment technologies will be emphasized at sites with liquid wastes, areas with high concentrations of hazardous substances, or with highly mobile and/or highly treatable contaminants;
- To minimize the need for long-term management of contaminated materials, hazardous substances will be destroyed, detoxified, and/or removed to concentrations below CULs throughout sites with small volumes of hazardous substances;

- Engineering controls, such as containment, may need to be used at sites with large volumes of materials with relatively low levels of hazardous substances where treatment is impracticable;
- To minimize the potential for migration of hazardous substances, active measures will be taken to prevent precipitation and runoff from coming into contact with contaminated soil or waste materials;
- When hazardous substances remain on-site at concentrations which exceed CULs, they will be consolidated to the maximum extent practicable where needed to minimize the potential for direct contact and migration of hazardous substances;
- For sites adjacent to surface water, active measures will be taken to prevent/minimize releases to that water; dilution will not be the sole method for demonstrating compliance;
- Natural attenuation of hazardous substances may be appropriate at sites under certain specified conditions (see WAC 173-340-370(7)); and
- Cleanup actions will not result in a significantly greater overall threat to human health and the environment than other alternatives.

5.3.4. Applicable, relevant, and appropriate state and federal laws, and local requirements

WAC 173-340-710(1) requires that all cleanup actions comply with all applicable local, state, and federal law. It further states the term "applicable state and federal laws" shall include legally applicable requirements and those requirements that the department determines "…are relevant and appropriate requirements." This section discusses applicable state and federal law, relevant and appropriate requirements, and local permitting requirements considered and were of primary importance in selecting cleanup requirements. If Ecology identifies other requirements later, Ecology will apply those requirements to the cleanup actions at that time.

MTCA provides an exemption from the procedural requirements of several state laws and from any laws authorizing local government permits or approvals for remedial actions conducted under a consent decree, order, or agreed order (RCW 70A.305.090). However, the substantive requirements of a required permit must be met. The procedural requirements of the following state laws are exempted:

- Ch. 70.94 RCW, Washington Clean Air Act;
- Ch. 70.95 RCW, Solid Waste Management, Reduction, and Recycling;
- Ch. 70.105 RCW, Hazardous Waste Management;
- Ch. 75.20 RCW, Construction Projects in State Waters;
- Ch. 90.48 RCW, Water Pollution Control; and
- Ch. 90.58 RCW, Shoreline Management Act of 1971.

WAC 173-340-710(4) sets forth the criteria Ecology evaluates when determining whether certain requirements are relevant and appropriate for a cleanup action. Table B.4 lists the local, state, and federal laws likely containing the applicable or relevant and appropriate

requirements that apply to the cleanup action at the Site. Local laws, which may be more stringent than specified state and federal laws, will govern where applicable.

5.4. Evaluation of cleanup action alternatives

The requirements outlined in this section are used to conduct a comparative evaluation of the cleanup action alternatives and to select a cleanup action from those alternatives. FFS Table 1 summarizes each cleanup action alternative.

5.4.1. Threshold requirements

The following sections describe how the proposed alternatives meet MTCA threshold requirements.

Protection of human health and the environment

The remedial alternatives combine removal and capping to protect human health and the environment. Removal and capping would reduce potential human and ecological receptors by reducing the exposure pathways. As such, alternatives 1 and 2 would protect human health and the environment. Alternative 3 does not provide protection of human health and the environment in the proposed no action area of the Seasonal Beach area.

Compliance with cleanup standards

Alternatives 1 and 2 will meet cleanup standards by combining removal and capping. Alternative 3 does not meet cleanup standards because of the proposed no action area on the Seasonal Beach.

Compliance with state and federal laws

Alternatives 1 and 2 can meet regulatory requirements, as discussed in Section 5.3.4. Local laws, which can be more stringent, will govern actions when they are applicable. The design phase of this project establishes state and federal laws. Alternative 3 does not comply with MTCA regulations.

Provide for compliance monitoring

There are three types of compliance monitoring: protection, performance, and confirmational. Protection monitoring protects human health and the environment during the construction and operation and maintenance phases of the cleanup action. Performance monitoring confirms the cleanup action has met cleanup and/or performance standards. Confirmational monitoring confirms the long-term effectiveness of the cleanup action after meeting cleanup standards or other performance standards.

Each remedial alternative requires varying levels of all three types of compliance monitoring. Performance monitoring will track the effectiveness of the cleanup action and determine if it achieved cleanup standards. The Operating and Maintenance (O&M) plan will describe these monitoring activities. Health and safety plans will include protection monitoring requirements for remedial construction and final remedy O&M. All three alternatives satisfy this provision.

5.4.2. Other requirements

Use of permanent solutions to the maximum extent practicable

As discussed previously, to determine whether a cleanup action uses permanent solutions to the maximum extent practicable, the DCA specified in the regulation is used. The analysis compares the costs and benefits of the cleanup action alternatives and involves the consideration of several factors. The comparison of costs and benefits may be quantitative, but will often be qualitative and require the use of best professional judgment.

- Protectiveness measures the degree to which the cleanup action reduces existing risks, time required to reduce risk and attain cleanup standards, on- and off-site risks resulting from implementing the alternative, and improvement of overall environmental quality.

Alternatives 1 and 2 are protective of human health and the environment. Alternative 1 will provide for the greatest long-term protectiveness by removing site contaminants from the largest area of the Seasonal Beach. The no action area proposed in Alternative 3 is not protective of human health and the environment. Alternative 3 offers the lowest improvement in environmental quality and the highest likelihood of not attaining cleanup standards.

- Permanent reduction of toxicity, mobility, and volume measures the adequacy of the alternative in destroying the hazardous substance(s), the reduction or elimination of releases or sources of releases, the degree of irreversibility of any treatment process, and the characteristics and quantity of any treatment residuals.

Alternatives 1 through 3 rely on capping and institutional controls on multiple portions of the Site that could be undone by human and ecological activities. In addition, the Site is downstream from Teck's smelter operations in Trail, British Columbia. Teck's smelter operations previously included discharging granulated slag, liquid effluent, and other discharges into the Columbia River. The Columbia River can mobilize slag-impacted sediments from upstream sources and redeposit them across the beach and shoreline area over time.

- Cleanup costs are estimated based on design assumptions for each alternative. Costs are estimates based on design assumptions that might change. For a detailed description of the costs involved with each alternative, please refer to the FFS. The FFS presented a range of costs as shown in Table B.5.

- Long-term effectiveness measures the degree of success, the reliability of the alternative during the period that hazardous substances will remain above cleanup levels, the magnitude of residual risk after implementation, and the effectiveness of controls required to manage remaining wastes.

Alternative 1 ranks the highest because it removes contamination from the largest area. Alternative 3 ranks lower than alternatives 1 and 2 because it removes the least amount of contamination and includes an area of no action.

