Focused Feasibility Study Report

Northport Waterfront
Northport, Washington

for
Washington State Department of Ecology

April 19, 2021

GeoEngineers
Earth Science + Technology

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1.0 INTRODUCTION

This report presents the Focused Feasibility Study (FFS) for the Northport Waterfront site project (herein designated as the site) located in Stevens County. The site is located along the south bank of the Columbia River in Northport, Washington (see Vicinity Map, Figure 1). Ore smelting wastes originating from former Le Roi smelter operation have contaminated sediment and soil at the site. The site, as defined above, is part of a larger Model Toxics Control Act (MTCA) site that includes the former Le Roi smelter, a rail corridor and a current on-site smelter waste and yard soils repository.

The site consists of riverbank and nearshore sediment along the Columbia River and borders, in part, the Northport town park used for fishing, RV camping, boating and passive recreation activities. A small jetty divides the site approximately in half, forming a protected boat launch area in the upstream portion of the site. A broad, foot-accessible beach forms seasonally in the area downstream of the jetty. The beach platform forms during periods of low water levels, typically in the late summer, early fall, winter and early spring. Rising from the beach, steep vegetated slopes join the adjacent uplands consisting of park facilities, a Burlington Northern and Santa Fe Railway Company (BNSF) right-of-way/active track and the area of the demolished former Le Roi smelter operations remediated under a 2004 Environmental Protection Agency (EPA) emergency response action. Site Plan, Figure 2, depicts key features.

GeoEngineers prepared this FFS for the State of Washington Department of Ecology (Ecology) under Ecology Master Contract No. C1900044, work assignment number GEI025. The purpose of this FFS is to identify and describe cleanup action alternatives at the site to address contaminated soil, sediment and slag located in the nearshore. The goal of the cleanup action is to address ecological and human health risks associated with historical smelting activities.

1.1. General Site Information

The site is located upstream of Lake Roosevelt and includes the south bank and nearshore areas of the Columbia River between Smelter Rock and the State Highway 25 bridge. The area is adjacent to the Northport town park and the former Le Roi copper and lead smelter main operations area. Over time, the Le Roi smelter deposited granulated slag, in the form of sand-sized particles and slag aggregates (“clinker”) along the waterfront. Sediments within the area of study, secondarily, also have been altered by wastes discharged from another smelter across the United States-Canadian border in Trail, British Columbia.

The town park consists of an upper and lower area. The upper park elevations are about 20 to 30 feet above the river and includes parking, picnic tables and shelters, and several trailer hook-ups. The lower park includes an access road, boat launch, dock, shoreline and seasonal beach. A steep vegetated bank separates the upper and lower portions of the park. Another vegetated bank also separates the lower park from the river and seasonal beach. Portions of the waterfront, including the jetty, are, depending on the season, above water level and accessible. Accessibility varies depending on river levels. Water levels at the site are controlled by Columbia River flow conditions and indirectly by Lake Roosevelt, which is controlled by the Grand Coulee Dam. The shoreline bank and beach are exposed when river flows are low to moderate and when the water level in Lake Roosevelt is lowered.

1.2. Site History

The former Le Roi Smelter operated from about 1896 to 1921. The smelter initially refined copper, lead and silver ores from northeast Washington mines and copper and gold tellurium ores from British Columbia. The smelter reportedly processed ores until 1909, when operations temporarily ceased. Smelter waste

operations included releasing slurried and clinker slags to the Columbia River at the site. After a period of inactivity, the smelter reopened briefly in 1914 to process primarily lead ore. The smelter operated intermittently until 1921 when operations finally ceased. Most smelter buildings (furnace, roaster, crusher and ore buildings) were demolished prior to 1953, although some foundations and one stack remained until the early 2000s.

The upland smelter area and some town residences underwent an emergency response action overseen by the EPA in 2004. Response actions included demolition of remaining structures, excavation of shallow contaminated soil, on-site consolidation and subsequent capping of soil on the smelter site with a barrier layer and 1 foot of gravel. BNSF performed additional excavation of contaminated soil adjacent to and southeast of their right-of-way within the town park area and incorporated the contaminated soil into the EPA on-site disposal area. However, no cleanup actions to date have addressed the nearshore sediments and the bank impacted by smelter wastes and debris, including slags deposited along the shoreline or within the river. Slag materials (as both clinker and granulated particles) are widespread on the beach during low water stages of the river. The observable nature of the exposed slag varies due to the dynamics of river flows in the area and over time.

1.3. Site Conditions

The FFS divides the site into five geographic management subareas (Figure 2) to aid discussion and analysis of the distribution of metals (*seasonal beach, hillside upland and shoreline, jetty, bay and public dock, and bayshore*).

1. *Seasonal Beach* – consists of the exposed sand and cobble shoreline and nearshore beach located between the Highway 25 bridge, the hillside, the main channel flow of the Columbia River and the jetty. The beach typically is under water for most of the year.
2. *Hillside*– consists of the upland area south of the beach that slopes down to the river and is heavily vegetated. This area is exposed year-round. Clearings within this area show evidence of use as recreational areas.
3. *Jetty* – consists of the manmade jetty constructed near the boat launch to provide calmer water for the launching and retrieval of boats.
4. *Bay and Public Dock* – consists of the protected area between the jetty and the boat ramp.
5. *Bayshore* – consists of the shoreline area located northeast of the boat dock that includes exposed sediment near the shore and at the base of the riverbank.

1.4. Previous Investigations

Previous investigations were discussed in the Draft-Final Remedial Investigation documents (GeoEngineers 2019a and 2019b).

1.5. Remedial Investigation

The Remedial Investigation (RI) performed for the site in 2019 (GeoEngineers 2019b) characterized the nature and extent of metals contamination in the soil, sediment and slag. The RI consisted of collecting samples from 26 test pits (TP-1 through TP-26), 109 surface locations (XRF-1 through XRF-109) and 3 hand auger explorations (HS-1 through HS-3). Each sample was screened for metals using an X-ray fluorescence

(XRF) instrument and 59 select samples were submitted to an analytical laboratory for Target Analyte List (TAL) metals analysis. The RI summarizes screening and analytical results.

Although the adjacent upland smelter facility was demolished and the soil remediated, riverbank soil and nearshore sediment are still impacted by legacy smelter wastes, including deposition from upstream sources. Contaminant concentrations are elevated enough to represent a threat to human health and the environment and are widespread. Although a number of metals are present and might exceed anticipated cleanup levels and screening levels, the most widespread metals are copper, lead and zinc. These metals occur at elevated concentrations throughout the site such that their distribution and magnitude is the focus of the FFS to determine a remedy for the site. The RI establishes screening or preliminary cleanup levels for these metals.

The FFS evaluates cleanup options for the site based on the distribution and magnitude of copper, lead and zinc. The five subareas described in this report provide functionally discrete management zones for separate cleanup scenarios. Copper was determined to be both the maximum areal extent and maximum depth of contamination across all investigation areas. The *beach* subarea exhibits the greatest impacts with the maximum area and depth of contamination observed up to 4 feet below ground surface (bgs). For the *jetty* subarea, much of the contamination likely extends below the sampled surface because some of the material used to construct the jetty was locally sourced. The *hillside* subarea exhibits mature vegetation in several areas and scattered demolition debris.

2.0 CLEANUP ACTION ALTERNATIVES

GeoEngineers compiled an initial screening of cleanup alternatives in a technical memorandum (GeoEngineers 2020a). Based on consultation with Ecology, the alternatives presented in that memorandum were refined to those applied in this FFS. Note: after further refinement of the alternatives, the volumes presented in this FFS are improved estimates compared to the volumes presented in the memorandum.

The FFS presents a set of three site-wide cleanup alternatives (Alternatives 1, 2 and 3). These cleanup alternatives incorporate selected sets of scenarios that focus on combinations of removing or capping the contaminated soil, sediment and slag. The presentation of the site-wide alternatives integrates the five subareas defined in Section 1.3. Each of the three alternatives describes remedial actions for the entire site (all of the subareas). Only the remedial approach for the beach subarea changes in each of the three alternatives. The recommended remedial approach for the other subareas is the same for Alternatives 1 through 3 and are described in Sections 2.3 through 2.6. Alternative details are presented in Table 1 and alternative quantities in Table 2.

Additional remediation scenarios to address each subarea were evaluated and are presented in Appendix A. The remediation scenarios presented in Appendix A are not included in the three alternatives presented in the body of the FFS. These additional scenarios, including figures and cost estimates, are provided in the appendix to document additional informational considerations evaluated.

Each site-wide alternative is a variation of an excavation/removal scenario, in-place capping or a combination of both removal and capping. This evaluation did not consider in-situ remediation alternatives because of the characteristics of the site and aquatic setting, Ecology cleanup preferences, variable water

levels, lack of supporting infrastructure, timing, contaminant characteristics and degree of difficulty (i.e., adequately controlling variables to ensure success).

Ecology proposes that total physical removal of all contaminated sediments and soils within the project area as not practical. As such, the site-wide alternatives do not include a complete excavation approach of all contamination. Engineering uncertainties, increased in-river, hydraulic, ecological, community disruption, nearby engineered infrastructure risks, off-site transport, as well as overall costs of attempting such a remedy combine to exceed anticipated cleanup practicability.

The combined removal and containment (capping) alternatives presented below and further discussed in Section 3.0 can meet or exceed minimum MTCA and Sediment Management Standards (SMS) cleanup action requirements and represent effective permanent solutions for this site.

2.1. Common Elements of Site-Wide Alternatives

Each of the presented site-wide cleanup action alternatives will include elements that are required, regardless of the cleanup action selected. The described alternatives will not discuss these elements; however, the specific costs for them are included in the estimates for each alternative. These common elements include:

- Engineering design
- Permitting
- Construction oversight
- Confirmation sampling
- Temporary erosion and sediment control (TESC)
- Surveying
- Closure reporting

Engineering design also will include hydraulic modeling, as needed, for permitting and to ascertain measurable effects of the final selected site-wide alternative on the river system. A preliminary discussion of the hydraulic modeling is described in the technical memorandum "Northport Waterfront Feasibility Study, Hydraulic Analysis" dated July 8, 2020 (GeoEngineers 2020b, Appendix B). As mentioned above, the estimated costs for these common elements are included with each of the *beach* subarea scenarios because the *beach* subarea includes most of the contaminated sediment and associated costs for the site.

2.2. Beach Subarea

Alternatives 1, 2 and 3 consist of different options for the Seasonal Beach subarea. The remedial actions proposed for the other subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are the same for each of the three alternatives and these costs are included in Alternatives 1, 2 and 3. Additional removal/capping scenarios for the Beach and common subareas are presented in Appendix A.

2.2.1. Alternative 1 – Combined Excavation, Replacement and Capping: 2-foot Cap along Shoreline; 2-foot Excavation with Selected Excavations to 6 feet bgs, and Replacement in Excavated Areas; and Disposal; (Figure 3, Table 3)

This alternative combines capping the portion of the beach near the main channel edge of the river and excavating the contaminated material to 2 feet bgs in the areas that are not capped, which are closer to the shoreline. This alternative also accounts and provides for up to six select areas (scaled at 40-foot-diameter) excavated an additional 4 feet (total 6 feet bgs) to remove potential pockets of deeper contaminated material that could effectively remove elevated metals concentrations or visible slag. In this alternative and the other *beach* alternatives, the top 2 feet of excavated material from the beach could be screened to remove oversized material (such as cobbles) and the screened material could be available for reuse as backfill. The estimated costs for screening cobbles out of the excavated material or reusing the screened material as backfill are not included.

The excavated area would be backfilled with about 2 feet of imported fill material consisting of an assumed 80/20 mixture of 12-inch stream-bed consistent commercially obtained sediment material. The main channel edge would be capped from approximately Elevation 1,280 to 1,285 with 2 feet of the 80/20 mixture material. The boundary between the capped and excavated/backfilled areas will be graded to transition the change in elevation. Capping the main channel edge would make implementation of this alternative easier to construct because there would not be excavation activities along the swift main channel where variable river levels might interfere. The actual area capped could be adjusted in the field to reflect river conditions at the time of construction. The removal and backfill portion of the beach nearer to the shore would be excavated to 2 feet bgs, screened and backfilled (capped) with a riverine-compatible mixture. The approximate excavation area is 222,100 square feet (sf) (5.1 acres [ac]) and the approximate hot spot removal area is 7,500 sf (0.17 ac). About 17,600 cubic yards (cy) of contaminated material would be removed from the excavation area. The approximate capping only area (not including replacement of excavated material) is 63,500 sf (1.46 ac).

Costs for the other subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are included in the alternative pricing below. Description of the recommended remedial actions for the common subareas are found in Sections 2.3 through 2.6. The estimated costs to implement the recommended actions in the other subareas are tabulated in Table 6.

The estimated total cost to implement Alternative 1, including a 20 percent contingency, ranges from approximately $5,436,000 to $6,163,000, depending on the selected disposal option. Disposal options are described in Section 2.7. Table 3 provides details of the approximate costs for Alternative 1.

2.2.2. Alternative 2 – Combined Excavation, Replacement, Capping and Side Channel Enhancement Construction: 2-foot Excavation with Selected Excavations to 6 feet bgs, and Replacement; 2-foot Capped Areas; Side Channel Construction; and Disposal (Figure 4, Table 4)

Like Alternative 1, Alternative 2 is a combination of capping and excavation. The capping is expanded to the longitudinal crest of the outer bar in the downstream half of the subarea and in the northeast portion of the beach subarea (similar to Alternative 1). Contaminated soil would be removed to construct a more prominent side channel in the river through the *beach* subarea. The area between the side channel and the main channel also would be capped. The estimated minimum flowing elevation of the channel is selected at the 1,275-foot mark, requiring excavation up to 10 feet deep from current conditions. The channel edges would be sloped back to provide stability and channel form. Capping would be

conducted in the same manner as described in the previous alternative using a 2-foot cap consisting of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Contaminated soil would be excavated and removed from the remaining area to a depth of 2 feet and replaced with 2 feet of 80/20 mixture of 12-inch rounded rock and streambed sediment material. This alternative also includes excavation of up to six select areas excavated to a total of 6 feet bgs. The approximate area excavated is 163,300 sf (3.75 ac) including non-capped area (110,727 sf), side channel (45,057 sf) and six select (hot spot) areas (7,542 sf). The approximate area capped is 130,000 sf (2.98 ac). About 21,800 cy of contaminated material would be removed, which includes about 12,500 cy from the side channel.

Costs for the other subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are included in the alternative pricing below. Description of the recommended remedial actions for the common subareas are found in Sections 2.3 through 2.6. The estimated costs to implement the recommended actions in the other subareas are tabulated in Table 6.

The estimated total cost of implementing Alternative 2, including a 20 percent contingency, ranges from approximately $6,514,000 to $7,555,000 depending on the selected disposal option (described in Section 2.7). Table 4 provides details of the approximate costs for Alternative 2.

2.2.3. Alternative 3 – Combined Excavation, Replacement, Capping and No Action: 2-foot Excavation with Selected Excavations to 6 feet bgs, and Replacement; 2-foot Capped Areas; a No Action Area; and Disposal (Figure 5, Table 5)

This alternative also combines capping and contaminated material excavation and replacement similar to Alternative 1 with the modifications of no action being conducted 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 roughly centered between the main channel and shore. Excavation and capping would be conducted in the manner described in the previous alternatives. This alternative also includes excavation of up to six select areas excavated to a total of 6 feet bgs. The approximate areas capped and excavated are 98,400 and 153,500 sf (2.25 and 3.54 ac), respectively, and about 12,500 cy of contaminated material would be removed.

Costs for the other subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are included in the alternative pricing below. Description of the recommended remedial actions for the common subareas are found in Sections 2.3 through 2.6. The estimated costs to implement the recommended actions in the other subareas are tabulated in Table 6.

The estimated total cost of implementing Alternative 3, including a 20 percent contingency, ranges from approximately $4,588,000 to $5,106,000, depending on the selected disposal option (described in Section 2.7). Table 5 provides details of the approximate costs for Alternative 3.

2.3. Hillside Subarea

2.3.1. Hillside Subarea (Alt. 1, 2 and 3)– Excavation, Capping and Limited Trail Enhancement (Figure 6, Table 6)

Only limited actions, primarily with the goals of restricting access to minimize exposure and enhancing recreational use, will be conducted on the hillside to avoid impacting the well-established vegetation. The baseline action proposed for the *hillside* subarea incorporates the primary goals. Additionally, two enhanced options are considered (Enhancements 1 and 2) that add more recreational elements to this

baseline. The goal of the actions being considered on the hillside are to focus recreational use and pedestrian traffic in areas where the contamination has been addressed and protect and enhance the hillside vegetation zone. The baseline actions include:

- Removing surface debris from the hillside. Easily accessible debris will be removed in a manner that does not disturb mature vegetation. For cost estimating, we assume general surface debris cleanup on the hillside will require 2 days. .
- Removing contaminated soil and slag debris from three exposure areas to depths between 2 to 4 feet bgs, based on contaminated sample results or visible slag. The contaminated soils removed from the hillside will be disposed in the same manner as the sediments from the *beach* and other subareas.
- Removing soil hotspots on the hillside that may designate as a Resource Conservation and Recovery Act (RCRA) hazardous waste, based on data obtained during the RI. For costing purposes these potential RCRA hazardous wastes are assumed to be disposed at a Subtitle C landfill, such as Waste Management's facility near Arlington, Oregon.
- Upgrading/stabilizing the existing defined trail that leads from the parking area to the bottom of the hillside, including adding a seating area with park benches and a picnic shelter accessible from the main trail. The upgrades will include excavating about 1 foot of existing soil and replacing with common borrow in the trail and recreation locations to reduce exposure to contaminated soil left in-place. The trails will be re-surfaced. New infill plantings of native vegetation and rail fencing will be established along the trails to discourage public use off the established trails and picnic areas. These same actions will be conducted at the trails and recreational areas added in each of the enhancement options for the hillside.
- Incorporating 500 feet of access control fencing along the top of the hill, picnic zone and along the existing trail.

The approximate volume of soil and slag debris excavated in this alternative is about 1,331 cy, including the potential designation of RCRA hazardous waste, which is estimated at 100 cy.

