DRAFT
MITIGATION WORK PLAN
TERMINAL 4 PHASE I REMOVAL ACTION
PORT OF PORTLAND, PORTLAND, OREGON

Prepared for

The Port of Portland

Portland, Oregon

Prepared by

Anchor QEA, LLC

421 SW Sixth Avenue, Suite 750

Portland, Oregon 97204

May 2013

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LIST OF ACRONYMS AND ABBREVIATIONS

ACM	active channel margin
Action Memo	Action Memorandum
AOC	Administrative Order on Consent
BiOp	Biological Opinion
CDF	confined disposal facility
City	City of Portland
dSAY	discounted service-acre year
EDT	Ecosystem Diagnosis and Treatment
ESA	Endangered Species Act
H:V	horizontal to vertical
HDP	Habitat Development Plan
HEA	Habitat Equivalency Analysis
LWD	large woody debris
NAVD88	North American Vertical Datum of 1988
NGVD	National Geodetic Vertical Datum
NMFS	National Marine Fisheries Service
OHWL	ordinary high water level
OLWL	ordinary low water level
Port	Port of Portland
PRP	Potentially Responsible Party
SIDIC	Sauvie Island Drainage Improvement Company
T4	Terminal 4
USEPA	U.S. Environmental Protection Agency
Wildlands	Wildlands, Inc.
Work Plan	Draft Mitigation Work Plan

1 INTRODUCTION AND BACKGROUND

1.1 Introduction

This Draft Mitigation Work Plan (Work Plan) is being submitted to the U.S. Environmental Protection Agency (USEPA) and the National Marine Fisheries Service (NMFS) to comply with the July 22, 2008 Biological Opinion (BiOp; NMFS 2008; Appendix A) and the June 30, 2008 Supplemental Section 404(b)(1) Evaluation (USEPA 2008; Appendix B) for the Terminal 4 (T4) Phase I Removal Action. This Work Plan summarizes the project background and provides information requested by USEPA in previous correspondence with the Port of Portland (Port).

As part of the T4 Phase I Removal Action, the Port incorporated the following habitat improvement actions, and, as a result, the habitat conditions in Wheeler Bay were improved:

- Planting of willow and cottonwood live stakes within the active channel margin (ACM) across the Wheeler Bay site
- Placement of large woody debris (LWD) within the ACM in specific sections of Wheeler Bay
- The placement of sand-gravel habitat material over placed riprap armor and the demonstration through previous and ongoing monitoring that the sand-gravel surface remains over much of the Wheeler Bay area

However, due to the need to place riprap armor in Wheeler Bay for shoreline stability, the BiOp identified the need for compensatory mitigation for impacts to critical habitat for federally listed salmon species. The required compensatory mitigation is to offset potential impacts to salmonid critical habitat from the placement of riprap armor. The 2008 Supplemental Section 404(b)(1) Evaluation made reference to the BiOp on the need for compensatory mitigation to address impacts to threatened and endangered species (USEPA 2008; Appendix B). Other potential impacts identified in the 2008 Supplemental Section 404(b)(1) Evaluation were temporary and/or expected to be offset by the cleanup action itself (USEPA 2008; Appendix B).

As part of the mitigation process, the Port evaluated a number of mitigation options, including stand-alone habitat improvement projects and purchasing credits from a third

party at a larger restoration site. Through this process, the Port found that, in general, opportunities for implementing mitigation projects within Portland Harbor are limited due to the industrial nature of the area and the lack of available open space. Based on the mitigation options analysis, the Port elected to settle its mitigation obligation through the purchase of credits from a habitat restoration project being developed by Wildlands, Inc. (Wildlands) at the Alder Creek site on the southern tip of Sauvie Island. The primary goal of the Alder Creek restoration site is to create, restore, enhance, and protect aquatic, riparian, and upland forest habitats on the site to benefit salmonid species occurring in the Lower Willamette River, as well as providing benefits to other aquatic, avian, and terrestrial species. The site has been specifically designed to consist of a mosaic of shallow water side channels, beach, mudflat, marsh, scrub-shrub, riparian, and forested upland habitats.

The purchase of credits from the Alder Creek site is consistent with the Endangered Species Act (ESA) and Supplemental Section 404(b)(1) mitigation requirements and requirements from the Action Memo (USEPA 2006; Appendix C) for the following reasons:

- As described in the BiOp (NMFS 2008; Appendix A), the placement of riprap armor at Wheeler Bay impacted juvenile salmon forage habitat during the winter when water levels reach the impacted area. The Alder Creek project will create a mosaic of habitat types that together will provide not only new forage areas that are inundated year-round (including during the winter), but will also provide valuable rearing and cover habitat for listed species and other aquatic species. The Alder Creek project will result in habitat elements that are more suitable for ESA-listed species as foraging and rearing areas than what was impacted at Wheeler Bay. In addition, the Alder Creek project is a large, continuous project that will vastly improve habitat conditions for listed species, as well as all aquatic species within Portland Harbor. Due to the size, the proposed financial assurances, and the permanent protection (i.e., recorded conservation easement) of the project, the potential for success is higher than for a much smaller-sized project.
- The only impact identified by the Supplemental Section 404(b)(1) Evaluation (USEPA 2008; Appendix B) requiring compensatory mitigation is the impact to critical habitat for listed salmonid species from the placement of riprap armor identified in the BiOp.

- The Alder Creek restoration project, which is consistent with recovery plans and local/regional conservation planning efforts, has been set up as a consolidated restoration site with credits that Potentially Responsible Parties (PRPs) may purchase to offset liability for injury to natural resources in Portland Harbor. The restoration focuses on recovery and protection of habitat for Chinook salmon and other listed salmonids, as well as other species the Trustees have identified as species of significance in Portland Harbor, including Pacific lamprey, osprey, bald eagle, mink, and river otter. This focus on local/regional conservation planning and recovery of listed species and their habitat is consistent with the general mitigation project requirements that USEPA previously identified for the T4 Removal Action project in the Action Memo. The Action Memo states, "All compensatory mitigation must be consistent to the maximum extent practicable with any established mitigation strategies or conservation initiatives supported by state and federal resource agencies for the Lower Willamette River basin." The Action Memo further states, "USEPA may consider mitigation proposals that do not meet all of the performance criteria if the Port demonstrates that the proposal otherwise contributes to conservation and recovery of ESA-listed species and/or other relevant conservation initiatives for the Lower Willamette River basin."

Additional background information, details, and rationale for why the Alder Creek site is appropriate for the T4 Phase I Removal Action mitigation are provided in the remainder of this Work Plan.

1.2 Background

The Port entered into an Administrative Order on Consent (AOC) with USEPA (2003) to perform a Non-Time-Critical Removal Action at the T4 site on the Willamette River in Portland, Oregon (Figure 1). This AOC requires the Port to conduct sediment remediation actions as specified in its Appendix B, Statement of Work. USEPA selected the preferred alternative for the removal action identified in the Engineering Evaluation/Cost Analysis in an Action Memorandum (Action Memo; USEPA 2006; Appendix C) dated May 11, 2006, which consisted of constructing a confined disposal facility (CDF) in Slip 1 and a

combination of dredging, capping, and monitored natural recovery at Slip 3, Wheeler Bay, Berth 401, and north of Berth 414.

Since USEPA issued the Action Memo (USEPA 2006; Appendix C), the Port has conducted the following related to the removal action:

- Submitted to USEPA a Conceptual 30 Percent Design Analysis Report and Pre-Final 60 Percent Design Analysis Report in 2006 consistent with the Action Memo.
- Worked with USEPA on design comments through an informal dispute resolution process.
- Requested a revised schedule for the T4 Removal Action to realign the project with the Portland Harbor Remedial Investigation/Feasibility Study schedule (USEPA approved on November 15, 2007). The schedule realignment for the T4 Removal Action required that the Port implement an abatement action (T4 Phase I Removal Action).
- Received a non-jeopardy BiOp from NMFS on July 22, 2008, and the Supplemental Section 404(b)(1) Evaluation on June 30, 2008, authorizing the T4 Phase I Removal Action.
- Implemented and completed theT4 Phase I Removal Action on October 22, 2008, to reduce risks at T4 based on the approved revised schedule.
- Requested a second schedule realignment for the remaining phase of the Removal Action (Phase II) to realign the project with the Portland Harbor Remedial Investigation/Feasibility Study and issuance of the Portland Harbor Record of Decision (USEPA approved on January 22, 2010). The schedule realignment for the Phase II Removal Action required the Port to submit a revised CDF 60 Percent Design Analysis Report using performance standards provided by USEPA.
- Submitted to USEPA a CDF 60 Percent Design Analysis Report on October 5, 2010 (USEPA approved the design on August 26, 2011).
- Conduct annual monitoring, maintenance, and reporting associated with the completed T4 Phase I Removal Action, including repairing the Wheeler Bay shoreline in 2010 and 2011.