- Short-term risk measures the risks related to an alternative during construction and implementation, and the effectiveness of measures that will be taken to manage such risks.

Each alternative poses similar short-term risks as each require excavation and transporting material on public roadways. Alternatives 2 would have the most risk because it removes the most contamination, and therefore, transports the most contaminated material over public roadways. Construction will occur in a manner not to create contaminated sediment movement during or after construction. Ecology anticipates construction will occur almost entirely with land-based equipment operating above the water line.

- Implementability considers whether the alternative is technically possible, the availability of necessary off-site facilities, services, and materials, administrative and regulatory requirements, scheduling, size, complexity, monitoring requirements, access for operations and monitoring, and integrations with existing facility operations.

All three alternatives are implementable at the Site. Remedial actions proposed for several areas will rely on short construction windows when river flows are low and sediments are exposed. As previously mentioned, lowering of Lake Roosevelt generally exposes sediment along the shoreline and Seasonal Beach. Lake Roosevelt is lowered to prepare for spring runoff, water flows, or other pool management purposes.

- To understand and consider public concerns, Ecology presented the draft RI/FS for public review and comment May 3 to June 2, 2021. We held an online public meeting on May 19, 2021. This CAP will also undergo public review and comment.

Ecology published our Response to Comments[4] in June 2021. We received comments from three individuals and one organization. You can learn more by reading the document.

Disproportionate cost analysis results

Costs are disproportionate to the benefits if the incremental costs of an alternative are disproportionate to the incremental benefits of that alternative. Based on an analysis of the factors listed above, the additional costs of Alternative 2 is disproportionate to its incremental benefit. Table B.6 provides a summary of the relative ranking of each alternative in the decision process. Figure A.4 summarizes the DCA.

Provide for a reasonable restoration time frame

WAC 173-340-360(4) describes the requirements and procedures for determining whether a cleanup action provides for a reasonable restoration time frame, as required under subsection (2)(b)(ii). The factors used to determine whether a cleanup action provides a reasonable restoration time frame are in WAC 173-340-360(4)(b).

[4]https://apps.ecology.wa.gov/cleanupsearch/document/102526

The three alternatives have similar restoration time frames. Each alternative is consistent with the factors in WAC 173-340-360(4)(b) and provide for a reasonable time frame.

5.4.3. Cleanup action expectations

WAC 173-340-370 outlines cleanup action expectations. Section 5.3.3 describes these expectations. The alternatives would address applicable expectations in the following manner:

- Alternatives 1 and 2 combine removal and capping to eliminate exposure to contaminated material in the Seasonal Beach area.
- Alternative 3 includes a no action area, and therefore, does not meet cleanup expectations.
- Remedial actions proposed for the Beach, Jetty, Bay and Public Dock, and Bayshore areas combine removal, capping, and institutional controls to eliminate or reduce exposure to contaminants.

5.5. Decision

Based on the above analysis, Ecology selects a combination of the FFS presented alternatives, with some additional modifications outlined in Section 6.0, as the proposed remedial action for the Site. The modifications outlined in Section 6.0 include capping the proposed no action area defined in Alternative 3 and re-grading the Seasonal Beach area to flow toward the main river channel. These modifications are protective of human health and the environment and satisfy MTCA requirements. Capping additional portions of the Seasonal Beach area will also reduce the volume of contaminated sediment transported offsite, thereby alleviating some short-term risk associated with hauling material on public roads. The additional cost of the selected remedy is not disproportionate to its incremental benefit. Table B.6 describes the comparative ranking of the selected cleanup action. Figure A.5 summarizes the DCA of the selected cleanup action compared to the FFS alternatives.

The cost of the selected cleanup action includes an additional 7,000 cubic yards of imported material, when compared to Alternative 3. This increase is to regrade and cap portions of the Seasonal Beach area. Based on the values and assumptions provided in the FFS, the increase in fill and cap area results in a total cost estimate of $4,918,000 to $5,436,000 for the selected cleanup action.

6. Selected Cleanup Action

The selected cleanup action for the Site includes a combination of focused removal, capping, and institutional controls. Ecology recognizes that certain areas will require minimal construction-related activities, whereas other areas will require a more prolonged period of remedial construction. Near-shore work will occur when water levels are lowest and in increments as to not risk impacts to the Site or river due to rising flows.

Excavation and capping might result in substantial alterations of the riverbed configuration and modified river flow characteristics. The final engineering design for the cleanup action will incorporate Site-specific hydraulic modeling to develop final Site grades and cap materials.

Excavated soil, sediment, and slag will be transported offsite to a permitted landfill for disposal.

6.1. Seasonal Beach

The selected cleanup action for the Seasonal Beach area combines g contaminant removal and capping. These actions remove contaminated materials from areas displaying the greatest impacts from smelter waste and protects human and environmental health by capping remaining contaminated material. The cleanup action includes:

- Capping the sub-area with 2 feet or more of imported stream-bed-consistent sediment material. The final engineering design for the cleanup action will incorporate site-specific hydraulic modeling to select the composition of the cap material such that the material can accommodate river dynamics. Capping includes portions of the beach near the main channel edge of the river and the prominent gravel bar along the downstream portion of the beach. As part of the Site re-grading action, portions of the Seasonal Beach (primarily adjacent to the jetty) are capped with up to 6 feet of material.
- Excavating contaminated material from the areas not capped and backfilling with 2 feet of cap material. As appropriate, the cleanup action will screen boulders and cobbles from the excavation to include with the cap material.
- Re-grading portions of the area to promote drainage of surface water back into the river. This action prevents stagnant water, and potentially smelter waste from upstream sources, from accumulating in depressions. In general, the cleanup action will fill the topographic depressions on the beach next to the jetty with cap material to an approximate elevation of 1,285 feet AMSL resulting in a bench profile that gently slopes toward the main river channel.

Figure A.6 shows the modifications to excavation and capping areas. The actual area of excavation and capping will depend on river conditions at the time of construction; however, construction will occur at a time of year when exposure of the main channel edge is at a minimum elevation of about 1,280 feet AMSL.

6.2. Jetty

The remedial action proposed in the FFS is the selected cleanup action for the Jetty sub-area. The selected action entails capping the entire jetty with imported fill to limit public exposure to the contaminated material and assure durability. The cleanup action caps the slopes of the jetty with 2 feet of 12-inch loose riprap, or similar, armoring keyed into the toe of the slope. The armoring incorporates cobbles and boulders from the Beach sub-area to give a natural appearance. The cap at the top of the jetty consists of 2 feet of the cap material used in the Beach sub-area and will tapered into the riprap.