Unit costs from the landscape architect for specific elements that might be installed are included in Appendix C.

2.3.2. Optional Recreational Enhancement 1 (Figure 7, Table 6)

Enhancement 1 adds to the baseline hillside alternative by installing additional recreational facilities (picnic shelters, benches and plantings) adjacent to the parking area and driveway down to the boat ramp.

The approximate volume of soil and slag debris excavated in this alternative is 1,480 cy.

2.3.3. Optional Recreational Enhancement 2 (Figure 8, Table 6)

Enhancement 2 adds to the features of Enhancement 1 and the base alternative by creating a loop trail on the hillside that includes benches and stairs.

The approximate volume of soil and slag debris excavated in this alternative is 1,606 cy.

2.4. Jetty Subarea

2.4.1. Jetty Subarea (Alt. 1, 2 and 3)– Capping (Figure 9, Table 6)

The *jetty* subarea consists of the manmade jetty constructed near the boat launch to provide calm water for the launching and retrieval of boats. Excavation is not considered for the jetty because it protects the boat launch and provides a core foundation for re-enforcement. Therefore, the only alternative considered is capping the entire jetty with imported fill to limit public exposure to the contaminated materials and assure durability. For FFS cost estimating, the slopes of the jetty would be capped with 2 feet of 12-inch loose riprap armoring keyed into the toe of the slope. A portion of screened cobbles and boulders from the Seasonal Beach would be integrated with the loose riprap for a natural presentation. The top of the jetty would be capped with 2 feet of the same 80/20 mixture used in the *beach* subarea to allow near-year-round pedestrian access. Conceptually, the jetty could be expanded to provide additional hydraulic protection for the *beach* subarea remedy. Any modifications to the jetty, including capping the existing jetty, will consider river dynamics during the design phase. The approximate volume of imported fill to cap the jetty is about 1,000 cy of riprap and 200 cy of the 80/20 mix.

2.5. Bay and Public Dock Subarea

2.5.1. Bay and Public Dock Subarea (Alt. 1, 2 and 3) – Capping, Excavate and Replace: Cap the Bay, Excavate 6 feet near Public Dock and Replace with 1.5 feet (Figure 10, Table 6)

The Bay and Public Dock subarea recommended action consists of placing approximately 1½ feet of imported streambed sediment material as a cap to reduce exposure to the contaminated sediments. The area around the dock would be excavated to 6 feet bgs and replaced with approximately 1½ feet of imported streambed sediment material to ensure a clean sediment interface and address potential residual contamination. The estimated costs for this action include installing a silt curtain or other best management practices to protect the Columbia River during excavation within the river. The deeper excavation around the dock would add about 4½ feet of water depth and improve boat access at the dock, especially during periods of lower water. The volume estimate includes the area near the dock, which ultimately might need to be avoided so as not to impede boating operations. The approximate volume of the imported capped material is 2,600 cy.

2.6. Bayshore

2.6.1. Bayshore Subarea (Alt. 1, 2 and 3) – Capping (Figure 11, Table 6)

This alternative for the Bayshore subarea is a capping only alternative that consists of a 1.5-foot of the 80/20 mix of imported fill matching the riverine compatible material as used in the other capping scenarios. The area capped is between the boat launch and approximately the RI sample location XRF-96. This area is accessible for public use during lower river levels. Capping this area will minimize the exposure to contaminated soil. A small degree of excavation and replacement along the boat ramp occurs under this scenario, due to concern for maintaining a level transition along the established concrete boat launch interface.

2.7. Disposal Options

For each of the removal alternatives described above, the soil, sediment and slag under the FFS costing scenarios will be transported off site to a permitted landfill. Based on the RI, most of the excavated sediments would be eligible for off-site disposal in a Subtitle D landfill. Subtitle D landfills manage

nonhazardous solid waste and include municipal solid waste and industrial waste landfills. The FFS assumes that the small quantity of potential RCRA hazardous waste, located on the *hillside* subarea, will be disposed at Waste Management's Subtitle C landfill located near Arlington, Oregon.

Off-site disposal of material removed from all the subareas would be loaded into road-rated dump trucks and transported to the permitted facility. Various standard protocols would be required, such as covering loads, and inspecting and cleaning wheels, as needed, to prevent tracking contaminated soil onto the haul routes. For costing, two locations have been identified as potential destinations:

1. The Stevens County landfill located near Kettle Falls, Washington (approximately 34 miles from the site).
2. Waste Management's Graham Road landfill located near Medical Lake, Washington (approximately 120 miles from the site).

Costs for transporting and disposing (tipping fees) the excavated material at either location are included in the estimates for each removal alternative. Disposal costs are compared for both locations in the table below:

DISPOSAL COST COMPARISON

	Stevens County Landfill	Graham Road Landfill
	(approximate cost per ton)	
On Site Loading	$2.50	$2.50
Transportation to Landfill	$12.00	$29.00
Tipping Fee	$75.00	$37.00
Total	$89.50	$68.50

3.0 EVALUATION OF CLEANUP ACTION ALTERNATIVES

Cleanup actions performed under MTCA meet certain minimum requirements defined as "threshold" requirements and also meet "other" MTCA requirements (WAC 173-340-360[2]). The cleanup action alternatives are evaluated to inform this FFS relative to the threshold requirements in Section 3.1. The alternatives are evaluated relative to the other requirements in Sections 3.1 through 3.4. Requirements of Washington's Sediment Management Standards (SMS) Chapter 173-204 WAC also guide river sediment and in-river cleanup. The site-wide alternatives also consider consistency with SMS requirements.

3.1. MTCA Threshold Requirements

Per the threshold requirements listed at WAC 173-340-360(2)(a), in order to comply with MTCA, cleanup actions:

- Protect human health and the environment.
- Comply with cleanup standards.

- Comply with applicable state and federal laws.
- Provide for compliance monitoring.

Each of the alternatives considered consists of a combination of either capping and/or excavation/disposal elements with the addition of limited institutional controls (fencing and plantings) on the *hillside* subarea. All three elements protect human health and the environment by meeting anticipated cleanup requirements. Excavation/disposal components would meet this requirement by permanently removing contaminated material from the site and disposing it at an off-site, permitted facility. Capping or replacement backfill would meet this requirement by constructing physical barriers to control human and aquatic life contact with remaining contaminated materials. Institutional controls also meet this requirement by limiting recreational access to upland areas where contaminated soil has not been addressed by other means to preserve upland natural areas.

Compliance with cleanup standards requires, in part, that cleanup levels are met at the applicable points of compliance. When a cleanup action involves containment of soils with hazardous substance concentrations exceeding cleanup levels at the point of compliance, the cleanup action may be determined to comply with cleanup standards, provided the requirements specified in WAC 173-340-740(6)(f) are met. For sediment clean up the compliance points address the biologically active zone (WAC 204-560).

All three alternatives can comply with applicable state and federal laws. Each of the alternatives would be implemented in accordance with applicable permitting or substantive requirements, workplace safety requirements and best management practices.

All alternatives provide for compliance monitoring. Protection monitoring would be conducted to ensure that worker and public health are protected during cleanup construction activities. Performance monitoring would be conducted under all the excavation alternatives to verify that contaminated material has been removed to the selected screening level. Conformational monitoring would ensure long-term effectiveness and ongoing application of institutional controls to protect human health.

3.1.1. Use of Permanent Solutions to the Maximum Extent Practicable

WAC 173-340-360(3) describes the MTCA requirements and procedures for determining whether a cleanup action uses permanent solutions to the maximum extent practicable, as required under WAC 173-340-360(2)(b)(i). MTCA defines a permanent solution or permanent cleanup action as (WAC 173-340-200):

> A cleanup action in which cleanup standards of WAC 173-340-700 through 173-340-760 can be met without further action being required at the site being cleaned up or any other site involved with the cleanup action, other than the approved disposal of any residue from the treatment of hazardous substances.

MTCA requires that when selecting a cleanup action, permanent solutions achieving cleanup standards are given preference. The default MTCA requirement for determining or comparing whether a cleanup action uses permanent solutions to the maximum extent practicable is to use a disproportionate cost analysis (DCA) to compare the costs and benefits of the cleanup action alternatives evaluated in the FS (WAC 173-340-360[3][b]). However, per WAC 173-340-360(3)(d), if a permanent cleanup action is proposed in the draft cleanup action plan, and Ecology concurs with the proposed cleanup action, a DCA is

not required. Each alternative presented meets the definition of a permanent and protective cleanup action.

3.1.2. Provision for Reasonable Restoration Time Frame

Each alternative presented could be implemented in one or two low water seasons.

3.1.3. Consideration of Public Concerns

The cleanup action to be selected will need to consider actual interests and concerns expressed by the public. It is anticipated that the local community surrounding the site could have certain concerns associated with the alternatives under consideration. For example, the number of trucks that would travel on surface streets to transport contaminated soil to an off-site disposal facility and to import fill to the site. Disruptions to use at the boat ramp during cleanup is another consideration. Ecology anticipates holding workshop public meetings to discuss the draft FFS and associated cleanup alternatives.

Ecology will pursue public input because several characteristics of the alternatives also could enhance public use or the aesthetics of the site and influence the effectiveness of the remediation. Characteristics that could be implemented as part of the remediation to enhance public use or aesthetics include the river side-channel enhancement, hillside trails, picnic spots and deeper excavation around the floating dock.

3.2. Preferred Cleanup Action Alternative

The table below summarizes the expected costs of Alternatives 1, 2 and 3, based on disposal at the Stevens County Landfill or Graham Road and using the middle unit cost, where there is a range of unit costs based on the scale of the task (such as excavation or importing fill). These costs include a 20 percent contingency added to the total.

COST SUMMARY TABLE

Alternative	Description (Beach Subarea)[1]	Cost (Disposal at Graham Road)[2]	Cost (Disposal at Stevens County)[2]
1	2-foot Cap along Shoreline; 2-foot Excavation with Selected Excavations to 6 feet bgs	$5,436,000	$6,163,000
2	2-foot Excavation with Selected Excavations to 6 feet bgs, and Replacement; 2-foot Capped Areas; Side Channel Construction; and Disposal	$6,514,000	$7,555,000
3	2-foot Excavation with Selected Excavations to 6 feet bgs, and Replacement; 2-foot Capped Areas; a No Action Area; and Disposal	$4,588,000	$5,106,000

Notes: [1] Includes cleanup costs for common subareas.
[2] Costs include a 20 percent contingency. .

A specific alternative is not defined at this time, pending public comment. The ranges in cost for the three alternatives are strongly influenced by the different actions proposed in the beach subarea and disposal options. The costs for the other subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are relatively the same for the three site-wide alternatives. Based on the costs developed for each of the site-wide alternatives, the cost to implement the alternatives are relatively close with Alternative 2 at the highest cost and Alternative 3 at the lowest cost. Alternative 1 costs are in the middle and is anticipated as the most

comprehensive acreage coverage. As proposed, 2 feet of fill is planned to replace excavated materials in the beach subarea. Alternative 1 and 2 may be considered more protective because greater volumes of contaminated material are removed or capped. Alternative 2 incorporates an enhancement of a side-channel, which will add complexity to the overall construction and design.

The hillside option can be expanded, based on the selected optional recreational enhancements. Each optional enhancement increases the cost and the recreational use of the hillside though it does not increase the protectiveness of the remediation.

4.0 LIMITATIONS

We have prepared this Focused Feasibility Study report for use by Ecology.

Within the limitations of scope, schedule and budget, our services have been executed in accordance with generally accepted environmental science practices in this area at the time this report was prepared. No warranty or other conditions, express or implied, should be understood. This report was prepared, based on previous investigations and data collected by others. GeoEngineers is not responsible for any data that was inaccurately reported by others and reproduced here.

Please refer to Appendix D titled "Report Limitations and Guidelines for Use" for important additional information pertaining to the use of this report.

5.0 REFERENCES

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Integral Consulting, Inc. 2014. Upper Columbia River – Draft Final Beach Sediment Study Field Sampling and Data Summary Report. Prepared for Teck American Incorporated. March 2014.

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

TABLES

GeoEngineers

Table 1

Alternative Details

Northport Waterfront Focused Feasibility Study

Northport, Washington

Subarea	Alternative	Figure	Table	Description
Seasonal Beach	Alternative 1. Combined Excavation, Replacement and Capping	Figure 3	Table 3	Cap main channel edge across the elevation 1285 to 1280 with 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Excavate and remove soil from remaining area to a depth of 2 ft and replace with 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Assumes up to six select removal locations with 20 ft radius to depths of 6 ft based on visual granular slag observations or contaminant concentrations.
	Alternative 2. Combined Excavation, Replacement, Capping and Side-Channel Enhancement Construction	Figure 4	Table 4	Expand the capping of the outer bar extending up to the longitudinal crest of the outer bar in the downstream half of the subarea. Excavate and remove soil from the remaining area to a depth of 2 ft and replace with 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Conduct additional excavation in the upstream half to construct a side channel designed for a flowing minimum of elevation of 1275'. Extended capping on east and west edges of the side channel. Assumes up to six select removal locations with 20 ft radius to depths of 6 ft based on visual granular slag observations or contaminant concentrations.
	Alternative 3. Combined Excavation, Replacement, Capping and No Action	Figure 5	Table 5	Cap cobbled area near bridge at high elevations using 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Also cap the channel edge in the northeast portion of the subarea across the elevation 1285 to 1280 using 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Add no action area to the northwest corner of the subarea. Remaining area will be excavated 2 ft and replaced with 2 ft of the cap material. Assumes up to six select removal locations with 20 ft radius to depths of 6 ft based on visual granular slag observations or contaminant concentrations.
Subareas Common to Alternatives 1, 2 and 3				
Hillside	Targeted Excavation, RCRA hazardous waste removal and Footpath/Recreational Improvements.	Figure 6	Table 6	Upgrade footpath to beach and install limited recreational improvements (benches and picnic tables foot-path and landing and remove contaminated soil from three selected areas. Assumed 1-foot excavation and 1-foot replacement of presumed contaminated material in walking trail areas. Targeted removal of bulk slag deposit and replacement and one additional area. Removal of RCRA hazardous waste from TP-21 location (Assume 100 cubic yards or 160 tons). Fencing and plantings used to limit access to undisturbed areas of the hillside.
	Optional Recreational Enhancement 1	Figure 7		Additional recreational enhancements including bench and picnic tables near the parking lot area.
	Optional Recreational Enhancement 2	Figure 8		Additional modifications to Recreational Enhancement 1 including a loop trail to the west.
Jetty	Capping / Armoring / Stabilizing	Figure 9		Excavate toe of existing jetty to key in 12-inch loose rip rap material; armor sides by placing 12-inch loose rip rap 2 ft thick. Cap top of existing feature with 80/20 mixture of 12-inch rounded rock and streambed sediment to resist erosion and provide pedestrian access.
Bay and Public Dock	Capping and Dock Excavation/Replacement	Figure 10		Capping the Bay with 1.5 ft of streambed sediment material. Excavation of 6 feet around public dock to increase low-water draft. Replace with 1.5 ft deep streambed sediment material. Dock floated to about 1275'.
Bayshore	Capping	Figure 11		Cap existing conditions with 1.5 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material.

Table 2

Alternative Quantities

Northport Waterfront Focused Feasibility Study

Northport, Washington

SubArea	Alternative	Excavation/Disposal			Select Excavation			Backfill/Replace			Cap		
		Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)	Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)	Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)	Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)
Seasonal Beach	Alternative 1. Combined Excavation and Capping[1]	222,101	2	16,452	7,542	4	1,117	222,101	2	17,569	63,460	2	4,701
	Alternative 2. Excavation and Capping[1]	110,727	2	8,202	7,542	4	1,117	110,727	--	9,319	129,769	2	9,613
	Alternative 2. Side Channel[1]	45,057	9.5	15,853	--	--	--	--	--	--	45,057	2	3,338
	Alternative 3. Excavation, Capping and No Action[1]	153,507	2	11,371	7,542	4	1,117	153,507		12,488	98,366	2	7,286
Subareas Common to Alternatives 1, 2 and 3													
Hillside	Targeted Removal[2]	9,334	2-4	1,235	--	--	--	9,334	2-4	1,235	--	--	--
	Walking Path	2,600	1	96	--	--	--	2,600	1	96	--	--	
	Optional Recreational Enhancement 1.	9,334	2-4	1,235	--	--	--	9,334	2-4	1,235	--	--	--
	Optional Recreational Enhancement 1. Walking Path	4,000	1	148	--	--	--	4,000	1	148	--	--	--
	Optional Recreational Enhancement 2.	9,334	2-4	1,235	--	--	--	9,334	2-4	1,235	--	--	--
	Optional Recreational Enhancement 2. Walking Path	3,400	1	126	--	--	--	3,400	1	126	--	--	--
Jetty	Capping / Armoring / Stabilizing: Streambed Material	--	--	--	--	--	--	--	--	--	3,053	2	226
	Capping / Armoring / Stabilizing: Rip rap Material	--	--	--	--	--	--	--	--	--	14,398	2	1,067
Bay and Public Dock	Bay Capping	--	--	--	--	--	--	--	--	--	28,323	1.5	1,574
	Public Dock Excavation and Replace	6,646	6	1,477	--	--	--	6,646	1.5	369	--	--	--
Bayshore	Capping Only	--	--	--	--	--	--	--	--	--	13,305	1.5	739

Notes:

[1]Assumes the top 2 feet of excavated material from Seasonal Beach will be screened; approximately 15% of excavated material will be available for re-use and not disposed.

[2]Includes excavation/disposal of 100 cubic yards (cy) (160 tons at 1.6 tons/cy) of Resource Conservation and Recovery Act (RCRA) hazardous waste.