1.2.1 Terminal 4 Phase I Removal Action

The T4 Phase I Removal Action construction occurred between August and October 2008 and consisted of the following activities (Figure 2):

- Dredging and off-site disposal of sediments with the highest chemical concentrations, including sediments from Berth 411 and the area north of Berth 414. In addition, sediments in Slip 3 at Berth 410 were also dredged for water-dependent maritime use.
- Capping at the head of Slip 3 to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas.
- Stabilizing the bank in Wheeler Bay to minimize contaminant migration to the river, including the following:
  - Re-grading the slope to a more stable configuration (3 horizontal to 1 vertical [3H:1V] slope) between elevations +10 and +30 National Geodetic Vertical Datum (NGVD)
  - Placement of new riprap armor material for stabilization between approximate elevations +10 and +15 NGVD between 0 and 700 feet from the mouth of the bay, and placement of additional riprap between 700 and 820 feet from the mouth of the bay in an area with pre-existing riprap
  - Placement of habitat material (i.e., sand and gravel) over new riprap armor between approximate elevations +10 and +15 NGVD between 0 and 700 feet from the mouth of the bay
  - Shoreline improvements, including the following:
    - Planting of live stake willows (three species) along the entire length of the Wheeler Bay shoreline between 0 and 700 feet from the mouth of the bay between elevations +15 and +20 NGVD
    - Hydroseeding between approximate elevations +20 and +30 NGVD
    - Installation of
    - LWD along the shore perimeter between approximate elevations +10 and +15 NGVD

As part of the Phase I project, a BiOp (NMFS 2008; Appendix A) and a Supplemental Section 404(b)(1) Evaluation (USEPA 2008; Appendix B) were issued. Specific details related to the

analyses and conclusions contained in these two documents are provided in Sections 1.2.2 and 1.2.3.

1.2.2 Biological Opinion

NMFS issued a non-jeopardy BiOp (NMFS 2008; Appendix A) on July 22, 2008, for the T4 Phase I Removal Action work described previously. Through the development of the BiOp, NMFS required the Port to add a mitigation component to the project description to avoid an adverse modification of critical habitat determination related to new riprap armor material that was proposed between approximate elevations +10 and +15 NGVD in Wheeler Bay. This mitigation component was added to the BiOp, and the BiOp was prepared assuming that the resulting surface material in Wheeler Bay between approximate elevations +10 and +15 NGVD would be riprap armor, although a 12-inch layer of sand and gravel habitat material was placed on top of the riprap armor. Specifically, the BiOp (page 7) states the following regarding the mitigation requirement:

> "The Port will plan, carry out, and manage compensatory mitigation activities using performance standards and criteria described in 40 CFR Part 230 to compensate for the degradation or loss of 0.33 acre of shallow water habitat and other aquatic resources that will be adversely affected by the proposed removal action. Among other things the compensatory mitigation plan will be based on: 1)measureable, enforceable ecological performance standards, including a mitigation ratio of 1.5: 1.0 to offset resource losses due to the time lag between permitted impacts and completion of the compensatory mitigation actions; 2)regular monitoring to ensure completion; 3)assurances of long-term protection of compensation sites; 4)financial assurances; and 5)identification of the parties responsible for specific project tasks. The Port will submit the Work Plan to NMFS for approval or disapproval within 2 years of the start of operations, and complete all actions necessary to mitigate the adverse effects of operations within 5 years of Plan approval. As described in 40 CFR 232.3(f)(2), NMFS will consider any time lag between commencement of sediment removal and the start of compensatory mitigation activities that exceeds 2 years to be an additional temporal loss of aquatic resource function when determining whether to approve or disapprove the proposed mitigation ratio.

> The Port will also place sand and gravel over the riprap surface of the Wheeler Bay bank stabilization and cap to create a more natural habitat. The Port recognizes that the long-term viability of sand placement over a riprap surface depends on site-specific conditions such as wave action, the shape of the shoreline, nearby river activities, and river dynamics. The Port will place the sand at this location because the Wheeler Bay conditions may be conducive to sand staying in place. The Port will monitor the area as a pilot project to determine whether the site-specific conditions are conducive to maintaining a sand habitat layer over the riprap. If monitoring demonstrates that a sandy surface can be maintained long-term, this may be considered by NMFS and EPA when determining the appropriate mitigation project for the Wheeler Bay bank stabilization and cap."

Since the BiOp was issued in 2008, the amount of required mitigation, mitigation approach, and the schedule were determined and adjusted as follows:

- The impact requiring mitigation per the 2008 BiOp and the 2008 Supplemental 404(b)(1) Evaluation was the placement of riprap over 0.33 acre (x 1.5) of shoreline habitat in Wheeler Bay. USEPA adjusted the required acreage to be 0.39 acre after considering the amount of sand and gravel material remaining over the riprap after 2 years of monitoring (see Appendix D for the December 7, 2010 email from Sean Sheldrake to Kelly Madalinski). This amount is based on a 1.5 to 1.0 mitigation ratio for the area of the shoreline that contains exposed riprap and a 1.0 to 1.0 ratio for the area of armored shoreline that remains covered with sand and gravel (Figure 3).
- Also as described previously, the Port was to submit a Mitigation Plan (now called the Mitigation Work Plan) to USEPA and NMFS within 2 years of the start of operations and complete all actions necessary to mitigate the adverse effects of operations within 5 years of document approval. The Port initiated discussions with USEPA and NMFS on the Mitigation Plan in July 2010 but did not submit a Work Plan until September 2010. Therefore, the Port committed to completing a mitigation project within 5 years from the end of October 2010. This commitment was formalized in a schedule modification, which is also captured in the current mitigation schedule. Therefore, the Port's mitigation project must be constructed by the end of October 2015. Specific details on the current, USEPA-approved schedule are provided in Section 1.2.4.

- No additional mitigation requirements resulted from the Wheeler Bay shoreline repair activities that occurred in 2010 and 2011 as a result of high water levels. Repair activities in 2010 generally consisted of placing additional armor material between 0 and 340 feet from the mouth of the bay within the original footprint of the stabilization area. During the 2011 repair activities, additional riprap was placed between 271 and 338 feet from the mouth of the bay where there was no existing riprap between elevations 15 and 16.7 feet NGVD (ordinary high water), but this did not add measurable acreage of riprap coverage. USEPA approved the 2010 and 2011 Closure Reports (Anchor QEA 2011a and 2012, respectively) that concluded no additional mitigation requirements were required.

1.2.3 Supplemental Section 404(b)(1) Evaluation

USEPA issued a Supplemental Section 404(b)(1) Evaluation (USEPA 2008; Appendix B) for the T4 Phase I Removal Action on June 30, 2008. The analysis concluded that the only Section 404(b)(1) impact requiring compensatory mitigation is related to endangered and threatened species and that the cleanup action itself improved habitat conditions by isolating or removing the surficial sediment with the highest chemical concentrations. The analysis of impacts provided in the document is summarized as follows:

- **Substrate**—The bottom topography was expected to be altered by the T4 Phase I Removal Action through dredging, placement of cap material, and stabilization of the shoreline. However, periodic maintenance dredging has occurred in the past within Slip 3, so topography changes due to dredging are not a new impact and in the long term, the dredged areas will fill in; the placement of capping material was expected to be inconsequential to the bottom topography and result in improved habitat through isolation of chemical contaminants, and the shoreline stabilization was expected to improve habitat potential as well, especially when mitigation is implemented. Overall, the analysis concluded that the discharge "is not expected to significantly alter the physical characteristics of the site."
- **Suspended Particulates/Turbidity**—Turbidity was expected to occur during dredging, capping, and shoreline stabilization activities, but no violation of water quality standards outside of the compliance boundary was anticipated during construction. As documented in the T4 Phase I Removal Action Completion Report, turbidity

values exceeded the criteria on one occasion that was attributed to the construction activities (Anchor QEA 2009). Shortly after the exceedance was detected, dredging was finished for the day. Additional best management practices were implemented during subsequent dredging activities and no other turbidity exceedances occurred related to construction (Anchor QEA 2009).

- **Water Quality**—As described previously, ambient water quality effects during construction were minimized and the analysis concluded that the T4 Phase I Removal Action was expected to result in improved water quality at the site through the removal of the material with the highest surficial chemical concentrations.
- **Current Patterns and Water Circulation**—These indicators were not expected to be impacted by the T4 Phase I Removal Action.
- **Normal Water Fluctuations**—The T4 Phase I Removal Action was not expected to substantively affect normal water fluctuations.
- **Salinity Gradients**—Not applicable.
- **Threatened and Endangered Species**—The analysis stated that NMFS determined that the [shoreline stabilization] area is important habitat and that placement of riprap will have an adverse effect on existing habitat, and therefore, is requiring mitigation (see Section 1.2.2 for more details).
- **Aquatic Food Web**—The immediate impact of dredging and placing cap and shoreline stabilization material was expected to remove or smother sessile benthic species, which was considered a temporary loss to the aquatic food web. A similar biological community was expected to redevelop quickly, and potentially a slight improvement to the aquatic food web could result.
- **Wildlife**—The T4 Phase I Removal Action was expected to displace birds and resident mammals during construction, but no permanent effects were expected.
- **Sanctuaries and Refuges**—Not applicable.
- **Wetlands**—No effect because no vegetated wetlands occur on site.
- **Mudflats**—Not applicable.
- **Vegetated Shallows**—Not applicable.
- **Riffle and Pool Complexes**—Not applicable.
- **Municipal and Private Water Supplies**—No effect because there are no water intakes within the slip or within its immediate vicinity downstream.

- **Recreational and Commercial Fisheries—**No commercial fishery occurs within the river. All recreational fishing activities were expected to be displaced from Slip 3 and the immediate area around the project area during construction. Work during the work window and the placement of a fish deterrent system to encourage fish to move past the work area were impact minimization measures that were implemented during construction to minimize and avoid impacts. No permanent impacts to recreational fisheries occurred as a result of the T4 Phase I Removal Action.
- **Water-related Recreation**—The construction activities may have required recreational boaters to move around the site; however, this was considered inconsequential.
- **Aesthetics**—The shoreline stabilization measures was expected to result in a "tidier" appearance; however, no substantial changes in aesthetics were expected.
- **Parks, National and Historic Monuments, National Seashores, Wilderness Areas, Research Sites, and Similar Preserves**—Not applicable.