6.3. Bay and Public Dock

The remedial action proposed in the FFS is the selected cleanup action for the Bay and Public Dock area, with modifications. The cleanup action consists of placing 2 feet of cap material used in other areas to prevent exposure to contaminated sediments. The action also includes excavating the area around the dock to 4 feet bgs and replacing with 2 feet of the cap material to prevent exposure to contaminated sediment left in-place.

6.4. Bayshore

The remedial action proposed in the FFS is the selected cleanup action for the Bayshore area, with modifications. The cleanup action consists of placing 2 feet of cap material used in the other areas to prevent exposure to contaminated sediments. A small amount of excavation and replacement along the boat ramp will occur to maintain a level transition along the established concrete boat launch interface.

Figure A.6 shows the approximate limits of the selected cleanup actions for the Seasonal Beach, Jetty, Bay and Public Dock, and Bayshore areas.

6.5. Hillside

The FFS proposed remedial action for the Hillside area is the selected cleanup action, with modifications. The cleanup action includes excavating and capping known contaminant hot spots and discouraging access to the Hillside to minimize exposure. The cleanup action includes the following:

- Removing easily accessible surface debris.
- Removing contaminated soil and slag debris from two exposure areas to depths between 3 and 4 feet bgs. Excavations will be backfilled with imported borrow material and completed with 6 inches of topsoil and plantings of native vegetation.
- Re-establishing/stabilizing the existing defined trail that leads from the parking area to the bottom of the hillside. Stabilizing the existing trail includes excavating 1 foot of existing soil and replacing with common borrow to reduce exposure to contaminated soil left in-place. Additional measures include limiting vehicle access and erosion controls to stabilize the trail.
- Excavating visible slag and up to two feet of contaminated soil from remaining areas of the hillside that are easily accessible and can be completed in a manner that does not disturb mature vegetation. Excavations will generally focus on the southwestern portion of the Hillside area. Excavation areas will be backfilled with imported borrow material and completed with topsoil and plantings of native vegetation.
- Establishing select bench seating and picnic shelter areas along the top of the Hillside to provided recreational activities in areas that have been remediated thereby reducing the potential for recreational activities on other areas of the Hillside.
- Placing rail fencing and new infill plantings of native vegetation along the trail to discourage public use off the established trail.

- Placing rail fencing along the top of the hill and proposed seating/picnic areas to discourage public use off the established areas.

Figure A.7 shows the approximate limits of selected cleanup action for the Hillside area.

6.6. Institutional controls

Institutional controls are measures undertaken to limit or prohibit activities that may interfere with the integrity of a cleanup action or result in exposure to hazardous substances at the Site. Such measures are required to assure the continued protection of human health, the environment, and the integrity of the cleanup action whenever hazardous substances remain at the Site at concentrations exceeding CULs. Institutional controls can include physical measures and legal and administrative mechanisms. WAC 173-340-440 provides information on institutional controls and the conditions under which they may be removed.

An environmental covenant for the Site will be recorded in accordance with the Uniform Environmental Covenants Act (Chapter 64.70 RCW). This cleanup action includes institutional controls such as fencing and seating/picnic areas in the Hillside area. Fencing and seating/picnic areas will provide opportunities for the public to use remediated areas, limit access to areas outside the remediated areas, and reduce the potential for exposure to contaminants at the Site. Institutional controls will include inspection and repair of capped areas and measures such as signage to educate the public about site contamination.

6.7. Periodic review

As long as CULs have not been achieved, WAC 173-340-420 states that at sites where a cleanup action requires an institutional control, a periodic review shall be completed no less frequently than every five years after the initiation of a cleanup action. Additionally, periodic reviews are required at sites that rely on institutional controls as part of the cleanup action. Periodic reviews will be required at this Site because institutional controls are part of the remedy.

7. References

Besser, J.M, et. al. 2018. *Characterizing toxicity of meta-contaminated sediments from the Upper Columbia River, Washington USA, to benthic invertebrates.* USGS Manuscript accepted and published by Environmental Toxicology and Chemistry.

CH2M Hill, 2012. *Summary and evaluation of Phase 1 (2005) sediment toxicity tests Upper Columbia River site*. Prepared for USEPA, Region 10, Seattle, WA.

GeoEngineers, Inc. 2019. *Remedial Investigation*, prepared for Washington State Department of Ecology.

GeoEngineers, Inc. 2020. *Focused Feasibility Study*, prepared for Washington State Department of Ecology.

MacDonald DD, Sinclair J, Crawford MA, Prencipe H, Coady M. 2012. *Evaluation and interpretation of the sediment chemistry and sediment toxicity data for the Upper Columbia River.* Prepared for Washington Department of Ecology Toxic Cleanup Program through Science Applications International Corporation. Bothell, Washington. Prepared by MacDonald Environmental Sciences Ltd., Naniamo, BC.

Teck. 2014. *Beach Sediment Study Field Sampling and Data Summary Report.* Prepared by Integral Consulting, Inc. for Teck American Inc.