Table 3

Alternative 1. Seasonal Beach, Hillside, Jetty, Bay and Public Dock and Bayshore

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Engineering Design / Work Plan / Project Management				
Engineering / design / work plan / project management	lump sum	$500,000	1	$500,000
Permitting	lump sum	$37,000	1	$37,000
			Sub-Total	**$537,000**
Observation[3] / Confirmation Sampling[4] / Reporting / Surveying				
Construction Observation and Documentation	per day	$1,800	40	$72,000
Confirmation Sampling	per sample	$260	100	$26,000
Remedial Action Report	lump sum	$40,000	1	$40,000
Final As-built Survey	lump sum	$5,000	1	$5,000
			Sub-Total	**$143,000**
Temporary Erosion and Sediment Control (TESC)				
Temporary erosion sediment control	lump sum	$5,000	1	$5,000
			Sub-Total	**$5,000**
Total Estimated Costs for Engineering Design, Observation, Sampling, Reporting, Surveying and TESC				**$685,000**
Seasonal Beach Subarea				
Contaminated Soil Excavation and Replacement[5,6]				
Mobilize / demobilize equipment	lump sum	$100,000	1	$100,000
Haul road improvement (site access)	liner feet	$5.00	500	$2,500
Excavate contaminated soil and stockpile	cubic yard	$6.75	17,569	$118,593
Import streambed sediment material (replacement fill)	cubic yard	$49.00	3,514	$172,179
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	14,055	$534,105
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	17,569	$131,769
			Sub-Total	**$1,059,146**
Contaminated Soil Capping[5]				
Import streambed sediment material (replacement fill)	cubic yard	$49.00	940	$46,067
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	3,761	$142,903
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	4,701	$35,256
			Sub-Total	**$224,225**
Total Estimated Costs for Alternative 1. Seasonal Beach Subarea				**$1,283,372**
Total Estimated Costs for Common Subareas (Hillside, Jetty, Bay and Public Dock and Bayshore)[7]				**$644,132**
Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement (Alternative 1. Seasonal Beach and Common Subareas) Sub-Total[7]				**$2,612,504**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport[8]	cubic yard	$4.00	17,620	$70,482
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[9]	$29.00	28,193	$817,587
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[9]	$36.50	28,193	$1,029,032
Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)				**$1,917,100**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport[8]	cubic yard	$4.00	17,620	$70,482
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[9]	$12.00	28,193	$338,312
Disposal fees (non-RCRA) at Stevens County Landfill	ton[9]	$75.00	28,193	$2,114,449
Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)				**$2,523,242**
Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement (Alternative 1. Seasonal Beach and Common Subareas) Sub-Total[7]				**$2,612,504**
Total Estimated Costs for Beach Subarea Alternative 1. and Common Subareas with Disposal Option 1. (Soil Disposal at Waste Management's Graham Road Facility)[7]				**$4,529,604**
20% Contingency				**$905,921**
Total Estimated Costs for Beach Subarea Alternative 1. and Common Subareas with Disposal Option 1. and 20% Contingency (Soil Disposal at Waste Management's Graham Road Facility)[7]				**$5,435,525**
Total Estimated Costs for Beach Subarea Alternative 1. and Common Subareas with Disposal Option 2. (Soil Disposal at Stevens County Landfill)[7]				**$5,135,746**
20% Contingency				**$1,027,149**
Total Estimated Costs for Beach Subarea Alternative 1. and Common Subareas with Disposal Option 2. and 20% Coningency (Soil Disposal at Stevens County Landfill)[7]				**$6,162,895**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects, and professional judgment.

[2]Refer to Table 2 for assumptions used to generate material quantities.

[3]Observation and documentation assumes field screening with XRF equipment and project construction duration of 40 days.

[4]Confirmation sampling assumes up to 100 samples collected and tested for Target Analyte List metals.

[5]Represented by areas shown on Figure 3 and Table 2. Includes up to six hot spot removals to a depth of 6 feet below ground surface.

[6]Assumes $100k for mobilization and demobilization; likely 10% of contractor cost.

[7]Details for Common Subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are found in Table 6.

[8]Quantities for disposal = excavated material from the Beach + material from common subarea excavations.

[9]Conversion to tons is 1.6 multiplied by cubic yards.

Table 4

Alternative 2. Seasonal Beach, Hillside, Jetty, Bay and Public Dock and Bayshore

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Engineering Design / Work Plan / Project Management				
Engineering / design / work plan / project management	lump sum	$500,000	1	$500,000
Permitting	lump sum	$37,000	1	$37,000
			Sub-Total	**$537,000**
Observation[3] / Confirmation Sampling[4] / Reporting / Surveying				
Construction Observation and Documentation	per day	$1,800	40	$72,000
Confirmation Sampling	per sample	$260	100	$26,000
Remedial Action Report	lump sum	$40,000	1	$40,000
Final As-built Survey	lump sum	$5,000	1	$5,000
			Sub-Total	**$143,000**
Temporary Erosion and Sediment Control (TESC)				
Temporary erosion sediment control	lump sum	$5,000	1	$5,000
			Sub-Total	**$5,000**
Total Estimated Costs for Engineering Design, Observation, Sampling, Reporting, Surveying and TESC				**$685,000**
Seasonal Beach Subarea				
Contaminated Soil Excavation and Replacement[5,6]				
Mobilize / demobilize equipment	lump sum	$100,000	1	$100,000
Haul road improvement (site access)	liner feet	$5.00	500	$2,500
Excavate contaminated soil and stockpile	cubic yard	$6.75	9,319	$62,906
Import streambed sediment material (replacement fill)	cubic yard	$49.00	1,864	$91,329
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	7,455	$283,308
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	9,319	$69,895
			Sub-Total	**$609,938**
Contaminated Soil Capping[5]				
Import streambed sediment material (replacement fill)	cubic yard	$49.00	1,923	$94,203
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	7,690	$292,221
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	9,613	$72,094
			Sub-Total	**$458,517**
Stream Channel Construction[5]				
Excavate contaminated soil and stockpile	cubic yard	$6.75	15,853	$107,010
Import streambed sediment material (replacement fill)	cubic yard	$49.00	668	$32,708
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	2,670	$101,462
Place, grade and compact import fill (replacement fill)	cubic yard	$13.50	3,338	$45,057
			Sub-Total	**$286,237**
Total Estimated Costs for Alternative 2. Seasonal Beach Subarea				**$1,354,692**
Total Estimated Costs for Common Subareas (Hillside, Jetty, Bay and Public Dock and Bayshore)[7]				**$644,132**
Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement (Alternative 2. Seasonal Beach and Common Subareas) Sub-Total[7]				**$2,683,824**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport[8]	cubic yard	$4.00	25,224	$100,895
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[9]	$29.00	40,358	$1,170,388
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[9]	$36.50	40,358	$1,473,074
Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)				**$2,744,357**
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport[8]	cubic yard	$4.00	25,224	$100,895
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[9]	$12.00	40,358	$484,298
Disposal fees (non-RCRA) at Stevens County Landfill	ton[9]	$75.00	40,358	$3,026,864
Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)				**$3,612,058**
Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement (Alternative 1. Seasonal Beach and Common Subareas) Sub-Total[7]				**$2,683,824**
Total Estimated Costs for Beach Subarea Alternative 2. and Common Subareas with Disposal Option 1. (Soil Disposal at Waste Management's Graham Road Facility)[7]				**$5,428,181**
20% Contingency				**$1,085,636**
Total Estimated Costs for Beach Subarea Alternative 2. and Common Subareas with Disposal Option 1. and 20% Contingency (Soil Disposal at Waste Management's Graham Road Facility)[7]				**$6,513,817**
Total Estimated Costs for Beach Subarea Alternative 2. and Common Subareas with Disposal Option 2. (Soil Disposal at Stevens County Landfill)[7]				**$6,295,882**
20% Contingency				**$1,259,176**
Total Estimated Costs for Beach Subarea Alternative 2. and Common Subareas with Disposal Option 2. with 20% Contingency (Soil Disposal at Stevens County Landfill)[7]				**$7,555,059**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects, and professional judgment.

[2]Refer to Table 2 for assumptions used to generate material quantities.

[3]Observation and documentation assumes field screening with XRF equipment and project construction duration of 40 days.

[4]Confirmation sampling assumes up to 100 samples collected and tested for Target Analyte List metals.

[5]Represented by areas shown on Figure 3 and Table 2. Includes up to six hot spot removals to a depth of 6 feet below ground surface

[6]Assumes $100k for mobilization and demobilization; likely 10% of contractor cost.

[7]Details for Common Subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are found in Table 6.

[8]Quantities for disposal = excavated material from the Beach + material from common subarea excavations.

[9]Conversion to tons is 1.6 multiplied by cubic yards.

Table 5

Alternative 3. Seasonal Beach, Hillside, Jetty, Bay and Public Dock and Bayshore

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Engineering Design / Work Plan / Project Management				
Engineering / design / work plan / project management	lump sum	$500,000	1	$500,000
Permitting	lump sum	$37,000	1	$37,000
			Sub-Total	**$537,000**
Observation[3] / Confirmation Sampling[4] / Reporting / Surveying				
Construction Observation and Documentation	per day	$1,800	40	$72,000
Confirmation Sampling	per sample	$260	100	$26,000
Remedial Action Report	lump sum	$40,000	1	$40,000
Final As-built Survey	lump sum	$5,000	1	$5,000
			Sub-Total	**$143,000**
Temporary Erosion and Sediment Control (TESC)				
Temporary erosion sediment control	lump sum	$5,000	1	$5,000
			Sub-Total	**$5,000**
Total Estimated Costs for Engineering Design, Observation, Sampling, Reporting, Surveying and TESC				**$685,000**
Seasonal Beach Subarea				
Contaminated Soil Excavation and Replacement[5,6]				
Mobilize / demobilize equipment	lump sum	$100,000	1	$100,000
Haul road improvement (site access)	liner feet	$5.00	500	$2,500
Excavate contaminated soil and stockpile	cubic yard	$6.75	12,488	$84,296
Import streambed sediment material (replacement fill)	cubic yard	$49.00	2,498	$122,385
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	9,991	$379,642
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	12,488	$93,662
			Sub-Total	**$782,484**
Contaminated Soil Capping[5]				
Import streambed sediment material (replacement fill)	cubic yard	$49.00	1,457	$71,406
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	5,829	$221,506
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	7,286	$54,648
			Sub-Total	**$347,560**
Total Estimated Costs for Alternative 3. Seasonal Beach Subarea				**$1,130,044**
Total Estimated Costs for Common Subareas (Hillside, Jetty, Bay and Public Dock and Bayshore)[7]				**$644,132**
Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement (Alternative 3. Seasonal Beach and Common Subareas) Sub-Total[7]				**$2,459,176**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport[8]	cubic yard	$4.00	12,539	$50,157
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[9]	$29.00	20,063	$581,827
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[9]	$36.50	20,063	$732,299
Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)				**$1,364,283**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport[8]	cubic yard	$4.00	12,539	$50,157
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[9]	$12.00	20,063	$240,756
Disposal fees (non-RCRA) at Stevens County Landfill	ton[9]	$75.00	20,063	$1,504,724
Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)				**$1,795,638**
Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement (Alternative 3. Seasonal Beach and Common Subareas) Sub-Total[7]				**$2,459,176**
Total Estimated Costs for Beach Subarea Alternative 3. and Common Subareas with Disposal Option 1. (Soil Disposal at Waste Management's Graham Road Facility)[7]				**$3,823,459**
20% Contingency				**$764,692**
Total Estimated Costs for Beach Subarea Alternative 3. and Common Subareas with Disposal Option 1. and 20% Contingency (Soil Disposal at Waste Management's Graham Road Facility)[7]				**$4,588,151**
Total Estimated Costs for Beach Subarea Alternative 3. and Common Subareas with Option 2. (Soil Disposal at Stevens County Landfill)[7]				**$4,254,814**
20% Contingency				**$850,963**
Total Estimated Costs for Beach Subarea Alternative 3. and Common Subareas with Option 2. and 20% Contingency (Soil Disposal at Stevens County Landfill)[7]				**$5,105,776**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects, and professional judgment.

[2]Refer to Table 2 for assumptions used to generate material quantities.

[3]Observation and documentation assumes field screening with XRF equipment and project construction duration of 40 days.

[4]Confirmation sampling assumes up to 100 samples collected and tested for Target Analyte List metals.

[5]Represented by areas shown on Figure 3 and Table 2. Includes up to 6 hot spot removals to a depth of 6 feet below ground surface

[6]Assumes $100k for mobilization and demobilization; likely 10% of contractor cost.

[7]Details for Common Subareas (Hillside, Jetty, Bay and Public Dock and Bayshore) are found in Table 6.

[8]Quantities for disposal = excavated material from the Beach + material from common subarea excavations.

[9]Conversion to tons is 1.6 multiplied by cubic yards.

Table 6

Common Subarea Details (Hillside, Jetty, Bay and Public Dock and Bayshore)

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Hillside Subarea				
Contaminated Soil Excavation, Transport and Disposal[2,3]				
Debris cleanup[4]	per day	$3,000	2	$6,000
Excavate contaminated soil and stockpile[12]	cubic yard	$6.75	1,331	$8,988
Import streambed sediment material (replacement fill)	cubic yard	$49.00	266	$13,049
Import 12-inch cobble material Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	1,065	$40,477
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	1,331	$9,986
Transport RCRA hazardous waste to Subtitle C landfill[12]	ton[5]	$85.00	160	$13,600
Subtitle C landfill tipping fees[12]	ton[5]	$217.00	160	$34,720
			Task Sub-Total	**$126,819**
Excavate Contaminated Soil from Walking Paths[2,6,7]				
Recreational Enhancement 1. Walking Path	cubic yard	$4.00	148	$593
			Task Sub-Total	**$593**
Landscaping Cost of Construction[6,7]				
Access control fencing	linear feet	$25	1400	$35,000
Hillside Landscaping	lump sum	$137,114	1	$137,114
Optional Recreational Enhancement 1.	lump sum	$125,501	1	$125,501
			Task Sub-Total	**$297,615**
			Total Estimated Costs for Hillside Subarea	**$425,027**
Jetty Subarea				
Capping / Armoring / Stabilizing[2,8]				
Import streambed sediment material	cubic yard	$49.00	45	$2,216
Import 12-inch cobble material	cubic yard	$38.00	181	$6,875
Import Heavy Loose Riprap [WSDOT Spec. 9-03.11(1)]	cubic yard	$35.00	1,067	$37,328
Place, grade and compact imported cap materials	cubic yard	$7.50	1,293	$9,695
			Sub-Total	**$56,114**
			Total Estimated Costs for Jetty Subarea	**$56,114**

Scope Item	Unit	Unit Cost[1]	Quantity[2]	Extended
Bay and Public Dock Subarea				
Bay Contaminated Soil Capping, Dock Excavation and Replacement[2,9]				
Silt curtain[10]	lump sum	$8,000	1	$8,000
Excavate contaminated soil and stockpile	cubic yard	$6.75	1,477	$9,969
Import streambed sediment material (replacement fill)	cubic yard	$49.00	1,943	$95,193
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	1,943	$14,570
			Sub-Total	**$127,733**
Bayshore Subarea				
Contaminated Soil Capping[2,11]				
Import streambed sediment material (replacement fill)	cubic yard	$49.00	148	$7,244
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	591	$22,471
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	739	$5,544
			Sub-Total	**$35,258**
Total Estimated Costs for Hillside, Jetty, Bay and Public Dock and Bayshore Subareas				**$644,132**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Refer to Table 2 for assumptions used to generate material quantities.

[3]Represented by areas shown on Figure 7 and Table 2. Includes excavation and disposal of RCRA hazardous waste near TP-21 location.

[4]Debris cleanup assumes a mini excavator with operator and additional laborer for 8 hours.

[5]Conversion to tons is 1.6 multiplied by cubic yards.

[6]Optional Recreational Enhancements 1-2 are shown in Figures 8 and 9. Probable costs of construction from SPVV Landscape Architects are shown in Appendix C.

[7]Optional Recreational Enhancement 2 can be added for estimated $306,610 including excavate/replace 126 cubic yards of soil for the extended walking path; Disposal quantities would increase by 126 cubic yards if Optional Recreational Enhancement 2 is added.

[8]Jetty Subarea represented by areas shown on Figure 10 and Table 2.

[9]Bay and Public Dock Subarea represented by areas shown on Figure 11 and Table 2.

[10]Silt curtain for excavation within the Columbia River assumes 300-foot length and 8-foot depth including installation/removal.

[11]Bayshore Subarea represented by areas shown on Figure 12 and Table 2.

[12]Includes excavation/disposal of 100 cubic yards (cy) (160 tons at 1.6 tons/cy) of Resource Conservation and Recovery Act (RCRA) hazardous waste.