1.2.4 Selection of a Mitigation Project and Schedule

The Port evaluated a number of mitigation options based on conceptual designs and feasibility analyses in 2010 and 2011, as documented in the November 8, 2010 (updated February 22, 2011) Mitigation General Description Memorandum (Anchor QEA 2010) and the May 20, 2011 Mitigation Conceptual Plan Memorandum (Anchor QEA 2011b). Based on these analyses, the Port elected to settle its mitigation obligation through the purchase of credits associated with 0.39 acre of a habitat restoration project being developed by Wildlands at the Alder Creek site on the southern tip of Sauvie Island (Figure 4). This decision and supporting rationale was documented in the September 30, 2011 Mitigation Conceptual Plan Memorandum (Anchor QEA 2011c). USEPA provided two rounds of comments on the document in November 2011 and February 2012. In a USEPA letter dated February 7, 2012 (Appendix E), USEPA stated that in order for USEPA to approve the use of the Alder Creek site as mitigation, it would need to review the following information listed in 40 CFR 230.94:

- Mitigation Goals and Objectives
- Site Selection Considerations
- Mitigation Credit Determination and Rationale

- Mitigation Plan
- Baseline Information about the Mitigation Site
- Performance Standards
- Monitoring Requirements
- Long-term Management Plan
- Maintenance Plan
- Adaptive Management Plan
- Site Protection Instrument
- Financial Assurances

Construction of the Alder Creek site is anticipated to begin in 2013, which occurs prior to the current mitigation schedule, committing the Port to complete a construction project by October 2015. As a result, preparation of a contingency plan in the event the Alder Creek site is not under construction within the current mitigation schedule will not be necessary.

The remainder of this Work Plan includes the information listed previously, as well as a summary of the impacts that occurred at Wheeler Bay through implementation of the T4 Phase I Removal Action and how the Alder Creek restoration site compensates for those impacts.

2 MITIGATION GOALS AND OBJECTIVES

The T4 Phase I Removal Action mitigation goal is to replace the lost functions associated with the placement of riprap in Wheeler Bay. The Port plans to purchase credits associated with 0.39 acre of habitat from the Wildland's Alder Creek restoration site. The goals and objectives for the Alder Creek restoration site are summarized as follows from the Habitat Development Plan (HDP; Appendix F). Additional details are provided in Section 2 of the HDP.

The primary goal of the Alder Creek restoration site is to create, restore, enhance, and protect aquatic, riparian, and upland forest habitats on the site to benefit salmonid species occurring in the Lower Willamette River, as well as providing benefits to other aquatic, avian, and terrestrial species. The site has been specifically designed to consist of a mosaic of shallow water side channels, beach, mudflat, marsh, scrub-shrub, riparian, and forested upland habitats.

Specific objectives to achieve this goal include the following:

- Remove the existing sawmill infrastructure (buildings, roads, pads, and equipment) from the floodplain
- Remove overwater structures and piles from the Lower Willamette River and Multnomah Channel in order to connect side channel habitat
- Re-plant with native vegetation and control invasive species; excavate material to create side channel habitat
- Excavate material to create frequently inundated marsh, mudflat, and riparian habitat (i.e., ACM)
- Excavate to connect the created/restored/enhanced aquatic habitats of the site to the Lower Willamette River and Multnomah Channel
- Install LWD to provide in-water habitat structure and complexity
- Establish riparian scrub-shrub and forest habitat adjacent to the created channels and marsh/mudflat to provide shading and a food source
- Establish upland forest habitat by depositing excavated material north (landward) of the Sauvie Island Drainage Improvement Company (SIDIC) levee and then seed/plant with native species

- Provide in-perpetuity protection through establishment of a conservation easement
- Provide in-perpetuity stewardship through the implementation of a Long-term Management Plan, which will be funded by a non-wasting endowment

After construction is complete, the restoration site is expected to provide the following habitat types and amounts:

- Approximately 21 acres of ACM, including mudflat and beach habitat, emergent marsh habitat, and scrub-shrub riparian habitat
- Approximately 2 acres of restored side channel
- Approximately 9 acres of riparian forest within the floodplain
- Approximately 20 acres of forested upland habitat outside of the floodplain

The remainder of this section provides additional information related to the unavoidable loss of habitat from the T4 Phase I Removal Action per the BiOp and the Supplemental 404(b)(1) Evaluation and how the Alder Creek site compensates for that loss of habitat.

2.1 Terminal 4 Phase I Removal Action Impacts

The unavoidable T4 Phase I Removal Action impact requiring compensatory mitigation is related to the placement of riprap armor material in Wheeler Bay. The impacts to the Wheeler Bay shoreline, as stated in the BiOp, include those related to the placement of riprap on sandy beach material in Wheeler Bay between approximate elevations +10 and +15 NGVD as follows:

- Displacement of beach habitat that could provide benthic feeding opportunities in the winter
- Loss of benthic feeding habitat that is inundated at higher flows

The shoreline area covered by riprap as part of the T4 Phase I Removal Action was chemically contaminated, and placement of the armor for shoreline stabilization effectively isolated the contaminated area from active foraging by juvenile salmonids and other species. In addition, a sand and gravel material was placed over the riprap material as a pilot study to determine if it would remain in place and avoid potential impacts to the substrate.

2.1.1 Pre-construction Habitat in Wheeler Bay

The pre-construction habitat in Wheeler Bay consisted of steep sloped shorelines, substrate with scattered debris and concrete, and a shoreline with little, if any, riparian vegetation that could overhang and provide cover in shallow water areas (Figure 5). These habitat elements provided benthic foraging opportunities for juvenile salmon species, although the substrate was degraded due to the presence of chemical contaminants. The habitat also consisted of shallow water, which is an important element for juvenile rearing. The rearing areas contained natural cover from LWD accumulations but lacked overhanging riparian cover elements.

Specifically, prior to the Phase I construction, Wheeler Bay was characterized as follows (Figure 6):

- Area A: Over-steepened slopes above +20 NGVD with erosion of contaminated material/bank slumping; bare soils, sparse invasive plants, little riparian cover, and abundant debris (concrete and asphalt); and a beach characterized by presence of debris, sand substrate, sparse LWD, and steep slopes between +10 and +15 NGVD. This is the area that was impacted by placement of riprap armor. There is a small section in the southeastern portion of Area A that still contains a layer of habitat material.
- Area B: Over-steepened slopes above +20 NGVD with invasive plants and little riparian cover; gently sloped beach between +10 and +15 NGVD with moderately abundant LWD; and an area of high quality beach habitat prior to Phase I construction. During Phase I construction, riprap armor was placed in this area with a 1-foot layer of habitat material placed over the armor to avoid substrate impacts.
- Area C: Extremely steep slopes with armor extending to below the water's edge. This area contained armor material prior to Phase I construction and was not subject to a mitigation requirement.

2.1.2 Post-construction Habitat in Wheeler Bay

Post-construction, Wheeler Bay is characterized by improved habitat conditions relative to pre-construction conditions and contains less steep (3H:1V) slopes with exposed riprap substrate covering a portion of the stabilized shoreline that is most prone to erosion. A

majority of the surface substrate along the shoreline consists of 7 to 10 inches (on average) of sand and gravel and other natural material over placed riprap. The entire length of the shoreline between 0 and 700 feet from the mouth of the bay is adjacent to planted willows that provide complexity and structure to the shoreline along with the placed and accumulated LWD. Chemical contaminants have been removed or isolated from the surface substrate, and shoreline debris consisting of asphalt and concrete and invasive plant species was removed.

Specifically, Wheeler Bay is characterized as follows post-construction (Figure 7):

- Area A: Re-graded slopes at a more stable configuration (3H:1V slope) between elevations +10 and +30 NGVD. New riprap armor material between approximate elevations +10 and +15 NGVD to stabilize the shoreline between 0 and 340 feet from the mouth of the bay. Originally, a 1-foot layer of habitat material was placed over the armor in this area to avoid substrate impacts; however, this habitat layer was not replaced over the additional armor that was placed during the 2010 and 2011 Wheeler Bay repair activities between 0 and 340 feet from the mouth of the bay. The layer of habitat material still remains over the southeastern end of Area A (Figure 7). Planted willows (three species) along the length of the shoreline between approximate elevations +15 and +20 NGVD, hydroseeding between approximate elevations +20 and +30 NGVD, and LWD along the shore perimeter between approximate elevations +10 and +15 NGVD. This area containing the exposed riprap has a 1.5:1 mitigation ratio associated with it as described in Section 1.2.2.
- Area B: The same as Area A, except that sand and gravel habitat material exists over the placed armor throughout this entire area. The average total thickness of material over the riprap is greater than 10 inches, with greater than 7 inches of sand and gravel habitat material (Anchor QEA 2013). This area has a 1:1 mitigation ratio associated with it as described in Section 1.2.2.
- Area C: Additional riprap added between 700 and 820 feet from the mouth of the bay over pre-existing riprap.

2.2 Alder Creek Restoration Project Benefits

The Alder Creek project benefits are summarized from the HDP in Appendix F. The Alder Creek project proposes to restore an industrial upland site to a mosaic of shallow water channels, marsh, mudflat, riparian, and forest habitats as shown on Figures 8 and 9a – 9e. The creation of shallow water channels and intertidal marsh, mudflat, and scrub-shrub habitat types will provide rearing and foraging habitat for salmonid species, Pacific lamprey, and possibly juvenile white sturgeon, as well as other native fish species in the Lower Willamette River. Riparian habitat creation and enhancement will provide shade and cover, as well as additional insect production for food for salmonids that may use the site at varying stages of their life cycles. LWD placed along the created channel margins and marsh habitat will provide complexity and added in-stream cover. Restoration, creation, and enhancement of floodplain habitats and wetlands will provide additional habitat for salmonids during periods of high water. Upland forest habitat established on the excavated material will provide habitat for numerous wildlife species.