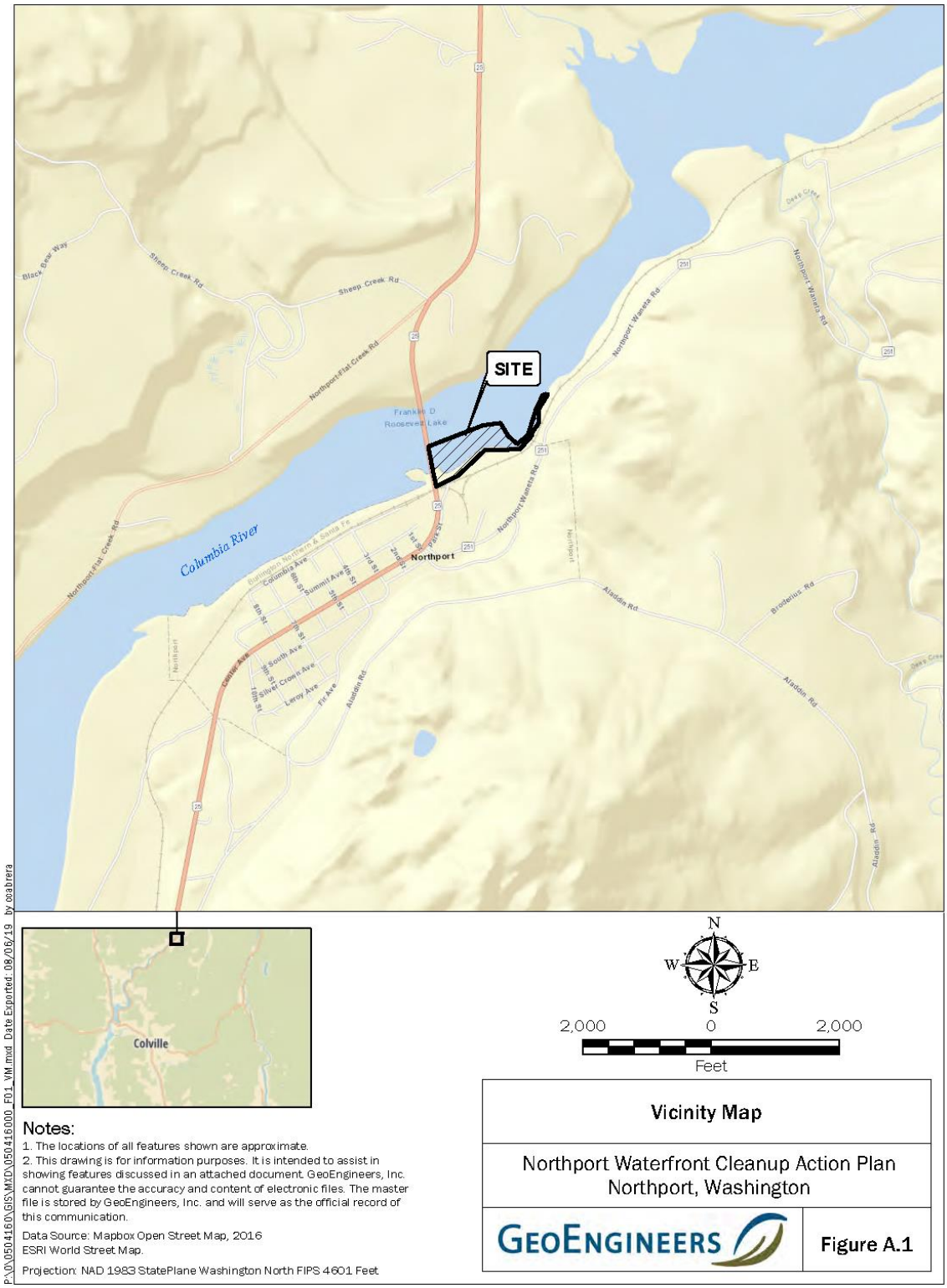
Washington State Department of Ecology, 2019, *Establishment of Site-Specific SMS Metals Cleanup Objectives for Contaminated Sediments – Northport Waterfront and Nearshore State Cleanup Site*.

Washington State Model Toxics Control Act, 2007, WAC 173-340.

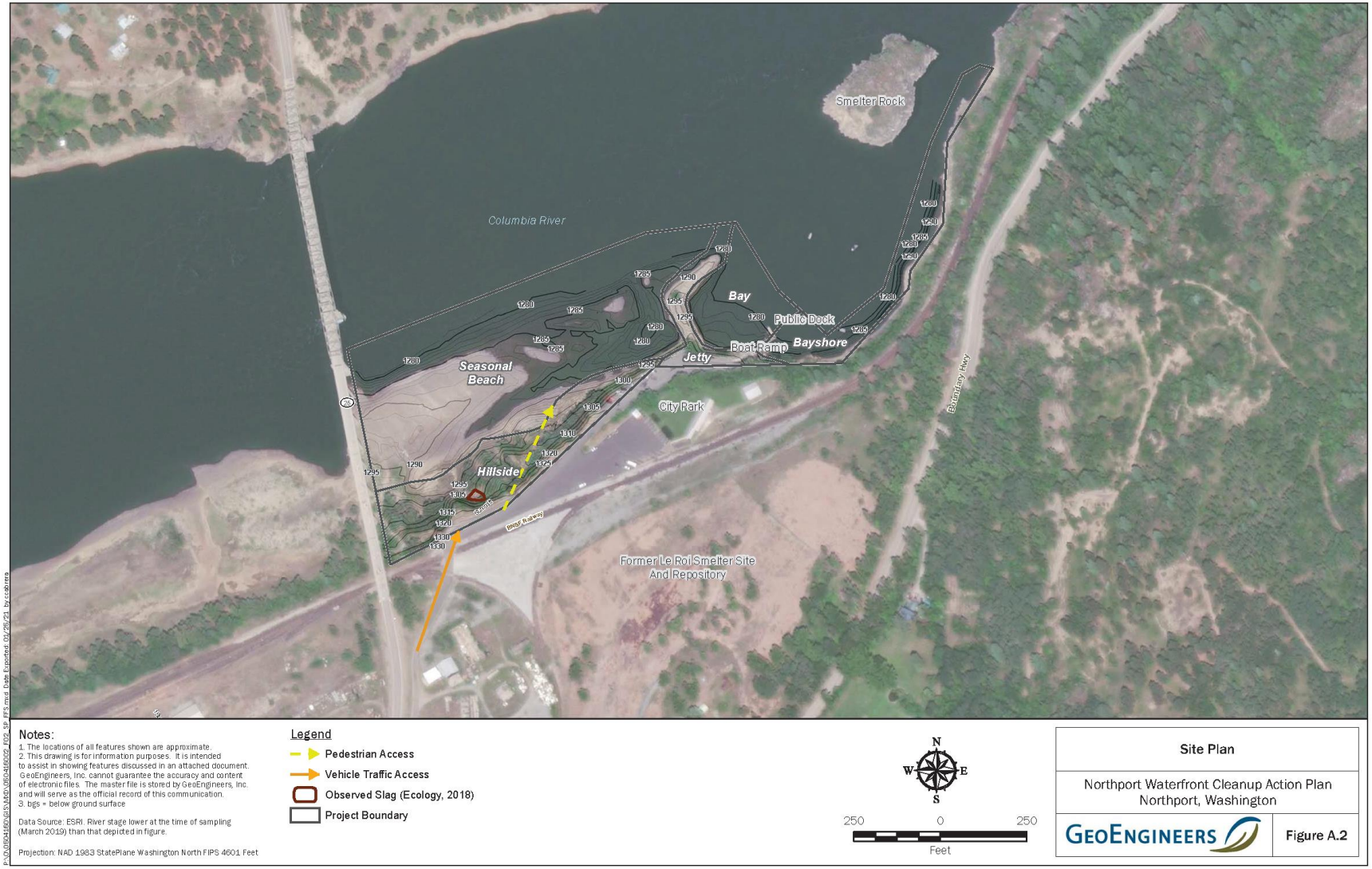
Washington State Sediment Management Standards, 2013, WAC 173-204.