FIGURES

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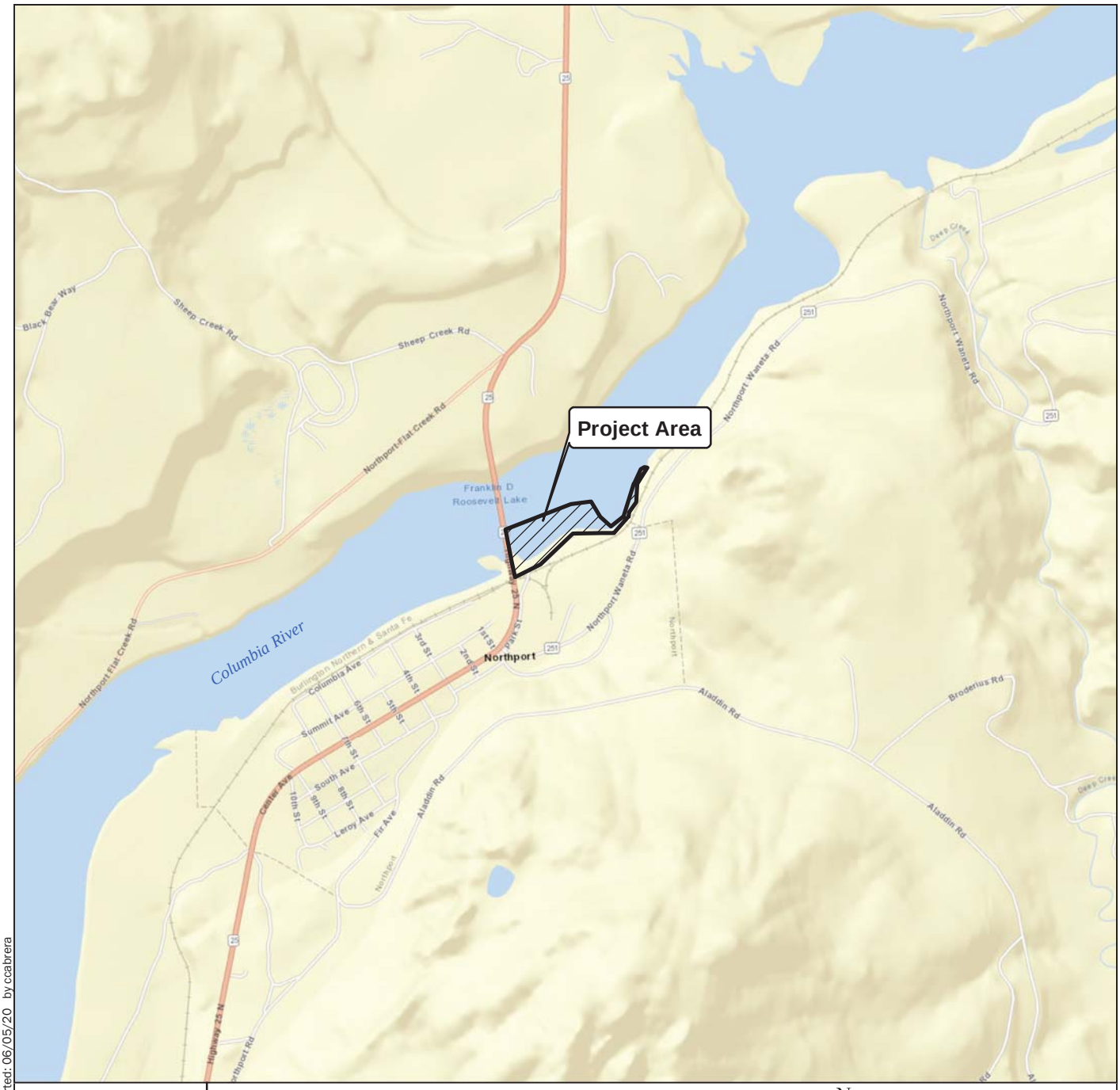

Notes:

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Data Source: Mapbox Open Street Map, 2016
ESRI World Street Map.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Vicinity Map

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 1

P:\0\0504160\GIS\MXD\0504160002_F01_VM_OnsiteDisposal.mxd Date Exported: 06/05/20 by ccabrera

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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 FFS
Northport, Washington

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Figure 2

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Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Excavate 2 feet and replace 2 feet (Alternative 1)
- Capped Area (2-foot Cap)

Replacement and capping material consists of appropriately graded boulder and stream sediment mixture consistent with native material.

Alternative 1 includes up to six hot spot removal locations excavated to a maximum depth of 6-foot with a 20-foot radius.

N W E S

100 0 100
Feet

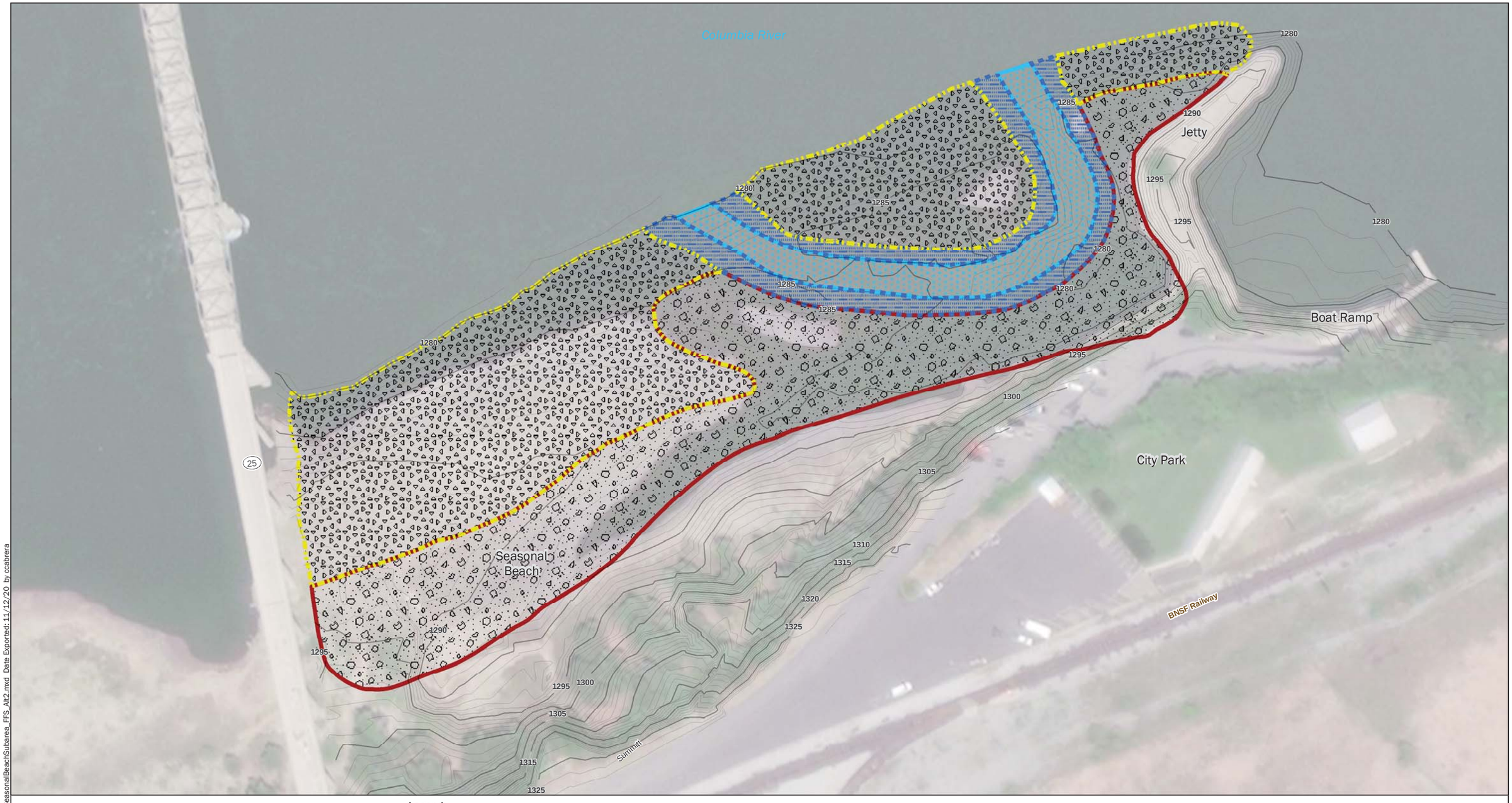
Seasonal Beach Subarea – Combined Excavation, Replacement and Capping (Alternative 1)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 3

P:\0\0504160\GIS\MXD\0504160002_F03_SeasonalBeachSubarea_CombinedExcavationCappingAlt1.mxd Date Exported: 11/02/20 by ccabrera



Notes:

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Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Excavate 2 feet and replace 2 feet
- Capped Area (2-foot Cap)
- Side Channel (2-foot Cap) (Flowing Elevation 1275')
- Channel Sloped Setbacks (2-foot Cap)

Replacement and capping material consists of appropriately graded boulder and stream sediment mixture consistent with native material.

Alternative 2 includes up to six hot spot removal locations excavated to a maximum depth of 6-foot with a 20-foot radius.

N W E S

100 0 100

Feet

Seasonal Beach Subarea – Combined Excavation, Replacement, Capping and Side-Channel Construction (Alternative 2)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 4

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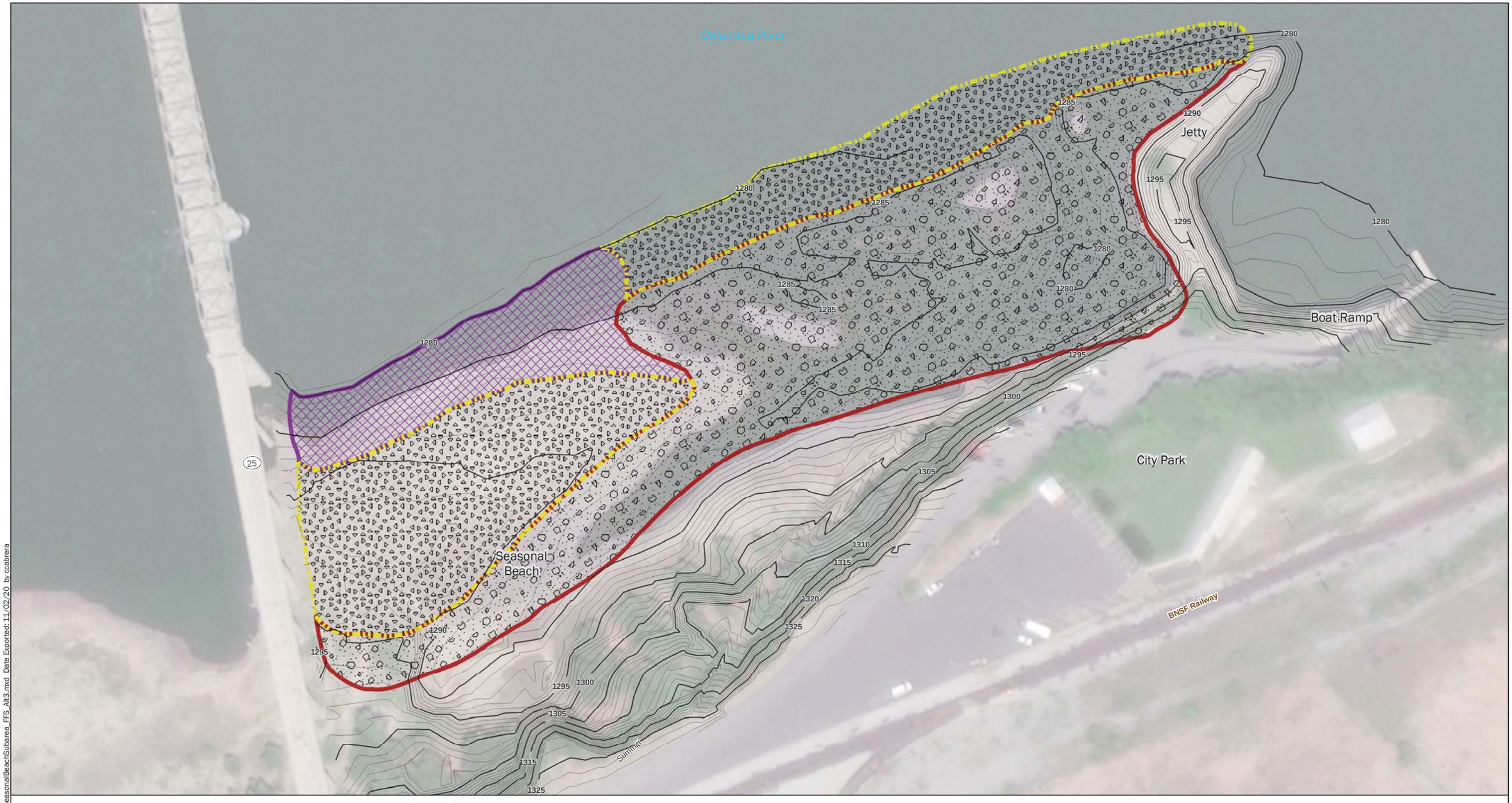

Notes:

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Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Excavate 2 Feet and Replace 2 Feet
- Capped Area (2-foot Cap)
- No Action

Replacement and capping material consists of appropriately graded boulder and stream sediment mixture consistent with native material.

Alternatives 3 includes up to six hot spot removal locations excavated to a maximum depth of 6-foot with a 20-foot radius.

N W E S

100 0 100

Feet

Beach Subarea – Excavation, Cap and No Action (Alternative 3)

Northport Waterfront FFS
Northport, Washington

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Figure 5

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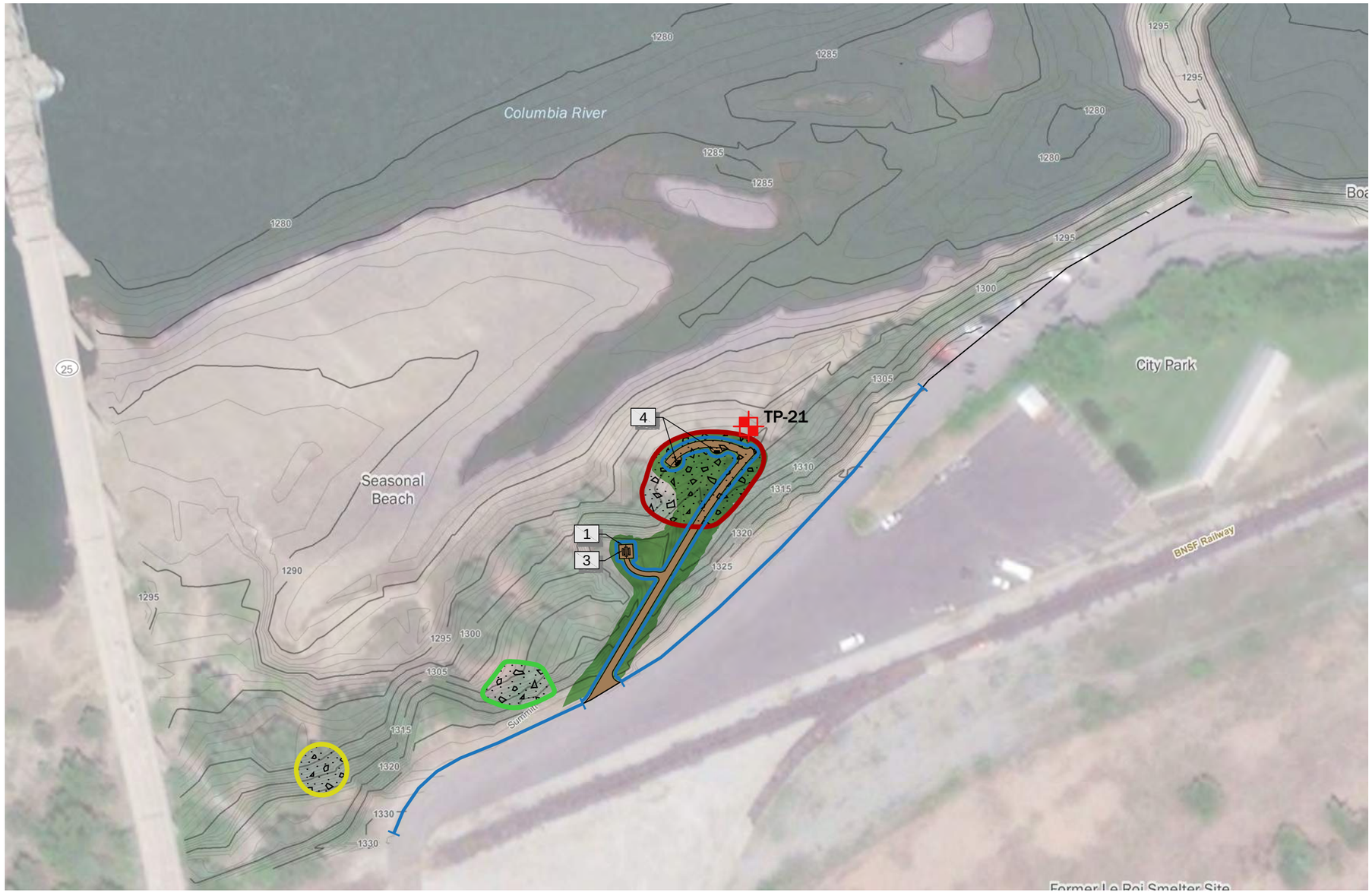

Notes:

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Data Source: Data for trail area, revegetation area and amenities from SPVV Landscape Architects Concept Plan Sheet L-20X

Legend

- Excavate 4 feet and Replace 4 feet
- Excavate 3 feet and Replace 3 feet
- Excavate 2 feet and Replace 2 feet
- 1 Picnic Shelter, 12' x 12'
- 3 Picnic Table
- 4 Bench
- Fencing
- Stabilized Soil Trail/Area (2,513 SF)
- Native Revegetation Area (10,103 SF)
- Test Pit Exploration with RCRA Hazardous Waste Soil

N W E S

100 0 100
Feet

Hillside Upland and Shoreline Subarea – Excavation and Recreation (Alt. 1, 2 and 3)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 6

P:\0\0504160\Graphics_Misc\Northport Hillside Alternate 1B.ai Exported 1/4/21 by spride

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Data Source: Data for trail area, revegetation area and amenities from SPVV Landscape Architects Concept Plan Sheet L-20X

Legend

- Excavate 4 feet and Replace 4 feet
- Excavate 3 feet and Replace 3 feet
- Excavate 2 feet and Replace 2 feet
- 1 Picnic Shelter, 12' x 12'
- 2 ADA Picnic Table
- 3 Picnic Table
- 4 Bench
- Fencing
- Stabilized Soil Trail/Area (3,976 SF)
- Native Revegetation Area (14,163 SF)
- Test Pit Exploration with RCRA Hazardous Waste Soil

N W E S

100 0 100
Feet

Hillside Upland and Shoreline Subarea – Excavation and Recreation (Optional Concept 1)

Northport Waterfront FFS
Northport, Washington

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Figure 7

P:\0 0504160\Graphics_Misc\Northport Hillside RE Concept 1.ai Exported 1/4/21 by spride

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Data Source: Data for trail area, revegetation area and amenities from SPVV Landscape Architects Concept Plan Sheet L-20X

Legend

- Excavate 4 feet and Replace 4 feet
- Excavate 3 feet and Replace 3 feet
- Excavate 2 feet and Replace 2 feet
- 1 Picnic Shelter, 12' x 12'
- 2 ADA Picnic Table
- 3 Picnic Table
- 4 Bench
- 5 Precast Concrete Stairs
- Stabilized Soil Trail/Area (9,348 SF)
- Native Revegetation Area (30,140 SF)
- Test Pit Exploration with RCRA Hazardous Waste Soil
- Fencing

N W E S

100 0 100
Feet

Hillside Upland and Shoreline Subarea – Excavation and Recreation (Optional Concept 2)