Elements of the proposed restoration project include the following as shown on Figures 8 and 9a – 9e):

- Shallow water channels located off of the main channel that are protected from high-velocity flows will provide year-round rearing and forage habitat that is rare in the Lower Willamette River for listed species and other aquatic species. These shallow water channels essentially function as off-channel habitat that could provide refuge from high-velocity, main stem flows.
- Following construction, the site will contain freshwater marsh, mudflat, and beach habitats. This area is also essentially off-channel habitat and will provide rearing, forage, and cover habitat for juvenile salmon and steelhead, as well as other aquatic species. The created freshwater marsh, mudflat, and beach areas will provide habitat for invertebrates, which are an important prey source for listed species.
- Establish, preserve, and enhance riparian habitat.

3 SITE SELECTION CONSIDERATIONS AND RATIONALE

As detailed in Section 4.1 of the HDP (Appendix F), the Alder Creek restoration site and the types of restoration and enhancement activities proposed were selected by Wildlands based on an opportunities and constraints analysis, existing topography, and limiting factors for salmon and steelhead.

The construction of the Alder Creek restoration project will provide a habitat complex that is rare in the Lower Willamette River. In the past, the Lower Willamette River was characterized by a system of connected river channels, open slack water, emergent wetlands, riparian forests, and adjacent upland forests. Over the last 150 years, the Lower Willamette River has been degraded by construction of dams, fill and development along the shoreline and in floodplain areas, and diking and dredging the channel for navigation. Prior to the 1850s, the Lower Willamette River was comprised of approximately 80% shallow water and 20% deep water habitat. Currently, the river is 80% deep water and 20% shallow water habitat (ODFW and NMFS 2011).

A review of restoration strategies for the Lower Willamette River was conducted to document the local focus and approach to restoration activities. The result of the review indicates that the Alder Creek restoration project will provide habitat that is significantly lacking in the Lower Willamette River. The most relevant documents that were reviewed and a summary are provided in the following:

- The Draft Willamette Subbasin Plan identified limiting factors in the Lower Willamette River mainstem for the focal species in the river, including cutthroat trout, winter steelhead, spring Chinook salmon, and coho salmon. Limiting factors for these species were determined using Ecosystem Diagnosis and Treatment (EDT) to analyze habitat conditions on a reach-by-reach basis. Limiting factor analyses are used to guide restoration/mitigation strategies within a specific river or stream reach. EDT analysis indicated that the applicable limiting factors in the Lower Willamette River are habitat diversity and habitat quantity. Factors that have reduced habitat diversity include loss of shallow water habitat, lack of wood, bank hardening and reconfiguration, and loss of off-channel habitats (WRI 2004). In addition to habitat diversity and the quality of habitat available in the Lower Willamette River, the

quantity of habitat available for key life history stages is also limiting. Lack of off-channel habitat, low levels of wood and shallow water habitat, and lack of channel and bank complexity all result in a lack of sufficient amounts of key habitat available for migration and rearing stages of Chinook, coho, and steelhead using the Lower Willamette River (WRI 2004). Based on these limiting factors, recommended aquatic habitat restoration actions include increasing habitat complexity and habitat quantity by increasing the amount of shallow water and off-channel habitat, increasing the amount of floodplain habitat accessible to the river, and increasing the number of large pieces and densities of wood (Appendix J of the Draft Willamette Subbasin Plan).

- The City of Portland (City) Watershed Assessment Summary (2004) identifies restoration and protection opportunities in the Lower Willamette River in Portland. Identified restoration opportunities for the City include increasing the amount of shallow water habitat, improving stormwater quality, recharging the groundwater to reduce stormwater impacts, continuing with the re-vegetation program, and working with the U.S. Army Corps of Engineers (USACE) to influence the way upstream flood control and hydropower dams are operated to improve changes in seasonal flow patterns.

Therefore, the Alder Creek site provides a rare opportunity within Portland Harbor to create a mosaic of shallow water channels, emergent marsh, mudflat, beach, scrub-shrub, riparian forest, and upland forest habitats. The Alder Creek site is approximately 1.5 miles from T4 and is located within the same watershed as T4 (Figure 4). The different habitat types that will be created are limiting in the Lower Willamette River and surrounding region. The Alder Creek proposed restoration action will create continuous habitat over a large area, which is expected to be more beneficial and sustainable than creating a much smaller restoration area along the river. Larger restoration sites are more diverse and provide more access to aquatic and terrestrial species (NOAA and USFWS 2012). A larger restoration project is also expected to be more resistant to disturbance and able to recover more quickly after a disturbance (NOAA and USFWS 2012). The site is adjacent to and across the river from other potential restoration sites identified by the Trustees. If these potential restoration sites are restored, the ecological value of each project would increase.

In addition, the Alder Creek project is appropriate to use for the T4 Phase I Removal Action mitigation because the only compensatory mitigation identified by the 2008 Supplemental Section 404(b)(1) Evaluation and the 2008 BiOp was for impacts related to critical habitat for federally listed salmon species. All other potential impacts identified in the 2008 Supplemental Section 404(b)(1) Evaluation were temporary and/or expected to be offset by the cleanup action itself (USEPA 2008; Appendix B). Therefore, the purchase of credits associated with 0.39 acre from the Alder Creek site is consistent with the ESA and Supplemental Section 404(b)(1) mitigation requirement and mitigation requirements from the Action Memo (USEPA 2006; Appendix C), as documented further in the rest of this section.

3.1 Endangered Species Act Requirements

As described in the BiOp (NMFS 2008; Appendix A), the placement of riprap armor at Wheeler Bay impacted juvenile salmon forage habitat during the winter. The Alder Creek project will create a mosaic of habitat types that together will provide not only new forage areas that are inundated year-round (including during the winter), but will also provide valuable rearing and cover habitat for listed species and other aquatic species. The Alder Creek project will result in habitat elements that are more suitable for ESA-listed species as foraging and rearing areas than what was impacted at Wheeler Bay. In addition, the Alder Creek project is a large, continuous project that will vastly improve habitat conditions for listed species, as well as all aquatic species within Portland Harbor. Due to the size, proposed financial assurances, and permanent protection (i.e., recorded conservation easement) of the project, the potential for success is higher than for a much smaller-sized project. These considerations increase the value of the proposed 0.39 acre of mitigation versus a stand-alone 0.39-acre project.

Specific considerations for how the proposed mitigation elements associated with the Alder Creek project are consistent with the mitigation requirement described in the BiOp are provided by habitat type in the following:

- Shallow Water (-1 to +1.5 NGVD/+2.5 to +5 North American Vertical Datum of 1988 [NAVD88]) and ACM (+1.5 to +16.5 NGVD/+5 to +20 NAVD88)—the shallow water channels expected to be provided at Alder Creek are designed to have a bottom

elevation between -1 and +1.5 NGVD (+2.5 to +5 NAVD88), and the ACM habitat includes a variety of habitat types between +1.5 and +16.5 NGVD (+5 to +20 NAVD88). Specifically, beach habitat is expected to occur between approximate elevations +1.5 and +6.5 NGVD (+5 and +10 NAVD88); mudflat habitat between +1.5 and +5 NGVD (+5 and +8.5 NAVD88); marsh habitat between approximate elevations +5 and +6.5 NGVD (+8.5 to +10 NAVD88); and scrub-shrub vegetation between approximate elevations +6.5 and +16.5 NGVD (+10 and +20 NAVD88). The elevations associated with the shallow water and ACM habitat at the Alder Creek site span a wider range than the impact area at Wheeler Bay, which was limited to an area at a higher elevation range between +10 and +15 NGVD (+13.5 and +18.5 NAVD88). The Alder Creek project is expected to provide newly created year-round forage habitat, while the forage habitat impacted at Wheeler Bay was only provided during the winter at higher flows.

- Riparian Habitat—the elevations of the Alder Creek project span a wider range than the impact area at Wheeler Bay and include adjacent riparian areas. The riparian habitat at Alder Creek is expected to span between approximate elevations +16.5 and +28.5 NGVD (+20 and +32 NAVD88) and will improve the function of the adjacent shallow water areas by shading open water, which helps to reduce water temperatures, and providing both cover from prey and food supply for fry, juvenile, and smolt life stages. This will not only improve forage opportunities for listed species but also provide cover and habitat complexity. Forage habitat was impacted at Wheeler Bay according to the BiOp, and this restoration element will improve the forage function.

The proposed action analyzed in the 2008 BiOp included mitigation described under the "Habitat Improvements" subsection (page 7) (NMFS 2008; Appendix A). As such, it is important to show that the Alder Creek project is consistent with the BiOp description to confirm that the analysis conducted in the BiOp is valid for the Alder Creek project. The "Habitat Improvements" portion of the BiOp appears in the following passages of indented, italicized text, followed by a description of how the proposed restoration action at Alder Creek is consistent with it.

The Port will plan, carry out, and manage compensatory mitigation activities using performance standards and criteria described in 40 CFR Part 230 to compensate for the degradation or loss of 0.33 acre of shallow water habitat and other aquatic resources that will be adversely affected by the proposed removal action.