Appendix A. Figures

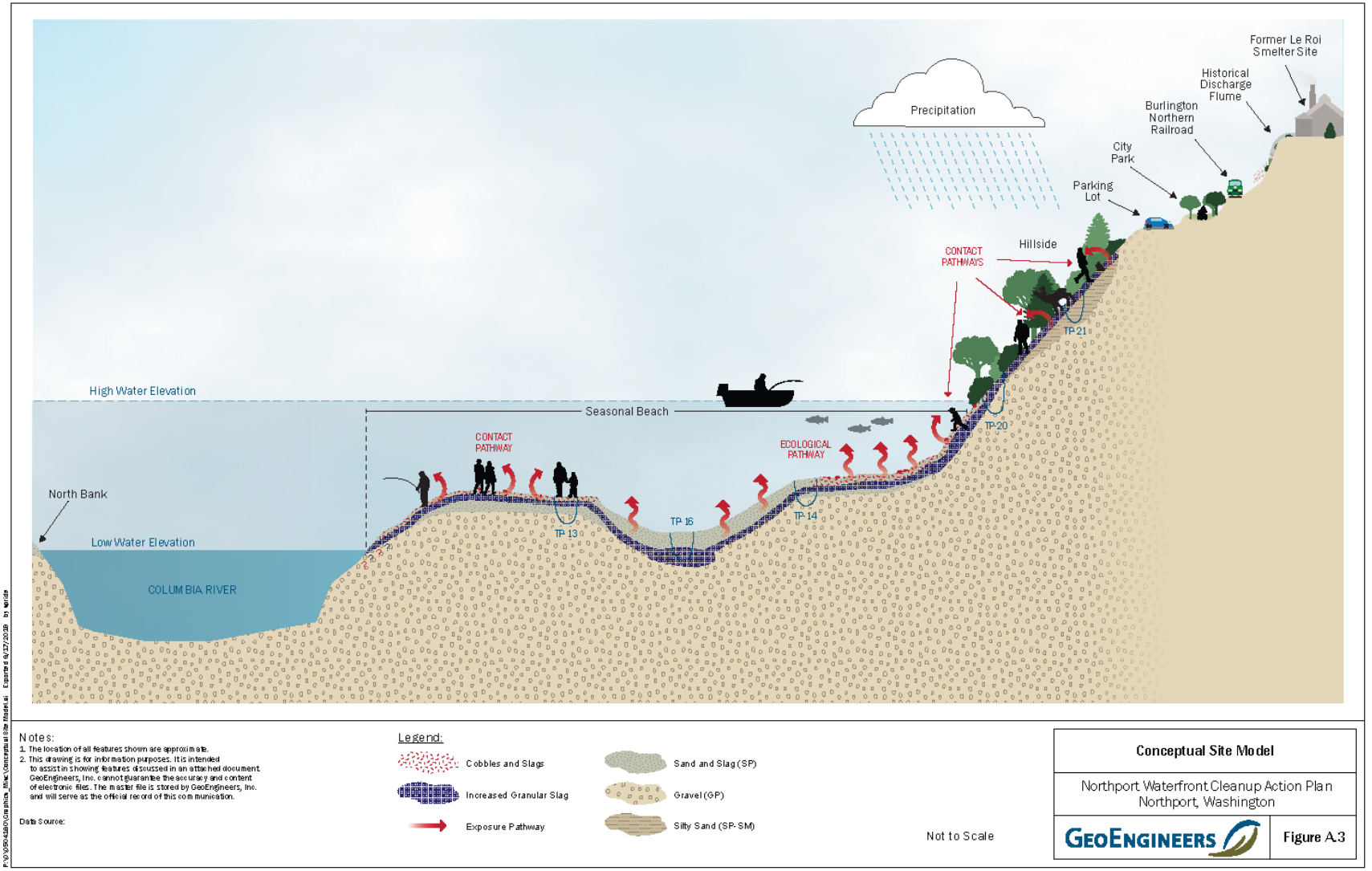
A.1. Vicinity map



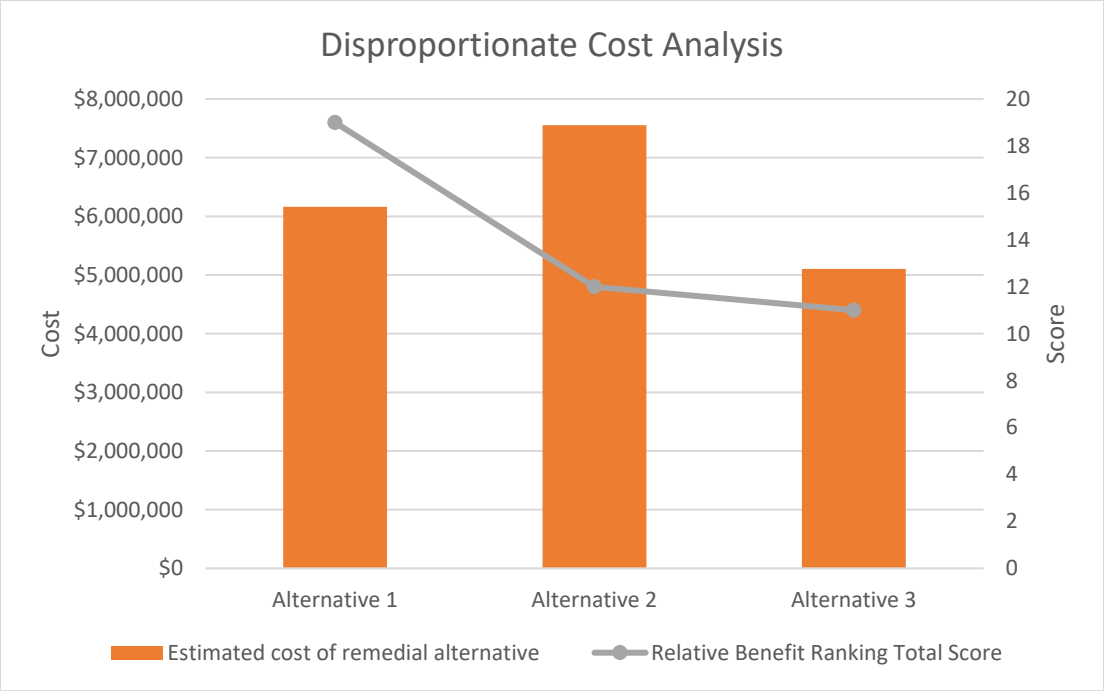
A.2. Site plan


Smelter Rock
Columbia River
Bay
Public Dock
Boat Ramp
Bayshore
Jetty
Seasonal Beach
City Park
Hillside
Former Le Roi Smelter Site And Repository
Boundary Hwy
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. bgs = below ground surface
Data Source: ESRI. River stage lower at the time of sampling (March 2019) than that depicted in figure.
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet
Legend
Pedestrian Access
Vehicle Traffic Access
Observed Slag (Ecology, 2018)
Project Boundary
N
W
E
S
250
0
250
Feet
Site Plan
Northport Waterfront Cleanup Action Plan
Northport, Washington
GeoEngineers
Figure A.2