Northport Waterfront FFS
Northport, Washington

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Figure 8

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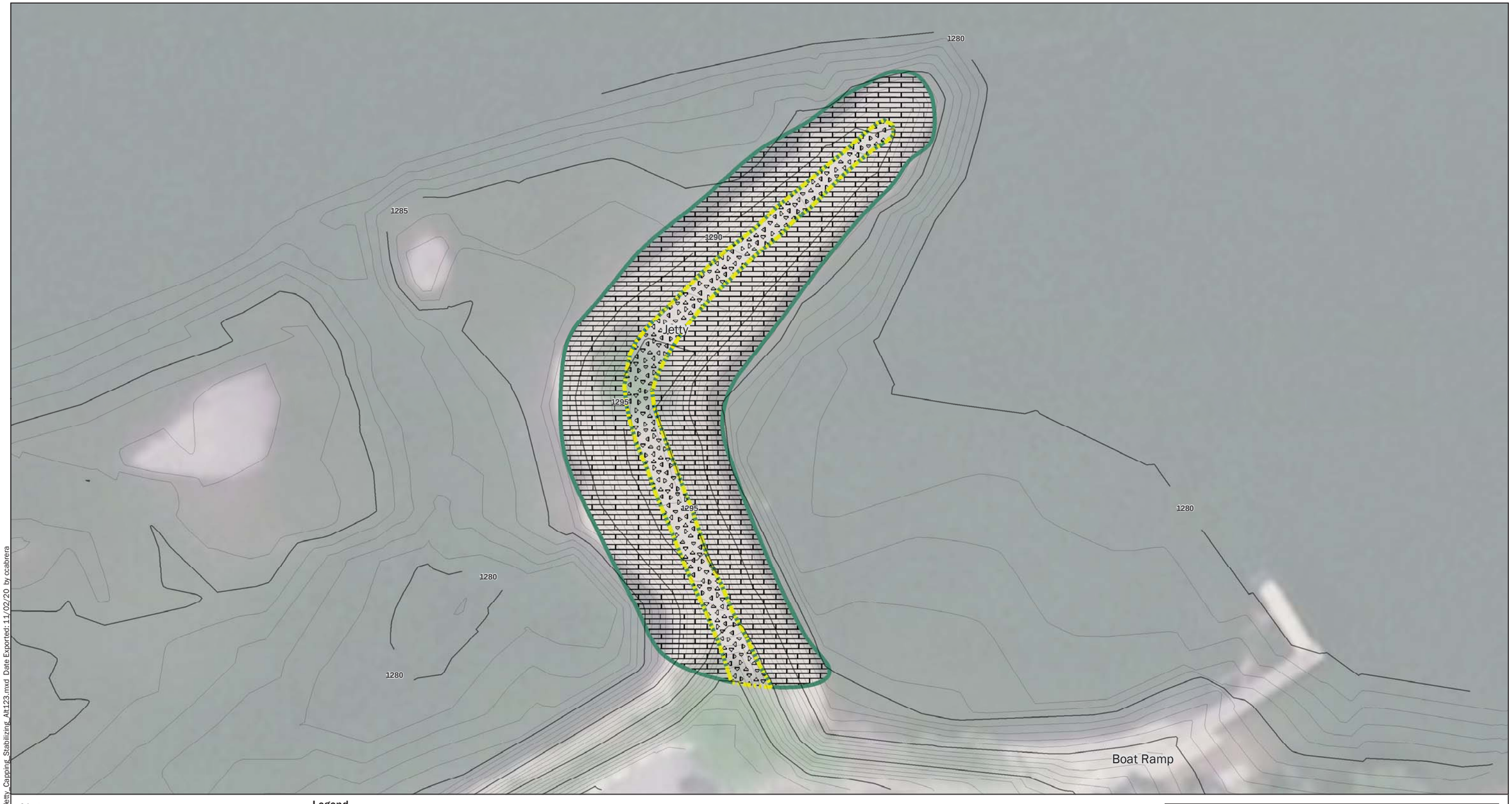

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3. Lead Screening Levels = 250 mg/kg
4. bgs = below ground surface

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Capped Area (2-foot capped)

Stabilized/Armored Area (2-foot keyed into toe of jetty)

Cap area consists of appropriately graded boulder and stream sediment mixture consistent with native material and allows pedestrian traffic.

Stabilizing material consists of a combination of sediment, cobles and boulder types consistent with native material.

N W E S

40 0 40

Feet

Jetty Subarea – Capping and Stabilizing Existing Feature (Alt. 1, 2 and 3)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 9

P:\0\0504160\GIS\MXD\0504160_F09_Jetty_Capping_Stabilizing_Alt123.mxd Date Exported: 11/02/20 by ccabrera

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3. Lead Screening Levels = 250 mg/kg
4. bgs = below ground surface

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Cap with 1.5 feet

Excavate 6 feet and Replace 1.5 feet (Float Dock at 1275')

Replacement and capping material consist of appropriately graded boulder and stream sediment mixture consistent with native material.

N W E S

40 0 40

Feet

Bay and Public Dock Subarea (Alt. 1, 2 and 3)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 10

P:\0\0504160\GIS\MXD\0504160_F10_BayDock_Alt123.mxd Date Exported: 11/02/20 by ccabrera

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3. Lead Screening Levels = 250 mg/kg
4. bgs = below ground surface

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Capped Area (1.5-foot Cap) (Alt. 1, 2 and 3)

Replacement and capping material consist of appropriately graded boulder and stream sediment mixture consistent with native material.

N
W E
S

30 0 30
Feet

Bayshore Subarea Capping (Alt. 1, 2 and 3)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure 11

APPENDICES

GeoEngineers

APPENDIX A
Subarea Scenarios

APPENDIX A. SUBAREA SCENARIOS

The FFS evaluates a range of cleanup scenarios for each subarea. This appendix presents each evaluated scenario for each subarea. As mentioned in Section 2.0, the remediation scenarios presented in this appendix are not included in the three alternatives presented in the body of the FFS. The scenarios included in this appendix are in addition to Alternatives 1 through 3 that are presented in the body of the FFS.

Beach Subarea

Scenario 1 – Maximum Excavation: General Excavation to 4 feet bgs, Selected Excavations to 6 feet bgs, Disposal and Partial Backfill (Figure A-1, Table A-3)

The intent of this scenario is to remove most of the contaminated soil/sediment and slag from the *beach* subarea. The removed material would be replaced with imported fill and/or material obtained from the site. For this scenario, we estimated removal of the upper 4 feet of sediment and soil during a time of year when the river level and flow would be low, which would expose the shoreline in the *beach* subarea to about the 1,280-foot elevation. The approximate area affected by this scenario is 285,600 square feet (sf) [6.56 acres (ac)]. The approximate volume of soil, sediment and slag removed in this scenario is 42,900 cubic yards (cy). This scenario also accounts and provides for up to six select areas (scaled at 40-foot diameter) excavated an additional 2 feet (total 6 feet bgs) to remove potential pockets of deeper contaminated material. The excavated area would be backfilled with about 2 feet of material consisting of cobbles and boulders screened from the excavated material and imported fill consisting of an 80/20 mixture of 12-inch rounded rock and streambed sediment material.

The resulting final sediment surface within the *beach* subarea would be approximately at an elevation of 2 feet less then present-day elevation.

Disposal options for the material removed in this and the other scenarios are discussed in Section 2.7 of the FFS.

The estimated total costs of implementing Scenario 1 range from approximately $6,689,000 to $8,164,000, depending on selected disposal option.

Scenario 2 – Partial Excavation: Reduced Excavation to 2 feet bgs, Selected Excavations to 6 feet bgs, Disposal and Complete Backfill (Figure A-1, Table A-4)

This scenario represents a lower volume estimate for removing contaminated soil/sediment and slag by excavating to about 2 feet bgs. Based on the data generated during the Remedial Investigation, metals were most prevalent and at greater concentrations in the upper 2 feet of the beach and the visible granulated slag was more prevalent in the upper 2 feet of the beach. Excavation to this depth would remove the majority of the sediment that contains metals concentrations exceeding five times the screening level established in the RI. Elements common to Scenario 1 include screening the cobbles and boulders and excavating six select areas up to 6 feet bgs. The excavation would be backfilled to approximately existing grades using the same mixture described in Scenario 1. The approximate area affected by this scenario is 285,600 sf (6.56 ac). The approximate volume of soil, sediment and slag removed in this scenario is 22,300 cy.

The estimated total cost of implementing Scenario 2 ranges from approximately $4,423,000 to $5,189,000.

Scenario 3 – Uniform Capping: 2-foot Uniform Cap (Figure A-1, Table A-5)

This scenario consists of placing a uniform 2-foot cap across the beach area to reduce contact with the contaminated materials during the portions of the year when the beach is exposed. The imported fill used to cap the beach would be the same 80/20 mix used for backfill in Scenarios 1 and 2. This scenario would raise the elevation of the beach, which might make it accessible by walkers for longer portions of the year. It also would reduce water depths. The approximate area capped is 285,561 sf (6.56 ac).

The estimated total cost of implementing Scenario 3 is approximately $1,781,000.

Bay and Public Dock Subarea

Scenario 4 - Bay and Public Dock Subarea – Excavate and Replace: Excavate 2 feet and Replace (Figure A-2, Table A-6)

Scenario 4 consists of excavating 2 feet of fine-grain-dominated contaminated sediment from the bay and replacing it with imported fill consisting of streambed- consistent material. The replacement fill of 2 feet will serve as a cap for the remaining documented contaminated materials. The contaminated sediments would be disposed in the same manner as material removed from the other subareas. The approximate area affected by this scenario is 35,000 sf (0.80 ac). The approximate volume of contaminated sediment removed from the bay is 2,600 cy.

The estimated total cost of implementing Scenario 4 ranges from approximately $443,000 to $532,000, depending on the selected disposal option.

Scenario 5 – Capping (Figure A-2, Table A-6)

Instead of removing material from the bay, this scenario consists of placing approximately 1½ feet of imported streambed sediment material as a cap to reduce exposure to the contaminated sediments. The volume estimate includes the area near the dock, which ultimately might need to be avoided so as not to impede boating operations. The approximate area affected by this scenario is 35,000 sf (0.80 ac). The approximate volume of the imported capped material is 2,600 cy.

The estimated total cost of implementing Scenario 5 is approximately $124,000.

Scenario 6 – Modified Scenario 4 with Deep Excavation (Figure A-3, Table A-7)

Scenario 6 is a modified version of Scenario 4 (remove and replace 2 feet of contaminated sediment) by excavating the area around the dock to 6 feet bgs. The deeper portion of the excavations would still be replaced with 2 feet of imported streambed sediment material to ensure a clean sediment interface and address potential residual contamination. The deeper excavation around the dock would add 4 feet of depth and improve boat access at the dock, especially during periods of low water. The approximate area affected by this scenario is 35,000 sf (0.80 ac). The approximate volume of contaminated sediment removed from the bay is 43,600 cy.

The estimated total cost of implementing Scenario 6 ranges from approximately $537,000 to $660,000, depending on the selected disposal option.

Bayshore

Scenario 7 - Excavation and Replacement (Figure A-4, Table A-8)

Scenario 7 consists of excavating 2 feet of soil and replacing the removed soil with 2 feet of imported fill matching the riverine compatible material as used in the other capping scenarios. The area excavated and replaced is between the boat launch and approximately the RI sample location XRF-96. This area is accessible for public use during lower river levels. Removal and replacement of soil will reduce the risk of contact with any contaminated soil left in place and improve recreational shoreline access. Contaminated soil will be disposed in the same manner as the scenarios selected for the other subareas. The approximate area affected by this scenario is 13,300 sf (0.31 ac). The approximate volume of contaminated sediment removed in this scenario is 1,000 cy. Other quantity scenarios were evaluated for the Bayshore and a lesser quantity could be excavated/replaced at a lower cost.

The estimated cost to implement this alternative ranges from approximately $161,000 to $195,000, depending on the selected disposal option.

Table A-1

Scenario Details

Northport Waterfront Focused Feasibility Study

Northport, Washington

Subarea	Alternative	Figure	Table	Description
Seasonal Beach	Scenario 1. Maximum Excavation	Figure A-1	Table A-3	Excavate area wide and remove soil to a depth of 4 ft. Replace with 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Assumes up to six select removal locations with 20 ft radius to depths of 6 ft based on visual granular slag observations or contaminant concentrations.
	Scenario 2. Partial Excavation	Figure A-2	Table A-4	Excavate area wide and remove soil to a depth of 2 ft. Replace with 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material. Assumes up to six select removal locations with 20 ft radius to depths of 6 ft based on visual granular slag observations or contaminant concentrations.
	Scenario 3. Uniform Capping	Figure A-3	Table A-5	Uniform capping area wide (from ~1280 to 1300' elevation). Cap will consist of 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material.
Bay and Public Dock	Scenario 4. Excavate and Replace	Figure A-4	Table A-6	Excavate 2 ft and replace with 2 ft of streambed sediment material.
	Scenario 5. Cap Only			Cap existing conditions with 2 ft of 80/20 mixture of 12-inch rounded rock and streambed sediment material.
	Scenario 6. Modification for Previous Options	Figure A-5	Table A-7	Modification to Alternative 9. Excavation of 6 feet around public dock to increase low-water draft. Replace with 2 ft deep streambed sediment material. Dock floated to about 1275'.
Bayshore	Scenario 7. Removal and Replacement	Figure A-6	Table A-8	Remove 2 ft and replace 2 ft. Action only taken from Launch to XRF96 station.

Table A-2

Scenario Quantities

Northport Waterfront Focused Feasibility Study

Northport, Washington

SubArea	Alternative	Excavation			Select Excavation			Backfill/Replace			Cap		
		Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)	Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)	Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)	Area (Square Feet)	Depth (Feet)	Volume (Cubic Yard)
Seasonal Beach	Scenario 1. Maximum Excavation	285,561	4	42,305	7,542	2	559	285,561	2	21,711	--	--	--
	Scenario 2. Partial Excavation	285,561	2	21,153	7,542	4	1,117	285,561	2	22,270	--	--	--
	Scenario 3. Uniform Capping	--	--	--	--	--	--	--	--	--	285,561	2	21,153
Bay and Public Dock	Scenario 4. Excavate and Replace	34,969	2	2,590	--	--	--	34,969	2	2,590	--	-	--
	Scenario 5. Cap Only	--	--	--	--	--	--	--	--	--	34,969	2	2,590
	Scenario 6. Modification of Excavation/Capping	28,323	2	2,098	--	--	--	34,969	2	2,590	--	--	--
		6,646	6	1,477	--	--	--				--	--	--
Bayshore	Scenario 7. Removal and Replacement	13,305	2	986	--	--	--	13,305	2	986	--	--	--

Table A-3

Seasonal Beach Subarea

Scenario 1. Maximum Excavation

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Engineering Design / Work Plan / Project Management				
Engineering / design / work plan / project management	lump sum	$500,000	1	$500,000
Permitting	lump sum	$37,000	1	$37,000
			Sub-Total	**$537,000**
Observation[4] / Confirmation Sampling[5] / Reporting / Surveying				
Construction Observation and Documentation	per day	$1,800	40	$72,000
Confirmation Sampling	per sample	$260	100	$26,000
Remedial Action Report	lump sum	$40,000	1	$40,000
Final As-built Survey	lump sum	$5,000	1	$5,000
			Sub-Total	**$143,000**
Temporary Erosion and Sediment Control (TESC)				
Temporary erosion sediment control	lump sum	$5,000	1	$5,000
			Sub-Total	**$5,000**
Contaminated Soil Excavation and Replacement[6,7]				
Mobilize / demobilize equipment	lump sum	$100,000	1	$100,000
Haul road improvement (site access)	liner feet	$5.00	500	$2,500
Excavate contaminated soil and stockpile	cubic yard	$5.60	42,864	$240,038
Import streambed sediment material (replacement fill)	cubic yard	$49.00	4,342	$212,771
Import 12-inch cobble material (replacement fill)	cubic yard	$38.00	17,369	$660,025
Place, grade and compact import fill (replacement fill)	cubic yard	$6.75	21,711	$146,552
			Sub-Total	**$1,361,886**
Engineering Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement Sub-Total				**$2,046,886**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport	cubic yard	$3.50	42,864	$150,024
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[8]	$29.00	68,582	$1,988,890
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[8]	$36.50	68,582	$2,503,258

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)				**$4,642,171**
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport	cubic yard	$3.50	42,864	$150,024
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[8]	$12.00	68,582	$822,989
Disposal fees (non-RCRA) at Stevens County Landfill	ton[8]	$75.00	68,582	$5,143,680
Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)				**$6,116,693**
Engineering Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement Sub-Total				**$2,046,886**
Total Estimated Costs for Beach Subarea Scenario 1. with Option 1. (Soil Disposal at Waste Management's Graham Road Facility)				**$6,689,057**
Total Estimated Costs for Beach Subarea Scenario 1. with Option 2. (Soil Disposal at Stevens County Landfill)				**$8,163,578**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Estimated costs are considered to be within a margin of +/- 20 percent.

[3]Refer to Table A-2 for assumptions used to generate material quantities.

[4]Observation and documentation assumes field screening with XRF equipment and project construction duration of 40 days.

[5]Confirmation sampling assumes up to 100 samples collected and tested for Target Analyte List metals.

[6]Represented by areas shown on Figure A-1 and Table A-2. Includes up to six hot spot removals to a depth of 6 feet below ground surface

[7]Assumes $100k for mobilization and demobilization; likely 10% of contractor cost.

[8]Conversion to tons is 1.6 multiplied by cubic yards.