The Port proposes to purchase credits associated with 0.39 acre of habitat from the Alder Creek site as the compensatory mitigation for the T4 Phase I Removal Action project. The Alder Creek project proposes to restore a former lumber mill site to a mosaic of shallow water channels, marsh, mudflat, riparian, and forest habitats, as described previously. These types of habitat complexes are not common in the Lower Willamette River but are important habitat for listed species, as well as other aquatic species. The restored shallow water channels and ACM habitat, including the marsh, mudflat, and scrub-shrub habitats, at the Alder Creek site will be more suitable for ESA-listed species as foraging and rearing areas than what was impacted at Wheeler Bay. In addition to the shallow water and ACM habitat, the Alder Creek site will also restore riparian habitat, which increases the function of the adjacent shallow water and ACM habitats by shading open water, which helps to reduce water temperatures, and providing both cover from prey and food supply for fry, juvenile, and smolt salmon and steelhead. This will not only improve forage opportunities for listed species but will also provide cover and habitat complexity. The performance standards are described in more detail in Section 6.

Among other things the compensatory mitigation plan will be based on:

1. *Measureable, enforceable ecological performance standards, including a mitigation ratio of 1.5: 1.0 to offset resource losses due to the time lag between permitted impacts and completion of the compensatory mitigation actions*

USEPA and NMFS determined that the required amount of mitigation was 0.39 acre after considering monitoring results of the sand and gravel material that was placed over the riprap surface of the Wheeler Bay shoreline stabilization area. The acreage requirement is described in an email dated December 7, 2010, from Sean Sheldrake to Kelly Madalinski (Appendix D).

2. *Regular monitoring to ensure completion*

As described in Section 7, establishment period monitoring and long-term monitoring and maintenance will be implemented for the Alder Creek site. Initially, there will be an establishment period in which project performance standards and criteria will be monitored and maintenance activities would occur as necessary. The establishment period consists of the first 10 years following construction and planting of the site. After the 10-year establishment period, the long-term maintenance and monitoring period will begin. An Endowment Fund managed by a third party will be established to generate funds to cover the maintenance and monitoring activities in perpetuity.

3. *Assurances of long-term protection of compensation sites*

To provide permanent protection of the site, a conservation easement for the site will be recorded over the property and will be held by a Trustee- and USEPA-approved non-profit entity or government organization as described in Section 8.

4. *Financial assurances*

Financial assurances are described in Section 8 and will consist of an Interim Management Account, Construction Security, and Endowment Fund. The Interim Management Account will be used as a contingency fund for management of the project until the Endowment Fund target amount and target date are achieved. The Endowment Fund will be set up to fund the long-term monitoring and maintenance activities.

5. *Identification of the parties responsible for specific project tasks*

See the responses to items 2 and 3.

The Port will submit the Plan to NMFS for approval or disapproval within 2 years of the start of operations, and complete all actions necessary to mitigate the adverse effects of operations within 5 years of Plan approval. As described in 40 CFR 232.3(f)(2), NMFS will consider any time lag between commencement of sediment removal and the start of compensatory mitigation activities that exceeds 2 years to be an additional temporal loss of aquatic resource function when determining whether to approve or disapprove the proposed mitigation ratio.

The Port initiated discussions with NMFS and USEPA regarding a mitigation plan in July 2010, which was within 2 years of the start of the Phase I operation. Because the Port did

not submit a Work Plan until September 2010, the Port committed to completing a mitigation project within 5 years from the end of October 2010. This commitment was formalized in a schedule modification, which is also captured in the current mitigation schedule.

> *The Port will also place sand and gravel over the riprap surface of the Wheeler Bay bank stabilization and cap to create a more natural habitat. The Port recognizes that the long-term viability of sand placement over a riprap surface depends on site-specific conditions such as wave action, the shape of the shoreline, nearby river activities, and river dynamics. The Port will place the sand at this location because the Wheeler Bay conditions may be conducive to sand staying in place. The Port will monitor the area as a pilot project to determine whether the site-specific conditions are conducive to maintaining a sand habitat layer over the riprap. If monitoring demonstrates that a sandy surface can be maintained long-term, this may be considered by NMFS and EPA when determining the appropriate mitigation project for the Wheeler Bay bank stabilization and cap.*

As mentioned previously, USEPA adjusted the amount of required mitigation based on the results of monitoring the habitat layer over 2 years.

3.2 Supplemental Section 404(b)(1) Evaluation Requirements

The only impact identified by the Supplemental Section 404(b)(1) Evaluation (USEPA 2008; Appendix B) requiring compensatory mitigation was related to endangered and threatened species. However, additional categories included in the 404(b)(1) Evaluation are expected to benefit from the implementation of the Alder Creek restoration project as described in the following, which is summarized from Section 4.6 of the HDP (Appendix F). The expected benefits of the proposed restoration at Alder Creek to endangered and threatened species is provided in Section 4.1 and is not repeated in the following list.

- **Substrate**—The proposed restoration of the Alder Creek site will include the excavation of upland to create meandering side channels, emergent marsh, and mudflat areas that will provide new year-round rearing and forage habitat for juvenile salmon and steelhead and lamprey ammocoetes. The creation of emergent marsh and mudflat areas is expected to provide appropriate substrate at elevations designed to

improve and expand habitat for invertebrates. Invertebrates are an important prey source for fish, shorebirds, and other wildlife.

- **Aquatic Food Web**—The proposed excavation and creation of shallow water habitat areas, including emergent marsh and mudflat areas, will provide appropriate substrate for invertebrates, an important prey source for fish, birds, and wildlife. Additionally, the proposed riparian habitat along newly excavated side channels and marsh and mudflat areas will provide new sources of food and organic material. Proposed riparian areas will also provide cover to both shade water and reduce temperatures and protect fry and juvenile salmon and steelhead and Pacific lamprey from avian predators.
- **Water Quality**—The proposed riparian habitat adjacent to the side channels, mudflats, beach, and emergent marsh habitat will provide shade to the water, which may reduce water temperatures in immediately adjacent areas. In addition, riparian habitat is also expected to improve water quality by filtering sediment and nutrients, buffering aquatic habitats from adjacent land uses, providing slope stabilization, trapping woody debris, and when mature, providing large wood to the system.
- **Wildlife**—The main goal of the proposed Alder Creek restoration project is to create, restore, and enhance habitat for listed salmonid species. This type of restoration will also benefit other species that may occur on the site including a variety of fish, avian, and terrestrial species. All elements of the project aim to improve wildlife habitat. In addition to shallow water and ACM habitats for fry and juvenile salmon and steelhead, and other aquatic and aquatic-dependent species, proposed riparian forest and scrub-shrub habitat located directly adjacent to marsh and mudflat areas and upland forest habitat proposed landward of the SIDIC levee will provide birds and terrestrial wildlife with new forage and cover habitat. Proposed LWD structures will provide habitat complexity and potential perch sites for migratory birds (including bald eagles and osprey).
- **Wetlands**—As described in Sections 3.5 and 3.7.5 of the HDP (Appendix F), the Alder Creek site currently contains approximately 1.76 acres of low to moderate functioning wetlands that have been substantially affected by previous activities, including dredge material placement, road and levee construction, and sawmill operations (Figure 8 of Appendix F). The proposed restoration project at Alder Creek will excavate the existing degraded wetlands in the area waterward of the SIDIC levee to create the

habitat complex consisting of side channel, mudflat, beach, marsh, scrub-shrub, and riparian forest habitat types. Existing degraded wetlands along the SIDIC levee and a small portion of the existing wetlands landward of the SIDIC levee will be filled to create the upland forest habitat (Figure 12 of Appendix F). Overall, the existing degraded wetland areas that fall within the restoration footprint will be altered to create a higher functioning habitat complex.

- **Mudflats**—The proposed restoration at Alder Creek includes creation of and/or enhancement of mudflat and beach habitat. As part of the restoration action, meandering side channels will be created that will connect with Multnomah Channel to the west and the Willamette River to the east. Directly adjacent to the side channels, existing, degraded upland will be excavated to create tidally influenced mudflat areas. Excavation depths and earthwork are designed to naturally sustain tidally influenced mudflat habitat. The intent is to allow for seasonal flooding and draining with the fluctuating river levels.
- **Vegetated Shallows**—Adjacent to mudflat areas and excavated side channels, the Alder Creek restoration project also proposes to excavate existing upland to create emergent marsh habitat. The marsh habitat areas will be vegetated with native and appropriate emergent marsh vegetation.
- **Aesthetics**—Currently, the Alder Creek site consists of an industrial sawmill facility. There are numerous derelict pilings and dolphins along the site's shoreline. Much of the area is un-vegetated and developed upland, and what is vegetated is overrun with invasive species. The proposed project will create a natural shoreline by removing the sawmill facility, as well as the overwater structures. The project will create new meandering side channels with adjacent marsh and riparian habitats. The restored site will provide a natural landscape setting within the Portland Harbor Superfund Site, which may improve the aesthetics of the area over current conditions.

3.3 Consistency with the Action Memo

The Alder Creek project is also consistent with the Action Memo (USEPA 2006; Appendix C) that was issued by USEPA in 2006. The Alder Creek restoration project, which is consistent with recovery plans and local/regional conservation planning efforts, has been set up as a consolidated restoration site with credits that PRPs may purchase to offset liability for injury to natural resources in Portland Harbor. The restoration focuses on recovery and protection

of habitat for Chinook salmon and other listed salmonids, as well as other species the Trustees have identified as species of significance in Portland Harbor, including Pacific lamprey, osprey, bald eagle, mink, and river otter. This focus on local/regional conservation planning and recovery of listed species and their habitat is consistent with the general mitigation project requirements that USEPA previously identified for the T4 Removal Action project in the Action Memo. The Action Memo states, "All compensatory mitigation must be consistent to the maximum extent practicable with any established mitigation strategies or conservation initiatives supported by state and federal resource agencies for the Lower Willamette River basin" (page 23). The Action Memo further states, "USEPA may consider mitigation proposals that do not meet all of the performance criteria if the Port demonstrates that the proposal otherwise contributes to conservation and recovery of ESA-listed species and/or other relevant conservation initiatives for the Lower Willamette River basin" (page 24). As such, purchasing credits from a restoration project approved by the Trustees with a focus on ESA-listed species and their habitat is appropriate and consistent with past requirements provided in the Action Memo.