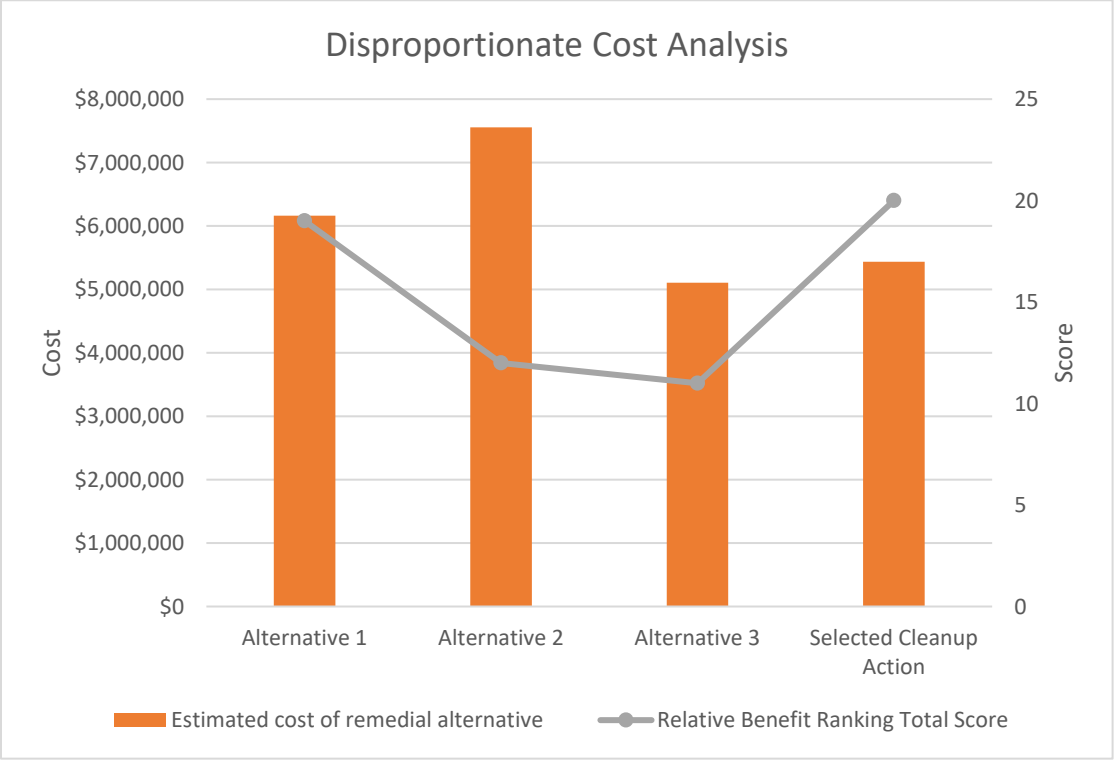
A.3. Conceptual site model



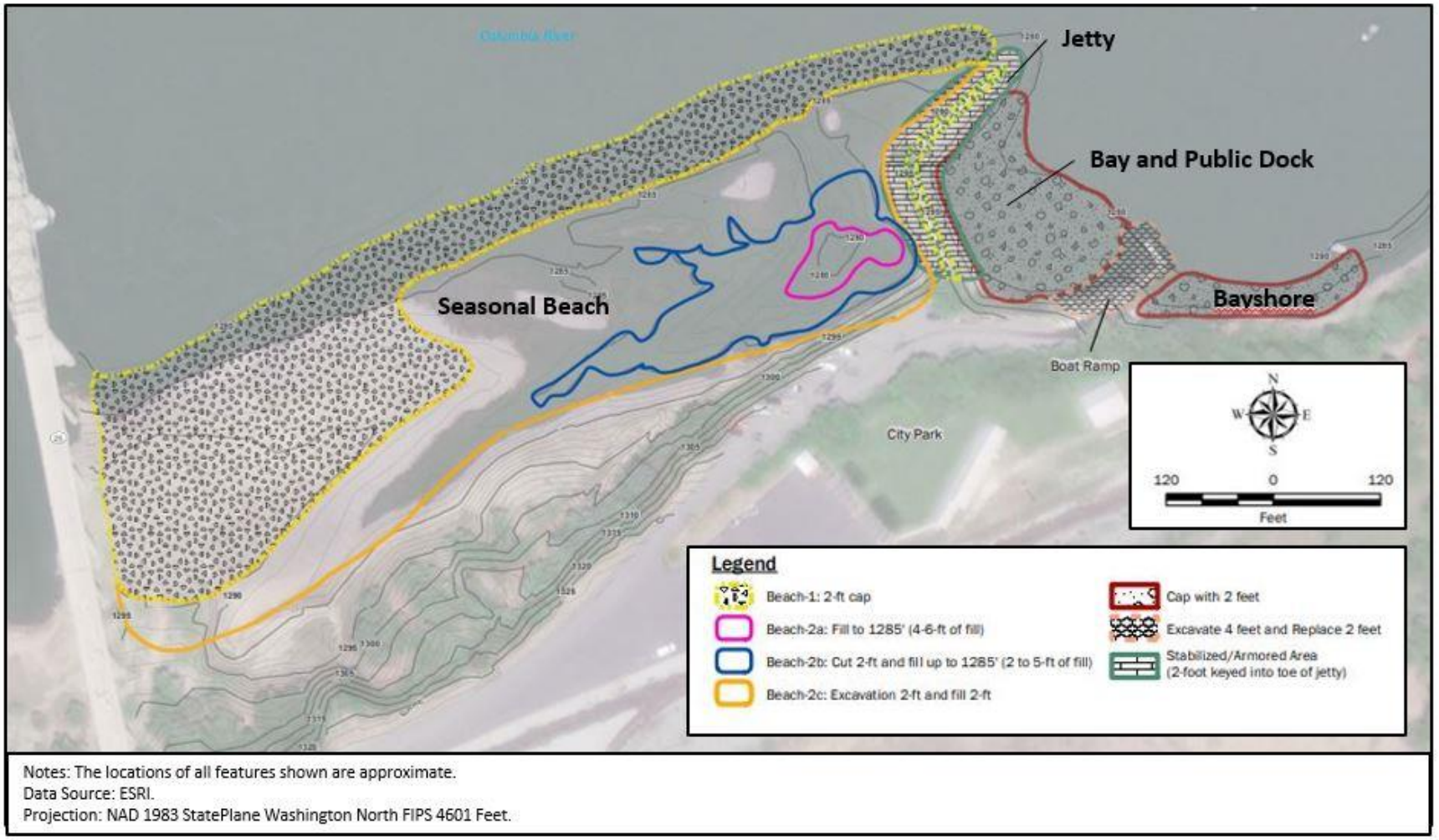
A.4. Summary of disproportionate cost analysis of FFS alternatives