Table A-4

Seasonal Beach Subarea

Scenario 2. Partial Excavation

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Engineering Design / Work Plan / Project Management				
Engineering / design / work plan / project management	lump sum	$500,000	1	$500,000
Permitting	lump sum	$37,000	1	$37,000
			Sub-Total	**$537,000**
Observation[4] / Confirmation Sampling[5] / Reporting / Surveying				
Construction Observation and Documentation	per day	$1,800	40	$72,000
Confirmation Sampling	per sample	$260	100	$26,000
Remedial Action Report	lump sum	$40,000	1	$40,000
Final As-built Survey	lump sum	$5,000	1	$5,000
			Sub-Total	**$143,000**
Temporary Erosion and Sediment Control (TESC)				
Temporary erosion sediment control	lump sum	$5,000	1	$5,000
			Sub-Total	**$5,000**
Contaminated Soil Excavation[6,7]				
Mobilize / demobilize equipment	lump sum	$100,000	1	$100,000
Haul road improvement (site access)	liner feet	$5.00	500	$2,500
Excavate contaminated soil and stockpile	cubic yard	$6.75	22,270	$150,323
Transport streambed sediment material (replacement fill)	cubic yard	$49.00	4,454	$218,246
Transport 12-inch cobble material (replacement fill)	cubic yard	$38.00	17,816	$677,008
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	22,270	$167,025
			Sub-Total	**$1,315,102**
Engineering Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement Sub-Total				**$2,000,102**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport	cubic yard	$4.00	22,270	$89,080
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[8]	$29.00	35,632	$1,033,328
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[8]	$36.50	35,632	$1,300,568

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)				**$2,422,976**
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport	cubic yard	$4.00	22,270	$89,080
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[8]	$12.00	35,632	$427,584
Disposal fees (non-RCRA) at Stevens County Landfill	ton[8]	$75.00	35,632	$2,672,400
Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)				**$3,189,064**
Engineering Design / Sampling / Reporting / TESC / Contaminated Soil Excavation and Replacement Sub-Total				**$2,000,102**
Total Estimated Costs for Beach Subarea Scenario 2. with Option 1. (Soil Disposal at Waste Management's Graham Road Facility)				**$4,423,078**
Total Estimated Costs for Beach Subarea Scenario 2. with Option 2. (Soil Disposal at Stevens County Landfill)				**$5,189,166**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Estimated costs are considered to be within a margin of +/- 20 percent.

[3]Refer to Table A-2 for assumptions used to generate material quantities.

[4]Observation and documentation assumes field screening with XRF equipment and project construction duration of 40 days.

[5]Confirmation sampling assumes up to 100 samples collected and tested for Target Analyte List metals.

[6]Represented by areas shown on Figure A-2 and Table A-2. Includes up to six hot spot removals to a depth of 6 feet below ground surface

[7]Assumes $100k for mobilization and demobilization; likely 10% of contractor cost.

[8]Conversion to tons is 1.6 multiplied by cubic yards.

Table A-5

Seasonal Beach Subarea

Scenario 3. Uniform Capping

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Engineering Design / Work Plan / Project Management				
Engineering / design / work plan / project management	lump sum	$500,000	1	$500,000
Permitting	lump sum	$37,000	1	$37,000
			Sub-Total	**$537,000**
Observation[4] / Confirmation Sampling[5] / Reporting / Surveying				
Construction Observation and Documentation	per day	$1,800	40	$72,000
Confirmation Sampling	per sample	$260	40	$10,400
Remedial Action Report	lump sum	$40,000	1	$40,000
Final As-built Survey	lump sum	$5,000	1	$5,000
			Sub-Total	**$127,400**
Temporary Erosion and Sediment Control (TESC)				
Temporary erosion sediment control	lump sum	$5,000	1	$5,000
			Sub-Total	**$5,000**
Contaminated Soil Excavation and Capping[6]				
Mobilize / demobilize equipment	lump sum	$100,000	1	$100,000
Haul road improvement (site access)	liner feet	$5.00	500	$2,500
Import streambed sediment material (20% cap)	cubic yard	$49.00	4,231	$207,299
Import 12-inch cobble material (80% cap)	cubic yard	$38.00	16,922	$643,051
Place, grade and compact import fill (replacement fill)	cubic yard	$7.50	21,153	$158,645
			Sub-Total	**$1,111,496**
			Total Estimated Costs for Beach Subarea Scenario 3.	**$1,780,896**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Estimated costs are considered to be within a margin of +/- 20 percent.

[3]Refer to Table A-2 for assumptions used to generate material quantities. Area represented by Figure A-1.

[4]Observation and documentation assumes field screening with XRF equipment and project construction duration of 40 days.

[5]Confirmation sampling assumes up to 40 samples collected and tested for Target Analyte List metals.

[6]Assumes $100k for mobilization and demobilization; likely 10% of contractor cost.

Table A-6

Bay and Public Dock Subarea

Scenarios 4 and 5. Excavate and Replace and Cap Only

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Scenario 4. Contaminated Soil Excavation and Replacement[4]				
Excavate contaminated soil and stockpile	cubic yard	$5.60	2,590	$14,506
Import streambed sediment material (replacement fill)	cubic yard	$49.00	2,590	$126,925
Place, grade and compact import fill and/or screened material (replacement fill)	cubic yard	$7.50	2,590	$19,427
			Sub-Total	**$160,857**
Scenario 5. Contaminated Soil Capping[4]				
Import streambed sediment material	cubic yard	$49.00	518	$25,385
Import 12-inch cobble material	cubic yard	$38.00	2,072	$78,745
Place, grade and compact imported cap materials	cubic yard	$7.50	2,590	$19,427
			Sub-Total	**$123,557**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport	cubic yard	$4.00	2,590	$10,361
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[5]	$29.00	4,144	$120,190
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[5]	$36.50	4,144	$151,273
			Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)	**$281,824**
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport	cubic yard	$4.00	2,590	$10,361
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[5]	$12.00	4,144	$49,734
Disposal fees (non-RCRA) at Stevens County Landfill	ton[5]	$75.00	4,144	$310,836
			Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)	**$370,930**
			Scenario 4. Contaminated Soil Excavation and Replacement Subtotal	**$160,857**
			Scenario 5. Contaminated Soil Capping Subtotal	**$123,557**

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Total Estimated Costs for Inbayment of Jetty and Public Dock Subarea Scenario 4. with Option 1. (Soil Disposal at Waste Management's Graham Road Facility)				**$442,682**
Total Estimated Costs for Inbayment of Jetty and Public Dock Subarea Scenario 4. with Option 2. (Soil Disposal at Stevens County Landfill)				**$531,788**
Total Estimated Costs for Inbayment of Jetty and Public Dock Subarea Scenario 5 (No Soil Disposal)				**$123,557**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Estimated costs are considered to be within a margin of +/- 20 percent.

[3]Refer to Table A-2 for assumptions used to generate material quantities.

[4]Represented by areas shown on Figure A-3 and Table A-2.

[5]Conversion to tons is 1.6 multiplied by cubic yards.

Table A-7

Bay and Public Dock Subareas

Scenario 6. Modification for Previous Options

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Scenario 6. Contaminated Soil Excavation and Replacement[4]				
Excavate contaminated soil and stockpile	cubic yard	$6.75	3,575	$24,131
Transport streambed sediment material (replacement fill)	cubic yard	$49.00	518	$25,385
Transport 12-inch cobble material (replacement fill)	cubic yard	$38.00	2,072	$78,745
Place, grade and compact import fill and/or screened material (replacement fill)	cubic yard	$7.50	2,590	$19,427
			Sub-Total	**$147,688**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport	cubic yard	$4.00	3,575	$14,300
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[5]	$29.00	5,720	$165,875
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[5]	$36.50	5,720	$208,774
			Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)	**$388,948**
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport	cubic yard	$4.00	3,575	$14,300
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[5]	$12.00	5,720	$68,638
Disposal fees (non-RCRA) at Stevens County Landfill	ton[5]	$75.00	5,720	$428,987
			Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)	**$511,924**
			Scenario 6. Contaminated Soil Excavation and Replacement Subtotal	**$147,688**
			Total Estimated Costs for Inbayment of Jetty and Public Dock Subarea Scenario 6. with Option 1. (Soil Disposal at Waste Management's Graham Road Facility)	**$536,636**
			Total Estimated Costs for Inbayment of Jetty and Public Dock Subarea Scenario 6. with Option 2. (Soil Disposal at Stevens County Landfill)	**$659,612**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Estimated costs are considered to be within a margin of +/- 20 percent.

[3]Refer to Table A-2 for assumptions used to generate material quantities.

[4]Represented by areas shown on Figure A-4 and Table A-2.

[5]Conversion to tons is 1.6 multiplied by cubic yards.

Table A-8

Bayshore Subarea

Scenario 7. Removal and Replacement

Northport Waterfront Focused Feasibility Study

Northport, Washington

Scope Item	Unit	Unit Cost[1, 2]	Quantity[3]	Extended
Scenario 7. Contaminated Soil Excavation and Replacement[4]				
Excavate contaminated soil and stockpile	cubic yard	$6.75	986	$6,653
Transport streambed sediment material (replacement fill)	cubic yard	$49.00	197	$9,658
Transport 12-inch cobble material (replacement fill)	cubic yard	$38.00	788	$29,961
Place, grade and compact import fill and/or screened material (replacement fill)	cubic yard	$7.50	986	$7,392
			Sub-Total	**$53,664**
Disposal Options:				
Option 1. Disposal at Waste Management's Graham Road Facility				
Load stockpiled soil for transport	cubic yard	$4.00	986	$3,942
Transport contaminated (non-RCRA) soil to Waste Management's Graham Road Landfill	ton[5]	$29.00	1,577	$45,730
Disposal fees (non-RCRA) at Waste Management's Graham Road Landfill	ton[5]	$36.50	1,577	$57,556
			Disposal Option 1. Sub-Total (Soil Disposal at Waste Management's Graham Road Facility)	**$107,228**
Option 2. Disposal at Stevens County Landfill				
Load stockpiled soil for transport	cubic yard	$4.00	986	$3,942
Transport contaminated (non-RCRA) soil to Stevens County Landfill	ton[5]	$12.00	1,577	$18,923
Disposal fees (non-RCRA) at Stevens County Landfill	ton[5]	$75.00	1,577	$118,267
			Disposal Option 2. Sub-Total (Soil Disposal at Stevens County Landfill)	**$141,132**
			Scenario 7. Contaminated Soil Excavation and Replacement Subtotal	**$53,664**
			Total Estimated Costs for Bayshore Subarea Scenario 7. with Option 1. (Soil Disposal at Waste Management's Graham Road Facility)	**$160,892**
			Total Estimated Costs for Bayshore Subarea Scenario 7. with Option 2. (Soil Disposal at Stevens County Landfill)	**$194,795**

Notes:

[1]Cost estimated from construction cost estimates solicited from applicable vendors and contractors, review of actual costs incurred during similar, applicable projects and professional judgment.

[2]Estimated costs are considered to be within a margin of +/- 20 percent.

[3]Refer to Table A-2 for assumptions used to generate material quantities.

[4]Represented by areas shown on Figure A-5 and Table A-2.

[5]Conversion to tons is 1.6 multiplied by cubic yards.

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

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Maximum excavation to 4 feet and replace 2 feet (Scenario 1)
Excavation 2 feet and replace 2 feet (Scenario 2)
Cap with 2 feet (Scenario 3)

Replacement and capping material consists of appropriately graded boulder and stream sediment mixture consistent with native material.

Scenarios 1 and 2 include up to six hot spot removal locations excavated to a maximum depth of 6-foot with a 20-foot radius.

N W E S

100 0 100
Feet

Seasonal Beach Subarea - Maximum Excavation, Partial Excavation and Uniform Capping (Scenarios 1, 2 and 3)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure A-1

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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Lead Screening Levels = 250 mg/kg
4. bgs = below ground surface

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Excavate 2 feet and Replace 2 feet (Scenario 4)
Capped area (Scenario 5)

Replacement and capping material consist of appropriately graded boulder and stream sediment mixture consistent with native material.

N
W E
S

40 0 40
Feet

Bay and Public Dock Subarea – Excavation and Replacement (Scenario 4) and Capping (Scenario 5)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure A-2

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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Lead Screening Levels = 250 mg/kg
4. bgs = below ground surface

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

- Excavate 2 feet and Replace 2 feet
- Excavate 6 feet and Replace 2 feet (Float Dock at 1275')

Replacement and capping material consist of appropriately graded boulder and stream sediment mixture consistent with native material.

N W E S

40 0 40
Feet

Bay and Public Dock Subarea (Scenario 6)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure A-3

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Notes:
1. The locations of all features shown are approximate.
2. This drawing is for information purposes. It is intended to assist in showing features discussed in an attached document. GeoEngineers, Inc. cannot guarantee the accuracy and content of electronic files. The master file is stored by GeoEngineers, Inc. and will serve as the official record of this communication.
3. Lead Screening Levels = 250 mg/kg
4. bgs = below ground surface

Data Source: ESRI.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

Legend

Excavate 2 feet and Replace 2 feet (Scenario 7)

Replacement and capping material consist of appropriately graded boulder and stream sediment mixture consistent with native material.

N W E S

30 0 30

Feet

Bayshore Subarea – Removal and Replacement (Scenario 7)

Northport Waterfront FFS
Northport, Washington

GeoEngineers

Figure A-4

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APPENDIX B
Hydraulic Analysis Memorandum dated July 10, 2020

GeoEngineers

523 East Second Avenue, Spokane, Washington 99202, Telephone: 509.363.3125, Fax: 509.747.2250 www.geoengineers.com

Memorandum

To:	John Roland, Washington State Department of Ecology
From:	Ryan S. Carnie, PE; Scott H. Lathen, PE; Bruce D. Williams
Date:	July 10, 2020
File:	0504-160-02
Subject:	Northport Waterfront Focused Feasibility Study, Hydraulic Analysis

1.0 INTRODUCTION

This memorandum presents a summary of hydraulic considerations associated with alternative scenarios proposed to address the metals-contaminated soil, sediment and slag located at the Northport Waterfront site (herein designated as the site), as shown in Vicinity Map, Figure 1. GeoEngineers, Inc. (GeoEngineers) has prepared this memorandum for the Washington State Department of Ecology (Ecology) under Ecology Master Contract No. C1900044, work assignment number GEI025. John Roland, Ecology project manager, contributed to this analysis, to align it with overall project steps and needs. Ecology will use this memorandum to inform data collection and final selection of hydraulic analyses to inform remediation alternatives evaluation and design development.

1.1. Alternative Scenarios

Several remedial alternatives presented in the Northport Waterfront Remediation Alternatives memorandum prepared by GeoEngineers dated April 30, 2020, propose sediment replacement or modifications to subareas that, if implemented, will benefit from hydraulic analysis. In an abundance of caution this analysis considers that the overall cleanup of sediments could also theoretically result in measurable effects on hydraulic conditions to the main flow channel of the Columbia River upstream, through and immediately downstream of the subareas. The subareas and alternatives under consideration include:

- The Beach Subarea, including all removal scenarios, all capping scenarios and grading a permanent river channel through the beach;
- The Jetty Subarea, including the capping scenario and the jetty extension scenario;
- The Bay Subarea, including material removal and capping; and
- The Bayshore Subarea, including material removal and capping.

Scenarios considered for the above-listed remedial alternatives involve modifications to channel bank materials and potentially channel cross sections, which may lead to channel response such as localized sediment transport changes, and localized variable hydraulic conditions including velocity and depth. Therefore, a list of data acquisition options and considerations are discussed to better inform remedial alternative analyses or design. This initial evaluation considers engineering design and permitting obligations such as regulatory flood and floodplain concerns, infrastructure and potential recreational facility impacts. In addition, hydraulic analysis is useful in evaluating alternative scenario effectiveness and stability.

1.2. Channel Response Considerations

These above-listed remedial alternative scenarios each propose a replacement or modification to the channel section and channel bank material. Depending on the Subarea, consideration of certain potential secondary effects will inform the alternative selection process.

1.2.1. Beach Subarea

The Beach Subarea is the nearshore area located between the Highway 25 bridge, the hillside, the main channel of the Columbia River and the jetty. It is underwater part of the year and fully dry other parts of the year. The surface material primarily consists of sand and cobbles. Based on all site data, this area exhibits the highest energy, flow velocities and variability. Remediation alternatives under consideration for the Beach Subarea include excavation of sediments and slag at various amounts and replacement with imported material; capping contaminants to various levels; and grading a more prominent side channel into and out of the area (from and to the river main channel). The side channel concept would likely be designed as a quasi-perennial channel and would convey water throughout a greater period of the year.

A poorly formed side flow channel already essentially exists seasonally when the Beach Subarea floods due to higher river flows. But, an alternative that may consider more pronounced modifications to the topography/ bathymetry and material gradation within the Beach Subarea is expected, while low, to have the highest theoretical potential for measurable effects on the main channel downstream toward the Highway 25 bridge or to project-area base flood elevation. Therefore, for this subarea hydraulic analyses incorporating the adjacent main channel of the River is advised to assess base flood elevation changes, material stability and any potential for scour at the bridge supports.

Hydraulic analysis of a permanent enhanced side channel alternative will also be informed most effectively by hydraulic modeling to identify inundation throughout an annual hydrologic period, channel design depth and geometry, and to further assess appropriate channel material stability conditions. Modifying the flow patterns through the project site by constructing a side channel capable of flow over a broader range of water level and flow conditions will likely require enhanced design sensitivities and potentially locally alter shear stress and hydraulic gradients as the enhanced side channel flow re-enters the main reach.

1.2.2. Jetty Subarea

The Jetty Subarea includes the manmade jetty located near the boat launch that provides calmer water for boat access to the Columbia River. Remediation alternatives proposed for the Jetty Subarea focus on capping/armoring improvements and potential exploration of minor modifications that could enhance performance. These could include assessing potential benefits to the performance of preferred Beach Subarea alternatives and further reducing recontamination potential within the project area due to slag continually remobilizing within the river from sources near the town of Trail, British Columbia located upstream of the project area.

A hydraulic modeling analysis that incorporates the main flow of the River in the immediate vicinity is recommended to principally assess material stability and potential sediment distribution projections in and around the jetty and boat launch, if modifications are significant. Modification to the jetty geometry may alter hydraulic conditions of the Jetty, Beach and Bay subareas. Therefore, the hydraulic analysis is advised to incorporate the main flow of the channel to account for interactive effects.

1.2.3. Bay Subarea

The Bay Subarea is the nearshore area located between the jetty and the boat ramp. The area also includes the floating boat dock and ramp. The surface material consists of finer-grained sediments deposited between the jetty and the boat ramp. Hydraulics and sediment deposition are significantly controlled by the jetty. Remediation alternatives proposed for the Bay Subarea include excavation of contaminants and replacement with imported compatible, stable materials. Remediation alternatives also are being advanced to included capping of sediments without excavation in the reduced excavation scenario.

Hydraulic changes due to moderate modifications to the topography/bathymetry and material gradation within the Bay Subarea will be limited due to the presence of the jetty. Inclusion of this Subarea within a site-oriented hydraulic model of the river in this reach is recommended to assess material stability and interactions with the Jetty Subarea.