4 MITIGATION CREDIT DETERMINATION

The purchase of credits associated with 0.39 acre from the Alder Creek restoration project will compensate for the unavoidable impacts to aquatic resources that resulted from the T4 Phase I Removal Action project. The credits used at the Alder Creek site are discounted service-acre years (dSAYs). The credit evaluation is being done using the Habitat Equivalency Analysis (HEA) method, which was developed by the National Oceanic and Atmospheric Administration for use in Natural Resources Damage assessments to scale compensation for habitat damage resulting from oil spills and other contaminant-related impacts. In addition, USACE has also used the method to scale compensation for habitat impacts resulting from construction projects. The HEA method is based on replacing lost ecological services (functions and values) resulting from an impact rather than replacing lost acreage of similar habitat. This method is consistent with the 2008 Compensatory Mitigation Rule as well as the Action Memo (USEPA 2006; Appendix C), which states that "Preference will be given to compensatory mitigation plans that are consistent with habitat function."

To derive a credit amount, HEA is used to compare existing and proposed habitat conditions on a site using relative habitat values. Relative habitat values are assigned to different habitat types based on condition. The credit amount expected to be generated by the proposed project is 750 dSAYs, which was determined by the Trustees. The credit release schedule developed by Wildlands is provided in Appendix G.

The Port will purchase 5.6 dSAYs from Wildlands to provide the 0.39 acre of habitat. Since the overall acreage of the restoration footprint is 52.3 acres and the site is expected to generate 750 dSAYs, approximately 14.3 dSAYs (750/52.3) will be generated per acre. 5.6 dSAYs results from multiplying 14.3 dSAYs/acre by 0.39 acre. As shown in the credit release schedule in Appendix G, more than 5.6 dSAYs are expected to be available for release upon recordation of the conservation easement and completion of construction.

5 MITIGATION PLAN

Section 4 of the HDP (Appendix F) details the proposed Alder Creek site design. Key elements are summarized in the following sections.

5.1 Alder Creek Site—Baseline Conditions

The Alder Creek restoration site is located within the historical floodplain on the southern tip of Sauvie Island at the convergence of the Willamette River and the Multnomah Channel. Figure 10 depicts the existing condition of the site. The restoration site was most recently a lumber mill owned and operated by the Alder Creek Lumber Mill, but the mill is currently inactive. Lumber mill industrial activities have resulted in significant modifications to the site's natural landscape including upland fill, over-steepening of the site's shoreline with fill and riprap, in-water pilings, and overwater coverage. The 52.3-acre restoration site is bisected by the SIDIC levee and levee easement. The restoration site is also bisected by a north-south oriented underground utility easement. Both levee and utility easements are not within the restoration site boundary (Figures 8 and 10). Baseline conditions for the Alder Creek site are provided in Section 3 of the HDP (Appendix F).

5.2 Mitigation Design

To provide maximum habitat benefit for salmonids and other aquatic and wildlife species, as described in Section 2.2, the project includes four main components:

1. Demolition of the existing sawmill complex and related infrastructure
2. Restoration of side channels, ACM, and riparian forests
3. Establishment of upland forest
4. Establishment of habitat complexity

The following sections provide a summary of information provided in Sections 4.3 through 4.5 and 4.7 of the HDP (Appendix F) related to how the restoration project will be completed.

5.2.1 Construction Overview

Construction of the Alder Creek restoration project will be accomplished using heavy equipment, including but not limited to, scrapers, graders, excavators, and dump trucks. All construction activities will comply with local, state, and federal regulations and authorization will be obtained from all applicable agencies, as required. Impacts to existing natural resources will be avoided or minimized to the extent possible. Impact avoidance and minimization measures to be implemented are listed in Section 4.4 of the HDP (Appendix F).

5.2.2 Construction Sequencing and Timing

Construction sequencing and timing is summarized from Sections 4.3 and 4.5 of the HDP (Appendix F). The existing, inactive Alder Creek Lumber Mill and related infrastructure on the restoration site will be demolished and removed from the site. This includes the large equipment storage building and the log storage yard located north of the SIDIC levee. Material will be recycled, reused, salvaged, or sold as possible. All utilities located within the restoration site footprint including transformers at the mill and the on-site water supply well, will be disconnected and decommissioned by the appropriate utility and in accordance with state and local regulations.

Demolition activities will require a variety of construction equipment. Heavy equipment could include dozers, excavators, and dump trucks.

Following demolition activities, the portion of the site waterward of the SIDIC levee will be restored with side channels and a mosaic of ACM habitats, including mudflat, beach, emergent marsh, and scrub-shrub riparian areas. Similar to demolition, earthwork activities will use various types of construction equipment. Large equipment could include bulldozers, excavators, and scrapers. The earthern berm will be removed and meandering side channels will be excavated to restore hydrologic connections with Multnomah Channel on the west and the Willamette River on the east. The channels will be excavated to a depth to allow for permanent inundation. Directly adjacent to the side channels, the landscape will be excavated to create a mosaic of tidally influenced ACM areas bordered by riparian forest.

The proposed project will involve the excavation of approximately 442,000 cubic yards. Figures 9a – 9e depict existing and proposed grades and associated habitat types. Excavation work will occur during the summer in-water work window from July 1 through October 31. When possible, work will occur "in the dry" to reduce waterway impacts.

Following the excavation of the side channels and ACM habitat in the area waterward of the SIDIC levee, the majority of the earthwork material will be transported and placed landward of the SIDIC levee in the area that currently is the site's log yard. Upland forest habitat will be established in this location. Approximately 100,000 cubic yards of the excavated material will be placed within the existing SIDIC levee easement.

In addition to the earthwork activities described previously, approximately 75 pilings and an overwater structure located offshore of the restoration site will be removed.

LWD will be placed along the newly created side channels and within the adjacent ACM habitats, as appropriate. Debris piles may be created in the upland forested areas to provide cover for small mammals before the establishment of the native, woody vegetation.

5.2.3 Plantings

As described in Section 4.7 of the HDP (Appendix F), the proposed planting plan will minimize disturbance to existing native vegetation, including the small patches of native tree species along the site's southeastern and northwestern edges. The configuration of the side channels was designed to avoid the removal of native trees to the maximum extent practicable; although some native trees will need to be removed. Trees removed during construction activities will be reused as LWD or habitat complexity features, as appropriate. If healthy, native wetland herbaceous species are disturbed during construction, an effort will be made to salvage the vegetation and transplant it within the appropriate restored habitat area, as possible.

Proposed plantings will include container plants, bare root, and live stakes. Plant material type and size will depend on availability at the time of design implementation. Plant material will be procured from native plant nurseries in northwestern Oregon or

southwestern Washington. Live stakes may be collected from the existing habitats on the project site.

All disturbed upland areas will be seeded with a suitable native upland plant species seed mix. The native seed mix will be developed to minimize the extent of invasive species establishment. Seeding will occur prior to the rainy season to provide soil stabilization and prevent potential erosion.

5.2.4 Irrigation

As described in Section 4.7 of the HDP (Appendix F), the ACM and riparian habitats located waterward of the SIDIC levee are not expected to require irrigation as long as the installation year is a normal precipitation year. Although it is not expected, the upland forest areas located landward of the SIDIC levee may require irrigation for the tree plantings in the first few years to allow the trees to establish and increase survivorship.

5.3 Restored Habitat Areas—Proposed Conditions

The following describes target elevations and specific design features of each proposed habitat area (Figures 8 and 9a – 9e) as detailed in Section 4.6 of the HDP (Appendix F).

5.3.1 Side Channel Habitat

As described previously, approximately 2 acres of meandering and permanently inundated side channels will be excavated waterward of the SIDIC levee. The channel design will allow for flow-through; the two connections to the Willamette River will function as inlets and the connection to Multnomah Channel will function as the outlet; flow will typically move from east to west. The elevations of the bottom of the side channels will range from -1 to +2.5 NGVD (2.5 to 5.0 NAVD 88).

5.3.2 Active Channel Margin

The proposed design greatly expands the ACM area and creates an approximately 21-acre mosaic of un-vegetated beach, mudflat, emergent marsh, and riparian scrub-shrub habitats

between the proposed ordinary high water level (OHWL) and ordinary low water level (OLWL):

- **Un-vegetated Beach and Mudflat (approximately 3 acres).** These habitat areas are located between the OLWL along the Multnomah Channel, the Willamette River, and newly excavated side channels and the emergent marsh. The mudflat habitat will be located between elevations +2.5 and +5 NGVD (+5 and +8.5 NAVD88) and, due to wave action, the un-vegetated beach habitat will be located between elevations +2.5 and +6.5 NGVD (+5 and +10 NAVD88).
- **Emergent Marsh (approximately 6 acres).** This habitat will be developed between elevations +5 and +6.5 NGVD (+8.5 and +10 NAVD88) and will be semi-permanently flooded. The marsh habitat is designed to allow for flooding and draining with the fluctuating river levels. The marsh areas are expected to be vegetated with emergent marsh vegetation such as sedge and spikerush.
- **Riparian Scrub-Shrub (approximately 12 acres).** This habitat will serve as a transition zone between the emergent marsh habitat and OHWM, between +6.5 and +16.5 NGVD (+10 and +20 NAVD88), where the riparian forest habitat begins. The scrub-shrub areas will include low-growing woody trees and shrubs that are less than 15 feet high such as willows and dogwood.