A.5. Summary of disproportionate cost analysis including selected cleanup action

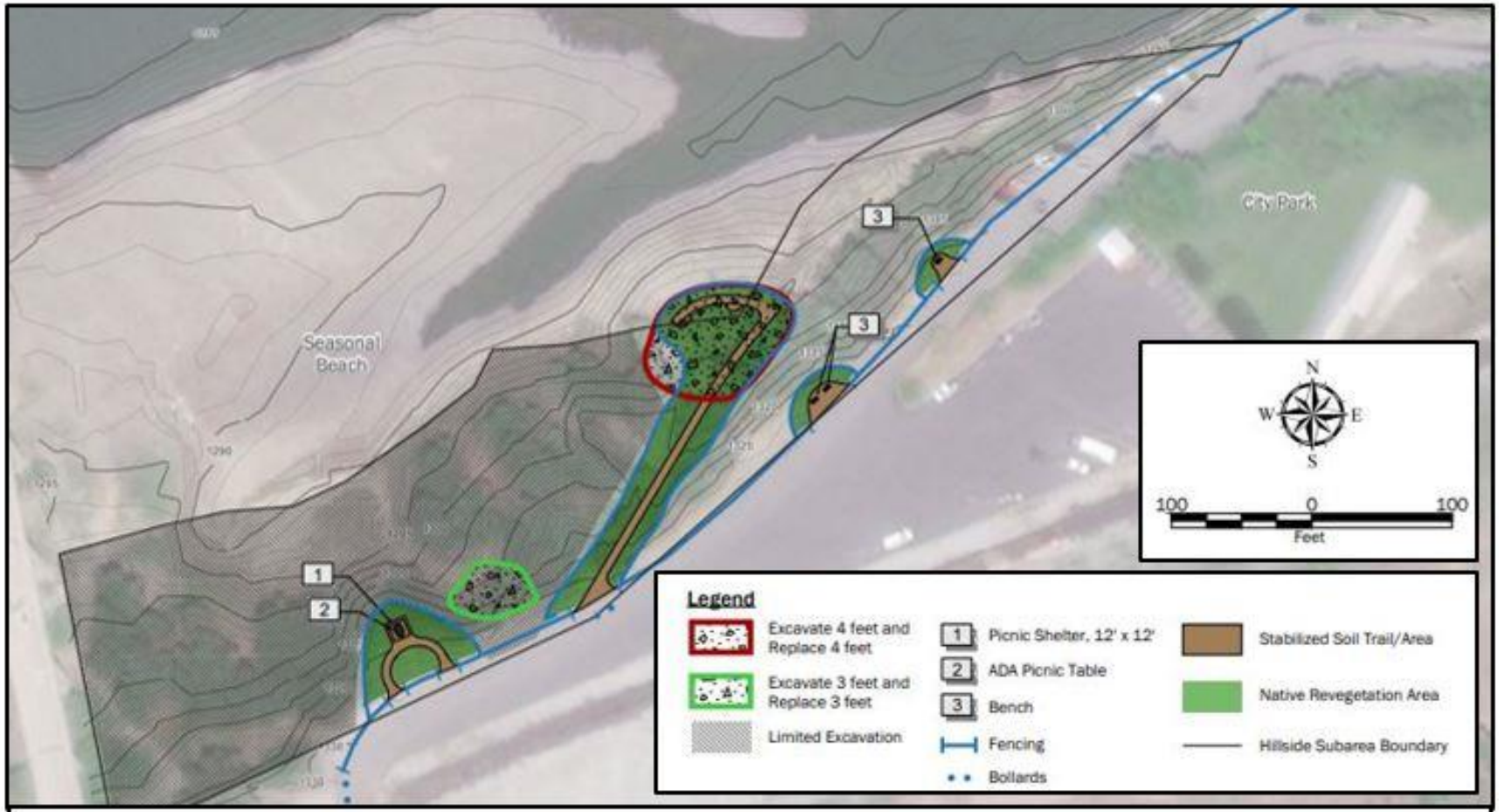


A.6. Selected cleanup action for Seasonal Beach, Jetty, Bay and Public Dock, and Bayshore areas



Notes: The locations of all features shown are approximate.
Data Source: ESRI.
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet.

A.7. Selected cleanup action for Hillside area



Notes: The locations of all features shown are approximate.
Data Source: ESRI.
Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet.

Appendix B. Tables

B.1. Screening levels used in the Remedial Investigation

Metals	Screening Level (milligram per kilogram [mg/kg])	Source
Arsenic	12.9	Ecology 2019
Barium	16,000	MTCA Method B
Cadmium	2	MTCA Method A
Chromium	131	Ecology 2019
Copper	143	Ecology 2019
Iron	56,000	MTCA Method B
Lead	250	MTCA Method A
Manganese	11,200	MTCA Method B
Mercury	1.46	Ecology 2019
Nickel	39	Ecology 2019
Zinc	3,200	SMS

B.2. Soil cleanup levels

Chemical of Concern	MTCA Method A (mg/kg)	MTCA Method B CUL (Non-Cancer) (mg/kg)	Simplified TEE CUL (mg/kg)
Arsenic	20	24	**20**
Copper	–	3,200	**100**
Lead	250	–	**220**
Zinc	–	24,000	**270**

Bold values selected for cleanup level.

CUL = cleanup level
mg/kg = milligrams per kilogram
TEE = terrestrial ecological evaluation

B.3. Sediment cleanup levels

Chemical of Concern	Floating Percentile Model (Ecology 2019) (mg/kg)	MTCA Method B CUL (Non-Cancer) (mg/kg)	Simplified TEE CUL (mg/kg)
Arsenic	**12.9**	24	20
Copper	143	3,200	**100**
Lead	338	--	**220**
Zinc	3,200	24,000	**270**

Bold values selected for cleanup level.

CUL = cleanup level
mg/kg = milligrams per kilogram
TEE = terrestrial ecological evaluation

B.4. Summary of Applicable or Relevant and Appropriate Requirements

ARAR	Regulated Activity	Evaluation
Stevens County Codes		
Ordinance 2008-4	Waste Disposal	Flow control ordinance that prohibits taking disposal materials to another county.
Oversized/Overweight Vehicle Permit	Hauling a load in excess or legal weight or size limitations to use a County road.	Might apply depending on haul routes and load size.
Building Permit	Any structure that can be for commercial/public use requires a building permit.	Might apply to Hillside features.
Shoreline Master Program	Development within Stevens County Partnership shorelines	Remedial action will comply with Shoreline Master Program guidelines.
Washington State		
Washington Administrative Code 173-27. Shoreline Management Permit and Enforcement Procedures	Use and development of state shorelines	Remedial action will comply with Shoreline Management Act.
Washington Administrative Code 173-60. Maximum Environmental Noise Level	Noise Levels	Maximum noise levels are applicable during construction activities.
Washington Administrative Code 173-204. Sediment Management Standards	Contaminated sediment	Remedial action will comply with SMS regulations.
Washington Administrative Code 173-340. Model Toxics Control Act (MTCA)	Toxic waste cleanup	Remedial action will be conducted under MTCA. Remedial alternatives will comply with MTCA regulations.
Washington Administrative Code 173-400. General Regulations for Air Pollution Sources	Fugitive emissions	Requires owner to take reasonable precautions to prevent fugitive emissions.
Washington Administrative Code 197-11 and 173-802. State and Environmental Policy Act	Construction activities with the potential for adverse environmental impacts	A SEPA review is required for projects with potential significant environmental impacts
Washington Administrative Code 220-660. Hydraulic Code Rules	Construction that will use, divert, obstruct, or change the natural flow or bed of the salt or fresh water of the state	A hydraulic project approval (HPA) construction permit applicable during construction.
Washington Administrative Code 296-155. Safety Standards for Construction Work	Construction worker safety	Applicable during construction activities.