1.2.4. Bayshore Subarea

The Bayshore Subarea includes the boat launch pad and includes the narrow bank of shoreline located northeast (upstream) of the boat launch. The Bayshore Subarea includes exposed sediment at the base of the steep riverbank hillside. Remediation alternatives under evaluation for the Bayshore Subarea include excavation of contaminants and replacement with clean imported material. Remediation alternatives also included capping contaminants without excavation in the reduced excavation scenario.

Hydraulic impacts due to modifications to the topography/bathymetry and material gradation within the Bayshore Subarea will be limited due to the presence of the jetty and the inherent low energy of the area.

2.0 DATA ACQUISITION

Evaluation of the various alternative scenarios can be best based on a common set of physical data and an understanding of regulatory requirements. This includes an understanding and integration of existing channel conditions, existing data (e.g., Doppler, bathymetry, etc.) and existing modeling information.

2.1. Elevation Data

The State of Washington Department of Natural Resources maintains publicly available light detection and ranging (LiDAR) digital elevation models for the project reach. Because LiDAR data does not include channel bathymetric data below the water surface, we recommend the acquisition of all existing bathymetric topographic data to ensure it is adequate for advancing a tailored model to the Project Area.

2.2. Physical Site Data

The performance of the proposed alternative scenarios is dependent on fluvial geomorphic conditions at both the local scale and secondarily at the reach scale. The hydraulics of the Columbia River near the project site and along the adjacent main-channel reach are affected by the existence of the Northport Bridge downstream and the Northport Waterfront Site.

Hydraulic modeling will include the calculation of high flow water surface elevations and will be used to identify the geomorphic class of the river. Evaluating as built and design documents for the bridge to evaluate material

gradation and qualities also may be beneficial. Site observations support establishing a comprehensive understanding of the river hydraulics and geomorphic conditions.

2.3. Regulatory Data

The Columbia River is within a regulatory special flood hazard area (SFHA) and the proposed alternatives are within a Zone AE floodplain. Therefore, local floodplain ordinances can be reviewed to determine if there are requirements involving a no-rise determination for the placement of fill within the floodplain and within the floodway. Other Joint Aquatic Resource Permit Application (JARPA) and associated US Army Corps of Engineers Section 404 for disturbances within the ordinary high-water mark requirements can be reviewed to further refine modeling objectives. Washington State Department of Transportation bridge factors also can be clarified further, as noted previously.

3.0 HYDROLOGIC AND HYDRAULIC ANALYSES

The upper Columbia River is a principally stable channel morphology, as is the conditions at the project site. Upstream dams have drastically reduced active natural sediment load. Review of the existing geomorphic function of the reach and anticipated performance of feasible alternatives inform final alternative selection and design. The results of the proposed conditions analyses also can be used to better quantify anticipated performance of each criteria and will identify potential factors to consider associated with each.

3.1. Hydrology

Streamflow gauging data for the Columbia River is available. A hydrologic analysis routinely incorporates utilizing United States Geological Survey (USGS) gage data on the Columbia River and a statistical analysis to calculate peak recurrence interval discharge values, including the 2-year (bankfull) and 100-year flood recurrence interval discharge to assist in project-focused modeling. The project reach is located upstream of Grand Coulee Dam and is within the impacted backwater during portions of the year. Therefore, during those months (typically summer) hydraulic boundary conditions and flow conditions are dependent on dam operations. An assessment of dam operations will inform hydraulic modeling for specific discharge events necessary to identify alternative impacts. Previous modeling data and reports in the river near the project area is anticipated to support such analyses.

3.2. Hydraulic Analysis

A hydraulic analysis of the project and adjacent reach is recommended to evaluate focused reach-wide hydraulic conditions and detailed characteristics at each subarea to best evaluate the feasibility of project alternatives, design demands and to estimate the effects of project alternatives on water surface elevations, flow velocities and as input to evaluation of geomorphic channel response.

GeoEngineers proposes that a one-dimensional (1D) hydraulic model may be adequate to evaluate flow and water level conditions at the project subareas. While a 2D model is more accurate at estimating local flow conditions and sediment response than a 1D model, it principally depends on having access to high-resolution bathymetric data with suitable for ground surface model development for the adjacent Columbia River main channel. Such optimizing data may not be adequately available and/or costly to produce. Therefore, we suggest a 1D model to inform alternative selection through the Focused Feasibility Study (FFS) process. The hydraulic model will be based on a foundation of accurate elevation data to reduce model uncertainty. The recommended

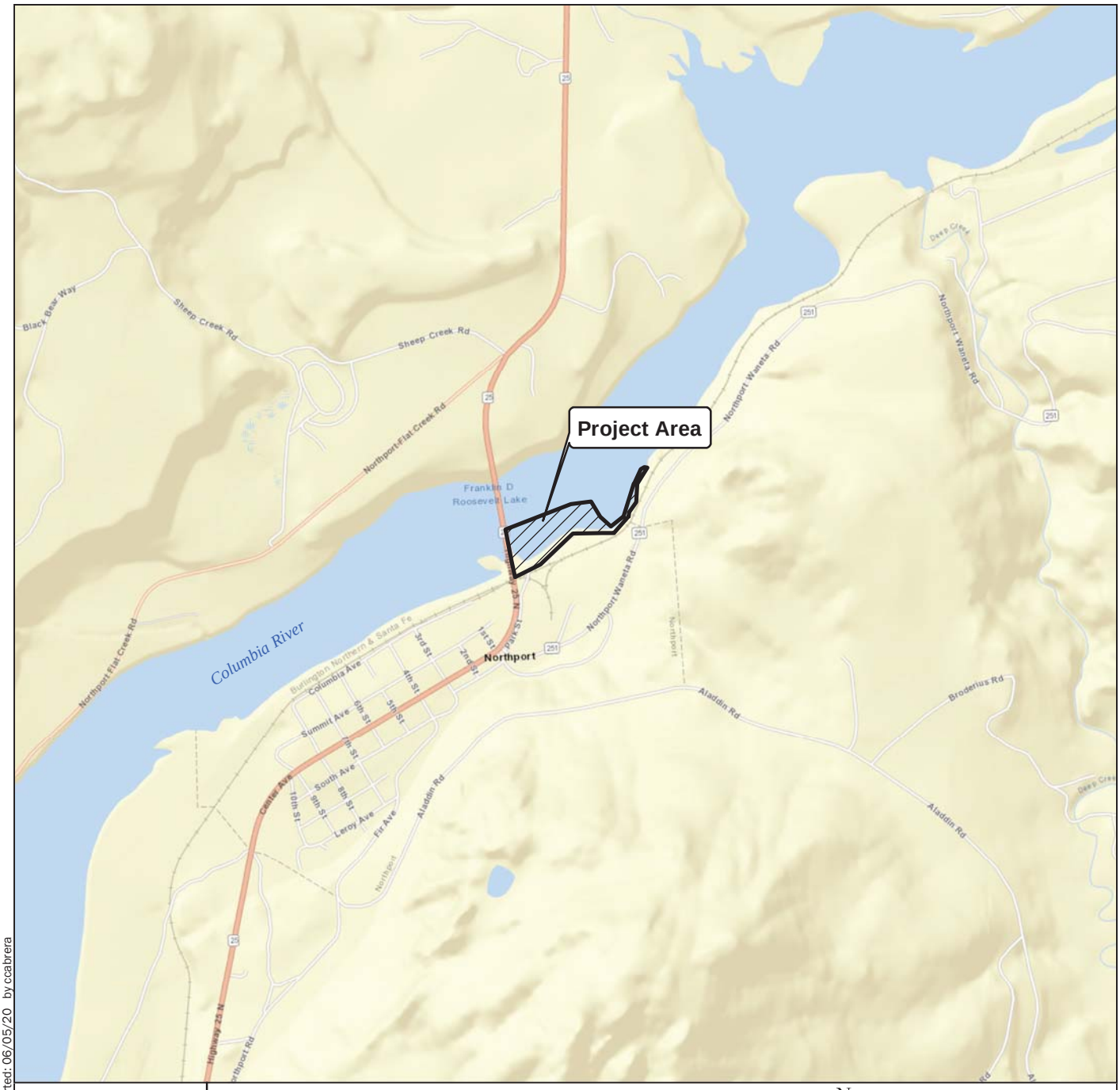
approach to developing the 1D model is to acquire cross-sectional bathymetric survey data as available and merge it with any available LiDAR terrestrial survey data.

GeoEngineers suggests at a minimum running the hydraulic model, once configured, for a range of discharges, such as the 2-year , 50-year and 100-year return period discharges that will be calculated through the hydrologic analysis described above. Because the subareas are impacted by the operation of the Grand Coulee Dam, calculating the 100-year discharge and resulting hydraulic conditions, including water surface elevation may be based on documented dam operations rather than gage data and standard hydraulic model techniques. For assessment of material stability associated with infrastructure such as bridge pier scour countermeasures and jetty stabilization subject to the 100-year discharge or greater, we recommend identifying the worst case scenario considering both a gage analysis and an assessment of dam operation. For assessments of habitat benefit and recreational use, we also recommend consideration of dam operations to inform alternative selection. Model runs for the existing conditions can be the starting point for subsequent analyses. We recommend the models provide estimates of channel velocities, stream power and shear stress for use in the geomorphic analysis and evaluation of water supply concepts.

3.3. Geomorphic Assessment Subarea Response

A geomorphic assessment is quantitative, process-based analyses (e.g., sediment transport, bank migration) rather than assessments of channel form or classification. Consideration of some components of this approach is recommended so that observational and quantitative results can be used to more adequately answer questions concerning the fundamental processes responsible for bank stability, capping material stability and scenario alternative response near and within the project site. Such assessment would incorporate channel and floodplain elevation data, existing modeling information within the upper River, site-specific hydraulic modeling results, existing USGS Doppler velocity knowledge, geomorphic field surveys of the Project area and an analysis of proposed design alternatives. We recommend an analysis and summary of existing data and data acquired from geomorphic survey within the context of understanding channel response to modifications of the stream bank. This evaluation shall include an analysis of the longitudinal profile, planform pattern, cross-section dimensions, cross-section hydraulics, riverbed and riverbank materials and sediment transport conditions.

Attachments:
Figure 1. Vicinity Map



N
W E
S

2,000 0 2,000

Feet

Vicinity Map

Northport Waterfront Remedial Investigation
Northport, Washington

GeoEngineers

Figure 1

Notes:

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

Data Source: Mapbox Open Street Map, 2016
ESRI World Street Map.

Projection: NAD 1983 StatePlane Washington North FIPS 4601 Feet

P:\0\0504160\GIS\MXD\0504160002_F01_VM_OnsiteDisposal.mxd Date Exported: 06/05/20 by ccabrera

APPENDIX C
SPVV Landscape Architects Costs

Probable Cost of Construction

Northport
Conceptual Design
6/29/20

Concept 1

Item	Unit	Unit Price	Quantity	Subtotal	Total
General Site Items and Demolition					
Verify Existing Utility Location and elevation	ea.	$ 400.00	1	$ 400	
Excavation of unsuitable debris and replacement	c.y.	$ 25.00	555.56	$ 13,889	
					$ 14,289
Landscaping					
Stabilized Soil Pathways	s.f.	$ 4.00	4000	$ 16,000	
Revegetation Mix (Hydro-seeded)	s.f.	$ 0.20	16,000	$ 3,200	
Shrubs-Ev./Dec. - 1 Gallon	ea.	$ 31.00	75	$ 2,325	
Topsoil, Native type, screened and placed	c.y.	$ 25.00	185	$ 4,630	
					$ 26,155
Site Furnishings					
8' Bench with Back	ea	$ 1,800.00	4	$ 7,200	
Picnic table, ADA accessible with concrete pad	ea.	$ 5,000.00	1	$ 5,000	
16x16 Picnic Shelter with ADA accessible table and concrete pad	ea.	$ 30,000.00	1	$ 30,000	
Trash Receptacle	ea.	$ 2,000.00	2	$ 4,000	
Wood Rail Fence	l.f.	$ 25.00	0	$ -	
					$ 46,200
Storm Drainage and Erosion Control Systems					
Erosion/Sedimentation Control	l.s.	$ 3,000.00	1	$ 3,000	
					$ 3,000
				Subtotal	$ 89,644
				Contingency 40%	$ 35,857
				Total	**$ 125,501**

Probable Cost of Construction

Northport
Conceptual Design
6/29/20

Concept 1B

Item	Unit	Unit Price	Quantity	Subtotal	Total
General Site Items and Demolition					
Verify Existing Utility Location and elevation	ea.	$ 400.00	1	$ 400	
Excavation of unsuitable debris and replacement	c.y.	$ 25.00	416.67	$ 10,417	
					$ 10,817
Landscaping					
Stabilized Soil Pathways	s.f.	$ 4.00	2600	$ 10,400	
Revegetation Mix (Hydro-seeded)	s.f.	$ 0.20	13,000	$ 2,600	
Shrubs-Ev./Dec. - 1 Gallon	ea.	$ 31.00	50	$ 1,550	
Topsoil, Native type, screened and placed	c.y.	$ 25.00	139	$ 3,472	
					$ 18,022
Site Furnishings					
8' Bench with Back	ea	$ 1,800.00	2	$ 3,600	
Picnic table, ADA accessible with concrete pad	ea.	$ 5,000.00	1	$ 5,000	
16x16 Picnic Shelter with ADA accessible table and concrete pad	ea.	$ 30,000.00	1	$ 30,000	
Trash Receptacle	ea.	$ 2,000.00	2	$ 4,000	
Wood Rail Fence	l.f.	$ 25.00	900	$ 22,500	
					$ 65,100
Storm Drainage and Erosion Control Systems					
Erosion/Sedimentation Control	l.s.	$ 4,000.00	1	$ 4,000	
					$ 4,000
				Subtotal	$ 97,939
				Contingency 40%	$ 39,176
				Total	**$ 137,114**

Probable Cost of Construction

Northport
Conceptual Design
6/29/20

Concept 2

Item	Unit	Unit Price	Quantity	Subtotal	Total
General Site Items and Demolition					
Verify Existing Utility Location and elevation	ea.	$ 400.00	1	$ 400	
Excavation of unsuitable debris and replacement	c.y.	$ 25.00	2361.1	$ 59,028	
					$ 59,428
Hardscape					
Trail Steps - Precast treads on CMU block	ea.	$ 250.00	40	$ 10,000	
					$ 10,000
Landscaping					
Stabilized Soil Pathways	s.f.	$ 4.00	3400	$ 13,600	
Revegetation Mix (Hydro-seeded)	s.f.	$ 0.20	32,000	$ 6,400	
Shrubs-Ev./Dec. - 1 Gallon	ea.	$ 31.00	75	$ 2,325	
Topsoil, Native type, screened and placed	c.y.	$ 25.00	324	$ 8,102	
					$ 30,427
Site Furnishings					
8' Bench with Back	ea	$ 1,800.00	5	$ 9,000	
Picnic table, ADA accessible with concrete pad	ea.	$ 5,000.00	2	$ 10,000	
16x16 Picnic Shelter with ADA accessible table and concrete pad	ea.	$ 30,000.00	2	$ 60,000	
Trash Receptacle	ea.	$ 2,000.00	4	$ 8,000	
Wood Rail Fence	l.f.	$ 25.00	900	$ 22,500	
					$ 109,500
Storm Drainage and Erosion Control Systems					
Erosion/Sedimentation Control	l.s.	$ 5,000.00	1	$ 5,000	
					$ 5,000
				Subtotal	$ 214,355
				Contingency 40%	$ 85,742
				Total	**$ 300,096**

Probable Cost of Construction

Northport
Conceptual Design
6/29/20

Concept 3

Item	Unit	Unit Price	Quantity	Subtotal	Total
General Site Items and Demolition					
Verify Existing Utility Location and elevation	ea.	$ 400.00	1	$ 400	
Excavation of unsuitable debris and replacement	c.y.	$ 25.00	2361.1	$ 59,028	
					$ 59,428
Hardscape					
Trail Steps - Precast treads on CMU block	ea.	$ 250.00	40	$ 10,000	
Asphalt Path (2" HMA over 6" CSBC)	s.f.	$ 3.27	0	$ -	
Boardwalk and Railing	s.f.	$ 50.00	1566	$ 78,300	
					$ 88,300
Landscaping					
Stabilized Soil Pathways	s.f.	$ 4.00	8481	$ 33,924	
Revegetation Mix (Hydro-seeded)	s.f.	$ 0.20	114,741	$ 22,948	
Shrubs-Ev./Dec. - 1 Gallon	ea.	$ 31.00	150	$ 4,650	
Topsoil, Native type, screened and placed	c.y.	$ 25.00	463	$ 11,574	
					$ 73,096
Site Furnishings					
8' Bench with Back	ea	$ 1,800.00	9	$ 16,200	
Picnic table, ADA accessible with concrete pad	ea.	$ 5,000.00	4	$ 20,000	
16x16 Picnic Shelter with ADA accessible table and concrete pad	ea.	$ 30,000.00	4	$ 120,000	
Trash Receptacle	ea.	$ 2,000.00	4	$ 8,000	
Wood Rail Fence	l.f.	$ 25.00	900	$ 22,500	
					$ 186,700
Storm Drainage and Erosion Control Systems					
Erosion/Sedimentation Control	l.s.	$ 7,500.00	1	$ 7,500	
					$ 7,500
				Subtotal	$ 415,024
				Contingency 40%	$ 166,010
				Total	**$ 581,034**

CONCEPT ALTERNATE 1B

SPVV
LANDSCAPE ARCHITECTS
1908 W NORTHWEST BLVD, STE A
SPOKANE, WA 99205
509.325.0511
www.spvv.com

SEAL:

CONSULTANT:

PROJECT NUMBER: 1946
NORTHPORT WATERFRONT FEASIBILITY STUDY
NORTHPORT, WA

SHEET TITLE: CONCEPT PLAN
DRAWN BY: JPJ
CHECKED BY: TCS

Revisions:

SHEET: L-20X
CONCEPTUAL DESIGN
06/24/2020

PLOT DATE:Monday, June 29, 2020 FILE LOCATION:P:\1946 Northport\Drawings\1946 Concept.dwg