5.3.3 Riparian Forest

Riparian forest habitat is proposed waterward of the SIDIC levee. This habitat area is proposed within the historical floodplain, above OHWL and adjacent to the ACM habitat mosaic. Approximately 9 acres of riparian forest will be created between elevations +16.5 and +28.5 NGVD (+20 and +32 NAVD 88).

As described previously, approximately 1 acre of riparian forest habitat exists in small patches along the eastern edge of the site bordering the Willamette River with native trees and shrubs and understory dominated by invasive species. This existing habitat will be enhanced with supplemental native species plantings and invasive species control, where needed.

5.3.4 Upland Forest

The area north of the SIDIC levee will consist of approximately 20 acres of restored or enhanced upland forest. This entire area is outside of the floodplain. This habitat area will be planted with native tree species. In addition, native upland seed will be applied to the area as well to establish native species within the understory.

6 PERFORMANCE STANDARDS

Note that the performance standards are still being developed and are subject to change. If any changes occur, they will be documented in the Final Mitigation Work Plan. Performance standards have been developed and will be implemented after restoration activities are complete to verify that construction occurred as specified and over the long term to confirm that performance criteria and mitigation goals and objectives are being achieved. Performance standards have quantitative criteria for success, which are directly linked to a contingency measure or adaptive management measure. Performance standards are related to aspects of the project over which managers have a relatively high level of control and can readily make adjustments to improve function.

Performance standards have been developed by Wildlands for the Alder Creek site and include the following parameters:

- Hydrology
- Geomorphic/structural features
- Vegetation
  - Emergent marsh
  - Scrub-shrub and riparian (ACM)
  - Riparian forest
  - Upland forest
  - Invasive plant species

Specific success criteria for the performance standards listed above are discussed in detail in Section 5.3 of the HDP (Attachment F).

7 MONITORING, MAINTENANCE, AND MANAGEMENT ACTIVITIES

Note that the monitoring, maintenance, and management activities are still being developed and are subject to change. If any changes occur, they will be documented in the Final Mitigation Work Plan. Establishment period monitoring, adaptive management, long-term monitoring, and long-term management activities are planned for the Alder Creek site to confirm that the project is constructed as designed, is trending towards achieving performance standards within 10 years, and after achieving performance standards, will be maintained and managed to sustain the project design in perpetuity. The monitoring, maintenance, and management activities are summarized from Sections 6.0, 6.2, and 7.0 of the HDP (Appendix F) and Sections 3.0 and 3.2 of the Management Plan (Appendix H) in the following subsections.

7.1 Establishment Period Monitoring

Establishment period monitoring will be implemented to show progress in establishing habitats, including hydrology, native vegetation, recruiting and retaining LWD, and controlling invasive plant species. Sections 6.0 through 6.2 of the HDP (Appendix F) provide specific details related to the monitoring design, specific monitoring activities, and monitoring schedule. In addition, baseline biological monitoring will occur where necessary to establish a baseline for future comparisons, and aerial photo interpretation and photo documentation will also be included as part of the monitoring program.

7.2 Adaptive Management

An adaptive management plan identifies potential measures that could be implemented to address unforeseen changes in site conditions or other components of the mitigation project. Section 7 of the HDP in Appendix F discusses remedial actions or corrective measures that could be implemented as adaptive management. In addition, Section 3.2.1 of the Management Plan in Appendix H states that, if necessary, adaptive management actions may be taken to meet the mitigation project's objectives based on the results of monitoring activities and observations and/or new information from on-going research of anadromous salmonids and other relevant species.

7.3 Long-term Monitoring

Long-term monitoring will be implemented after the establishment period monitoring and will occur on a regular basis in perpetuity to ensure long-term sustainability of the site. Long-term monitoring activities will be less intensive and will be implemented to determine if habitats are being maintained through time. Long-term monitoring and maintenance activities are discussed in detail in Section 3 of the Management Plan in Appendix H and include the following:

- General site monitoring through aerial photos and photo documentation
- Hydrology monitoring
- Vegetation monitoring
- Invasive species monitoring

Long-term monitoring activities will be funded by the project's endowment (see Section 8.0) in perpetuity after the end of the establishment period.

7.4 Long-term Management and Maintenance

A management plan has been prepared for the Alder Creek site that discusses how the Alder Creek site will be managed and maintained after performance standards have been achieved to ensure the long-term sustainability of the site. The Management Plan is attached as Appendix H. The Long-term Management section (i.e., Section 3.2) of the document includes the following items:

- Adaptive management
- Vegetation management
- Hydrologic connections
- LWD
- Beaver and nutria management
- Trash removal
- Trespass and public access

8 SITE PROTECTION AND FINANCIAL ASSURANCES

Note that the site protection and financial assurances are still being developed and are subject to change. If any changes occur, they will be documented in the Final Mitigation Work Plan. The portion of the Alder Creek restoration site that is unencumbered by easements will be protected from development in perpetuity by the recordation of a conservation easement. The draft form of conservation easement is provided in Appendix I. This form will be finalized in conjunction with a conservation easement holder, once one has been selected.

An Interim Management Account, Construction Security, and Endowment Fund will be created for financial assurances that the Alder Creek project will be implemented, monitored, and maintained in perpetuity. An Interim Management Account, described in detail in Section 4.6 of the Management Plan (Appendix H), will be used as a contingency fund for management of the project until the Endowment Fund target amount is achieved, at which time the Interim Management Account may be terminated. A Construction Security in the form of bond will be posted for the estimated cost of construction. The cost of construction was established by soliciting a third party cost estimate. A long-term management and maintenance endowment fund account will be established with a target amount designated. Long-term management, maintenance, and monitoring covered by this fund include the activities discussed in the Management Plan (Appendix H). The Endowment Fund is described in detail in Section 4.5 of the Management Plan and in Exhibit J-1(Endowment Fund Information), also provided in Appendix H.

9 REFERENCES

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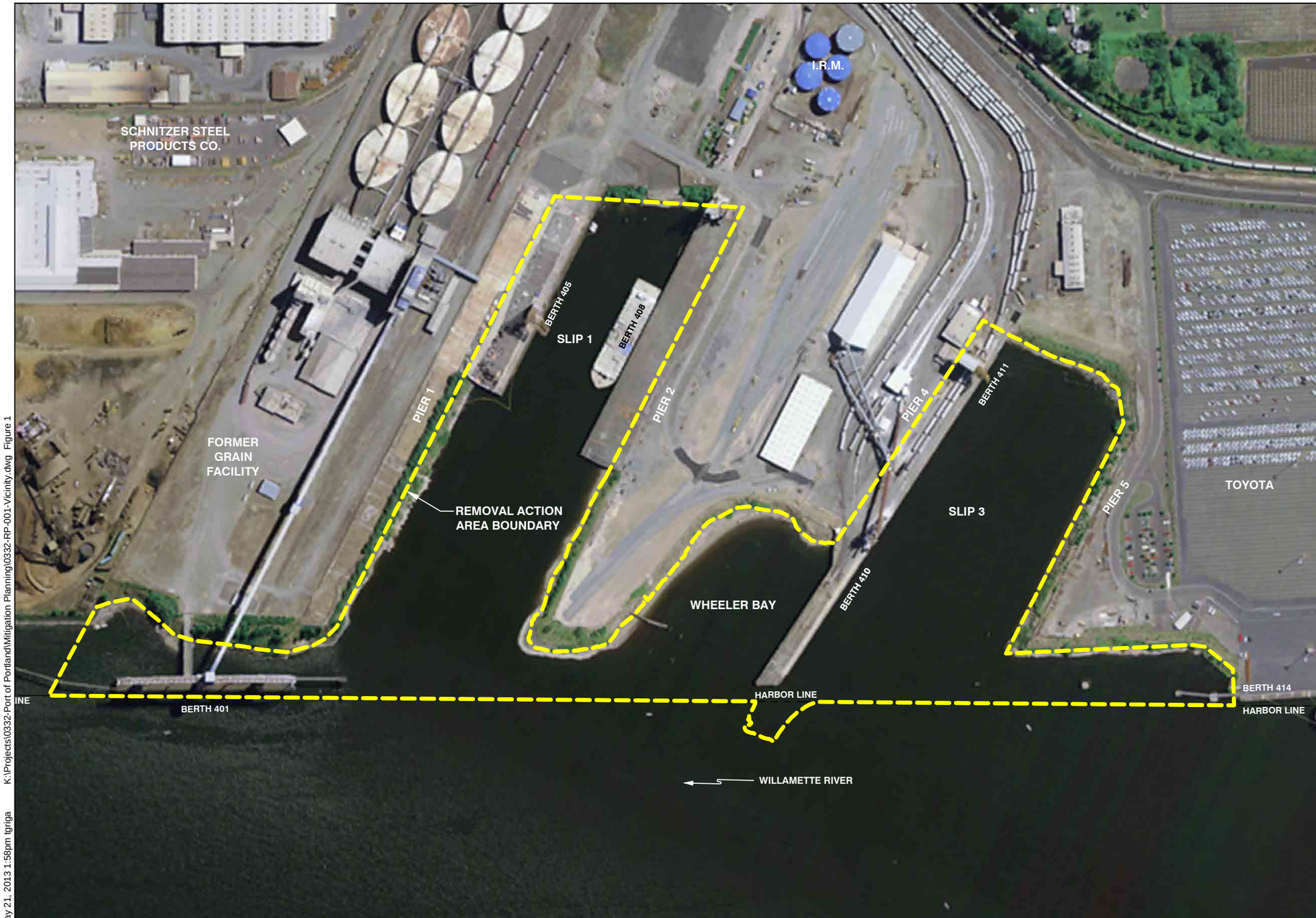
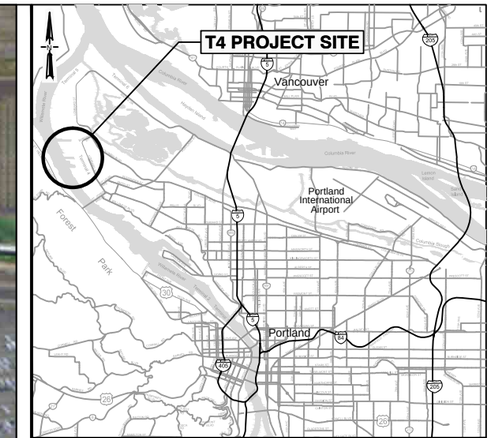
FIGURES





VICINITY MAP
SCALE: N.T.S.