ARAR	Regulated Activity	Evaluation
Washington State (continued)		
Washington Administrative Code 296-62. General Occupational Health Standards	Employee health and safety	Applicable during construction activities.
Chapter 79.105 RCW. Aquatic Lands	Work in state-owned aquatic land.	Applicable during construction activities.
Chapter 90.48 RCW. Water Pollution Control	Discharge stormwater to surface water of the state.	Construction Stormwater General Permit applicable during construction activities.
401 Water Quality Certification	Required for activity that might result in any discharge or excavation in water	Applicable during construction activities.
Federal Regulations		
Title 29 Code of Federal Regulations. Occupational Safety and Health Act	Employee health and safety	Applicable during construction activities.
Title 33 Code of Federal Regulations Part 330. Navigation and Navigable Waters. Nationwide Permit Program	Work in navigable waters of the United States	MTCA requires cleanup actions comply with applicable regulations.
Title 40 Code of Federal Regulations 50. Clean Air Act	Air emissions from construction activities	MTCA requires cleanup actions comply with applicable regulations.
Title 40 Code of Federal Regulations 260-268. Resource Conservation and Recovery Act	Management of hazardous and non-hazardous waste	MTCA requires cleanup actions comply with applicable regulations.
Title 33 of United States Code, Chapter 26. Clean Water Act	Regulates discharges of pollutants into U.S. waters	MTCA requires cleanup actions comply with applicable regulations.
Title 33 of United States Code, Clean Water Act Section 401 Certification	Required for activity that might result in any discharge or excavation in water	MTCA requires cleanup actions comply with applicable regulations.
36 CFR 800.16, Section 106. National Historic Preservation Act	Policy for preserving American heritage.	MTCA requires cleanup actions comply with applicable regulations

B.5. FFS alternatives cost estimates

Alternative	Total estimated cleanup cost	
	Low	High
1	$5,436,000	$6,163,000
2	$6,514,000	$7,555,000
3	$4,588,000	$5,106,000

B.6. Summary of alternative ranking

Alternative Numbers	Alternative 1	Alternative 2	Alternative 3	Selected Cleanup Action
Protectiveness	Score = 4	Score = 2	Score = 1	Score = 3
	Removes the greatest quantity of contaminated sediment.	Removes the greatest volume of sediment; however, significant portion is from side channel construction.	Achieves low level of protectiveness. Does not remove contaminates from no action area of Seasonal Beach.	Removes smaller volume of contaminated sediment compared to Alternative 1; however, capping provides protection from contaminants left in place.
Permanence	Score = 4	Score = 2	Score = 1	Score = 3
	Greatest reduction in contaminated soil. Capping and institutional controls that can be undone. Potential for recontamination from upriver sources.	Capping and institutional controls that can be undone. Potential for recontamination from upriver sources. Side channel enhancement promotes surface water drainage and reduces potential for recontamination on Seasonal Beach.	Capping and institutional controls that can be undone. Potential for recontamination from upriver sources.	Capping and institutional controls that can be undone. Potential for recontamination from upriver sources. Removes greater volume of contaminated sediment from Seasonal Beach sub-area compared to Alternatives 2 and 3. Site regrading promotes surface water drainage and reduces potential for recontamination on Seasonal Beach.

Alternative Numbers	Alternative 1	Alternative 2	Alternative 3	Selected Cleanup Action
Long-Term Effectiveness	Score = 2	Score = 3	Score = 1	Score = 4
	Long-term effectiveness rely on cover and potential for recontamination from upriver sources.	Long-term effectiveness rely on cover and potential for recontamination from upriver sources. Side channel, in part, mitigates recontamination by reducing ponding/deposition.	Long-term effectiveness rely on cover and potential for recontamination from upriver sources. No action area reduces effectiveness.	Long-term effectiveness rely on cover and potential for recontamination from upriver sources. Re-grading Seasonal Beach, in part, mitigates recontamination by reducing ponding/deposition.
Short-Term Risk	Score =2	Score = 1	Score = 4	Score = 3
	All cleanup actions rely on construction activities including transporting contaminated material and clean fill over public roads.	Alternative 2 removes the greatest volume of contaminates, and therefore, hauls the most contaminated material over public roadways.	Alternative 3 removes the smallest volume of contaminates, and therefore, hauls the least contaminated material over public roadways.	Selected cleanup action removes less volume of sediment than Alternatives 1 and 2, and therefore, hauls less material over public roadways.

Alternative Numbers	Alternative 1	Alternative 2	Alternative 3	Selected Cleanup Action
Implementability	Score = 2	Score = 1	Score = 4	Score = 3
	All cleanup actions utilize common remediation practices such as excavation, off-site disposal and capping. Construction on Beach sub-area to occur when river level at seasonal low. Duration of construction activities generally less then Alternative 2 and greater than Alternative 3.	All cleanup actions utilize common remediation practices such as excavation, off-site disposal and capping. Construction on Beach sub-area to occur when river level at seasonal low. Added complexity of side channel enhancement.	All cleanup actions utilize common remediation practices such as excavation, off-site disposal and capping. Construction on Beach sub-area to occur when river level at seasonal low. Alternative 3 is the least complex because of the no action area described on the Season Beach.	All cleanup actions utilize common remediation practices such as excavation, off-site disposal and capping. Construction on Beach sub-area to occur when river level at seasonal low. Duration of construction activities generally less then Alternative 2 and greater than Alternative 3.
Public Concerns	Score = 3	Score = 2	Score = 1	Score = 4
	Addresses comments regarding removing most contaminants.	Greatest impact to roads/public.	Doesn't address contaminates in portion of Seasonal Beach.	Protective of human health and the environment. Addresses comments regarding impacts to roads/public.
Total Score	19	11	12	20
Notes: Relative Benefits Ranking (Scored from 1-lowest to 4-highest)				