REFERENCE NOTES SCHEDULE RE 1

SYMBOL	DESCRIPTION	QTY
1	PICNIC SHELTER, 12' X 12'	
2	ADA PICNIC TABLE	
3	PICNIC TABLE	
4	BENCH	

SYMBOL	DESCRIPTION	QTY
	STABILIZED SOIL TRAIL/AREA	3,976 SF
	NATIVE REVEGETATION AREA	14,163 SF

CONCEPT RECREATIONAL ENHANCEMENT 1

NORTH

0 40 80 120 160 feet

1" = 40'

SPVV
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SEAL:

CONSULTANT:

PROJECT NUMBER: 1946

NORTHPORT WATERFRONT
FEASIBILITY STUDY

NORTHPORT, WA

SHEET TITLE:
CONCEPT PLAN

DRAWN BY: JPJ
CHECKED BY: TCS

Revisions:

SHEET:
L-20X
CONCEPTUAL DESIGN
06/24/2020

PLOT DATE:Monday, June 29, 2020 FILE LOCATION:P:\1946 Northport\Drawings\1946 Concept.dwg

REFERENCE NOTES SCHEDULE RE 2

SYMBOL	DESCRIPTION	QTY
1	PICNIC SHELTER, 12' X 12'	
2	ADA PICNIC TABLE	
3	PICNIC TABLE	
4	BENCH	
5	PRECAST CONCRETE STAIRS	
SYMBOL	DESCRIPTION	QTY
	STABILIZED SOIL TRAIL/AREA	9,348 SF
	NATIVE REVEGETATION AREA	30,140 SF

CONCEPT RECREATIONAL ENHANCEMENT 2

NORTH

0 40 80 120 160 feet

1" = 40'

SPVV
LANDSCAPE ARCHITECTS
1908 W NORTHWEST BLVD, STE A
SPOKANE, WA 99205
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CONSULTANT:

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NORTHPORT, WA

SHEET TITLE: CONCEPT PLAN

DRAWN BY: JPJ
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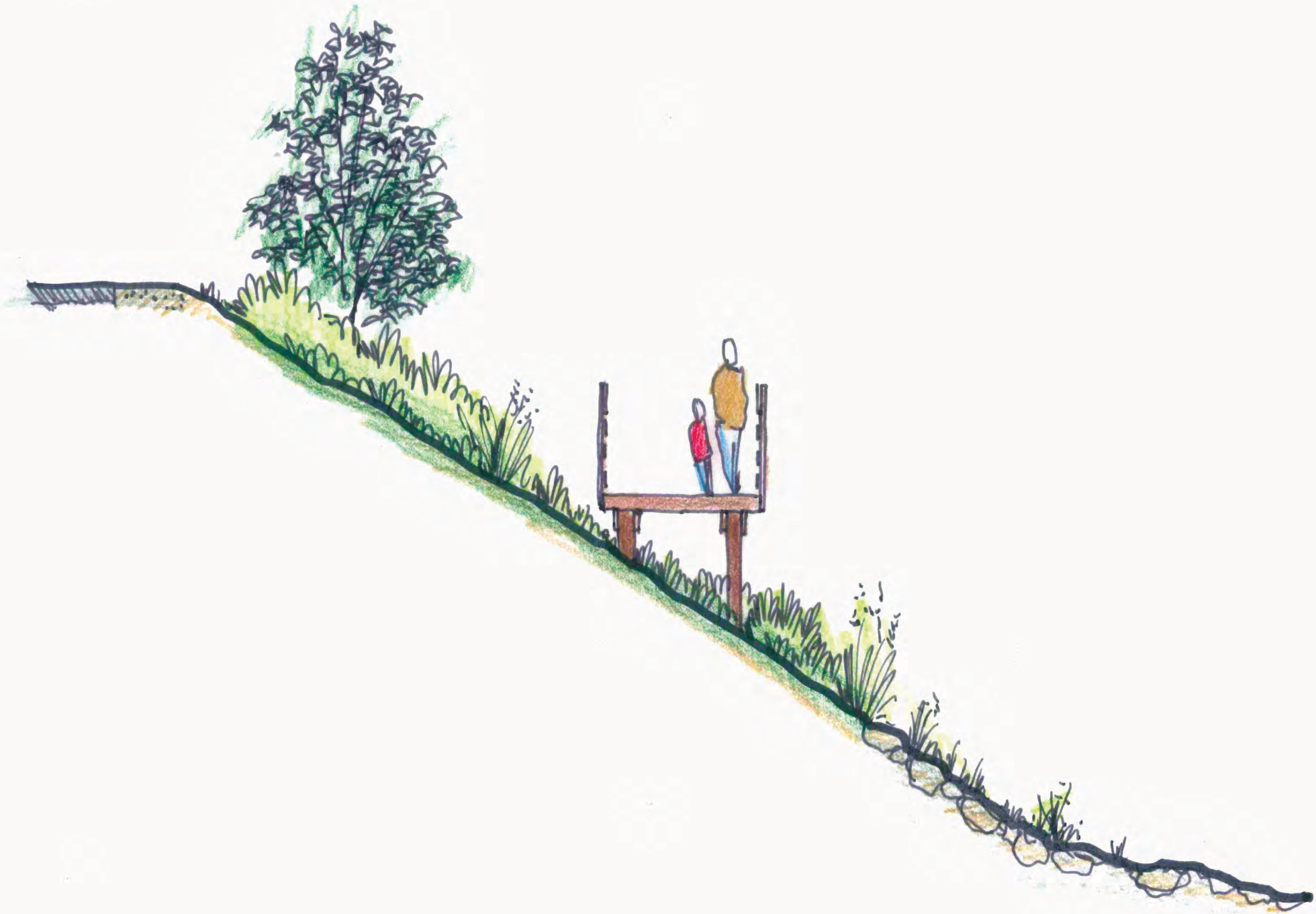
Revisions:

SHEET: L-20X
CONCEPTUAL DESIGN
06/24/2020

PLOT DATE:Monday, June 29, 2020 FILE LOCATION:P:\1946 Northport\Drawings\1946 Concept.dwg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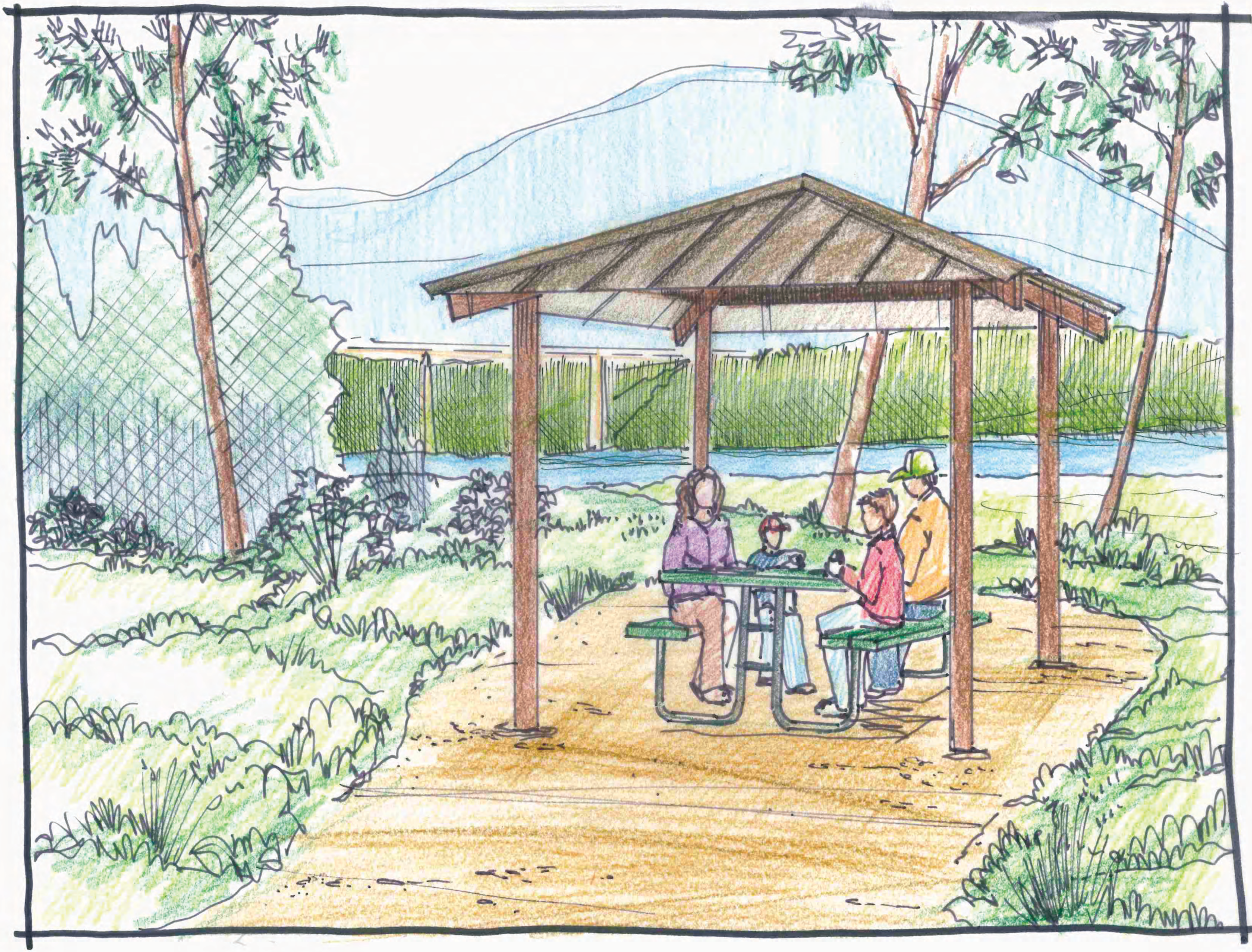

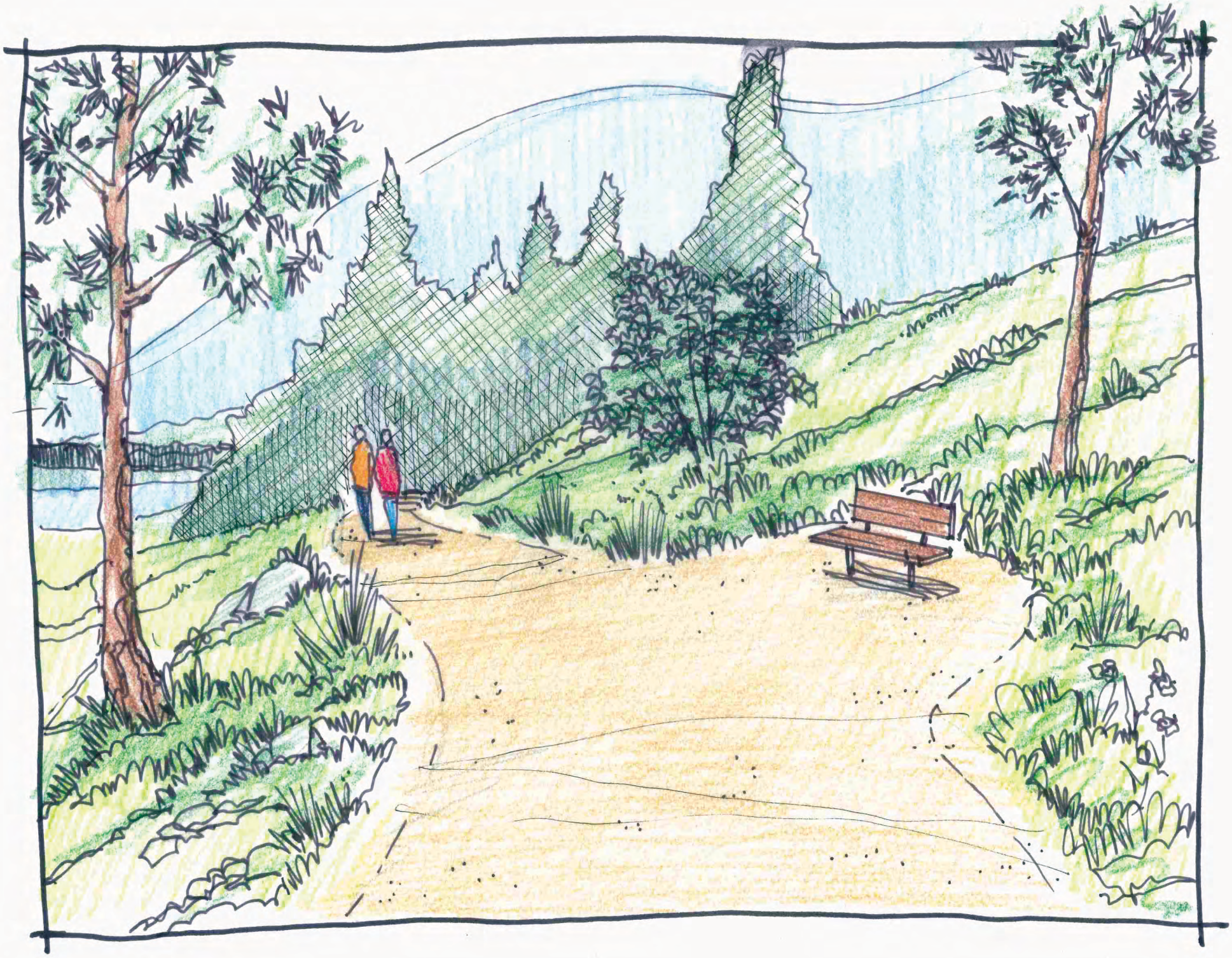

APPENDIX D
Report Limitations and Guidelines for Use

APPENDIX D
REPORT LIMITATIONS AND GUIDELINES FOR USE[1]

This appendix provides information to help you manage your risks with respect to the use of this report.

Read These Provisions Closely

Some clients, design professionals and contractors may not recognize that the geoscience practices (geotechnical engineering, geology and environmental science) are far less exact than other engineering and natural science disciplines. This lack of understanding can create unrealistic expectations that could lead to disappointments, claims and disputes. GeoEngineers includes these explanatory "limitations" provisions in our reports to help reduce such risks. Please confer with GeoEngineers if you are unclear how these "Report Limitations and Guidelines for Use" apply to your project or site.

Environmental Services Are Performed for Specific Purposes, Persons and Projects

This report has been prepared for use by the Washington State Department of Ecology (Ecology) as part of their evaluation of environmental conditions at the subject Property. This report may be made available to Ecology's authorized agents and regulatory agencies for review. This report is not intended for use by others, and the information contained herein is not applicable to other sites.

GeoEngineers structures our services to meet the specific needs of our clients. For example, an environmental site assessment or remedial action study conducted for a property owner may not fulfill the needs of a prospective purchaser of the same property. Because each environmental study is unique, each environmental report is unique, prepared solely for the specific client and project site. No one except Albertsons should rely on this environmental report without first conferring with GeoEngineers. This report should not be applied for any purpose or project except the one originally contemplated.

This Environmental Report Is Based on a Unique Set of Project-Specific Factors

This report applies to Northport Waterfront site. GeoEngineers considered a number of unique, project-specific factors when establishing the scope of services for this project and report. Unless GeoEngineers specifically indicates otherwise, do not rely on this report if it was:

- Not prepared for you,
- Not prepared for your project,
- Not prepared for the specific property explored, or
- Completed before important project changes were made.

If important changes are made after the date of this report, GeoEngineers should be given the opportunity to review our interpretations and recommendations and provide written modifications or confirmation, as appropriate.

[1] Developed based on material provided by ASFE, Professional Firms Practicing in the Geosciences, www.asfe.org.

Reliance Conditions for Third Parties

We have prepared this RI for the exclusive use of Ecology, their authorized agents and other regulatory agencies. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

This is to provide our firm with reasonable protection against open-ended liability claims by third parties with whom there would otherwise be no contractual limits to their actions.

Environmental Regulations Are Always Evolving

Some substances may be present in the Property vicinity in quantities or under conditions that may have led, or may lead, to contamination of the subject Property, but are not included in current local, state or federal regulatory definitions of hazardous substances or do not otherwise present current potential liability. GeoEngineers cannot be responsible if the standards for appropriate inquiry, or regulatory definitions of hazardous substance, change or if more stringent environmental standards are developed in the future.

Soil and Groundwater End Use

The cleanup levels referenced in this report are site- and situation-specific. The cleanup levels may not be applicable for other properties or for other on-site uses of the affected soil and/or groundwater. Note that hazardous substances may be present in some of the on-site soil and/or groundwater at detectable concentrations that are less than the referenced cleanup levels. GeoEngineers should be contacted prior to the export of soil or groundwater from the subject property or reuse of the affected soil or groundwater on-site to evaluate the potential for associated environmental liabilities. GeoEngineers will not assume responsibility for potential environmental liability arising out of the transfer of soil and/or groundwater from the subject property to another location, or the reuse of such soil and/or groundwater on-site in any instances that we did not recommend, know of, or control.

Subsurface Conditions Can Change

This environmental report is based on conditions that existed at the time the study was performed. The findings and conclusions of this report may be affected by the passage of time, by manmade events such as construction on or adjacent to the site, by new releases of hazardous substances, or by natural events such as floods, earthquakes, slope instability or groundwater fluctuations. Always contact GeoEngineers before applying this report to determine if it is still applicable.

Most Environmental Findings Are Professional Opinions

Our interpretations of subsurface conditions, remedial alternatives and remedial costs are based on field observations and chemical analytical data from the sampling locations at the Property documented in this report. Property exploration identifies subsurface conditions only at those points where subsurface tests are conducted, or samples are taken. GeoEngineers reviewed field and laboratory data and then applied our professional judgment to render an opinion about subsurface conditions throughout the Property. Actual subsurface conditions may differ—sometimes significantly—from those indicated in this report. There is always a potential that areas of contamination exist in portions of the Property that were not sampled or tested during previous studies. Our report, conclusions and interpretations should not be construed as a warranty of the subsurface conditions or related remedial costs.

Do Not Redraw the Exploration Logs

Environmental scientists prepare final boring and testing logs based upon their interpretation of field logs and laboratory data. To prevent errors or omissions, the logs included in an environmental report should never be redrawn for inclusion in other design drawings. Only photographic or electronic reproduction is acceptable and separating logs from the report can elevate risk.

GeoEngineers