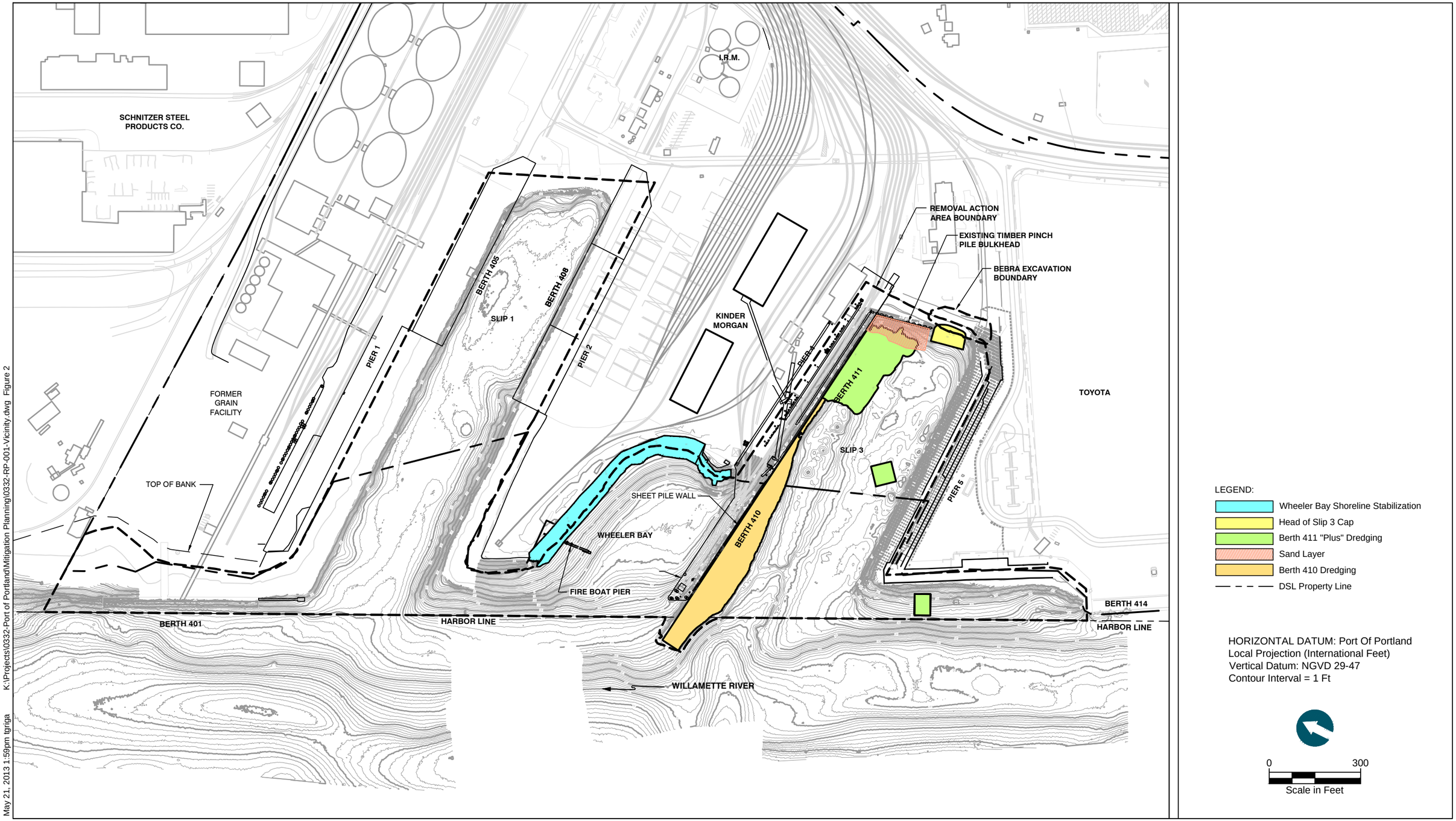
HORIZONTAL DATUM: Port Of Portland
Local Projection (International Feet)

0 300
Scale in Feet

May 21, 2013 1:58pm tgriga K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-001-Vicinity.dwg Figure 1

ANCHOR QEA

Figure 1
Terminal 4 Phase I Removal Action Vicinity Map
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



May 21, 2013 1:59pm tgriga K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-001-Vicinity.dwg Figure 2

ANCHOR QEA

Figure 2
Summary of Terminal 4 Phase I Removal Action
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

Figure 3
Wheeler Bay Shoreline in 2012
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

ANCHOR QEA

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K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-002-Site.dwg Figure 4

May 17, 2013 5:13pm tgriga

AERIAL: Bing Maps
HORIZONTAL DATUM:
Oregon State Plane North, NAD83, International Feet.

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Scale in Feet

Figure 4
Alder Creek and Wheeler Bay Vicinity Map
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

ANCHOR QEA

Source: Google Earth Pro 2007

Not to Scale

Figure 5
Wheeler Bay Shoreline Before Phase I Construction
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

ANCHOR QEA

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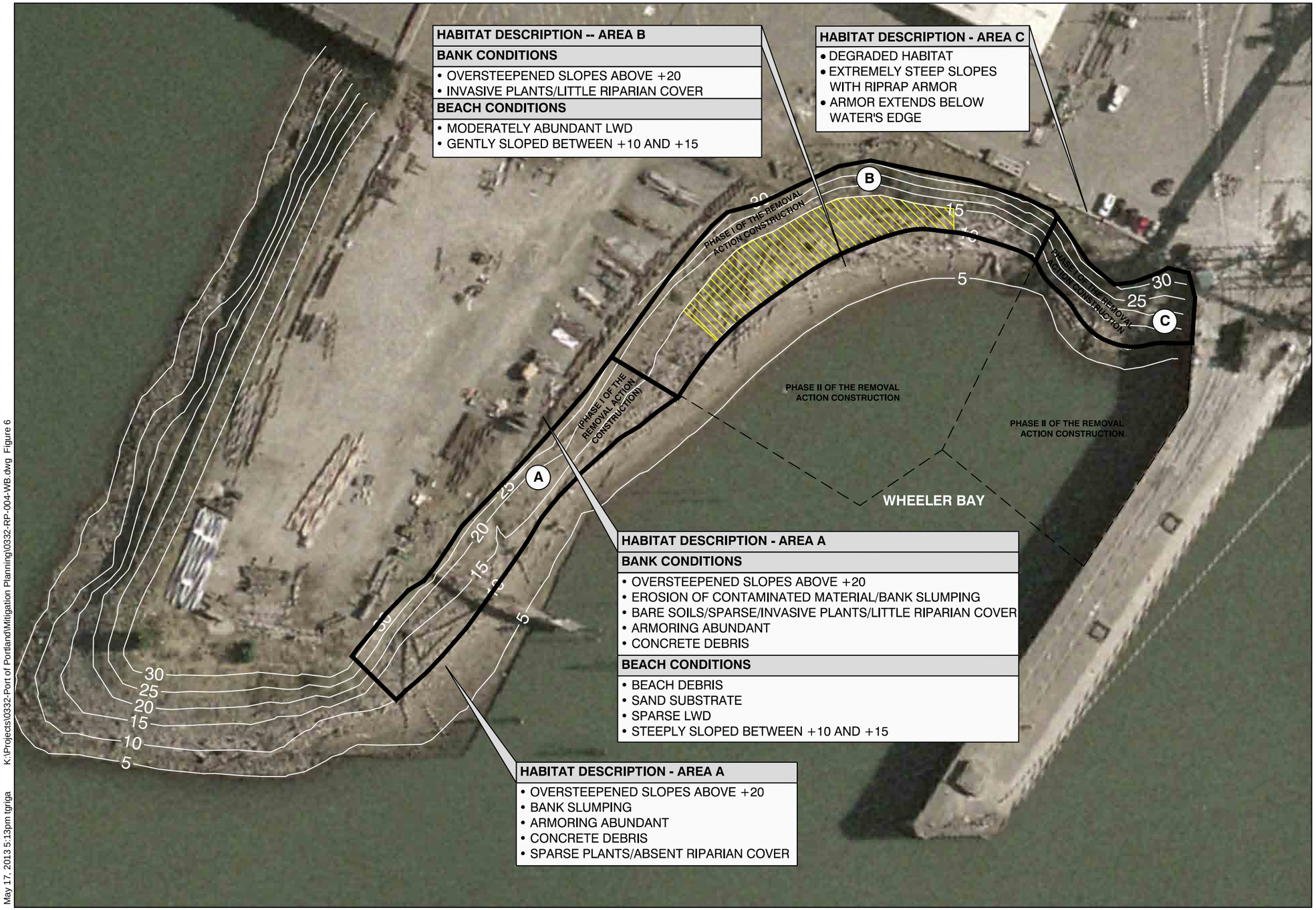


LEGEND:

- Habitat that was in Good Condition prior to Phase 1
- Phase 1 Removal Action Construction Footprint
- (A) Phase 1 Removal Action Construction Areas

NOTES:

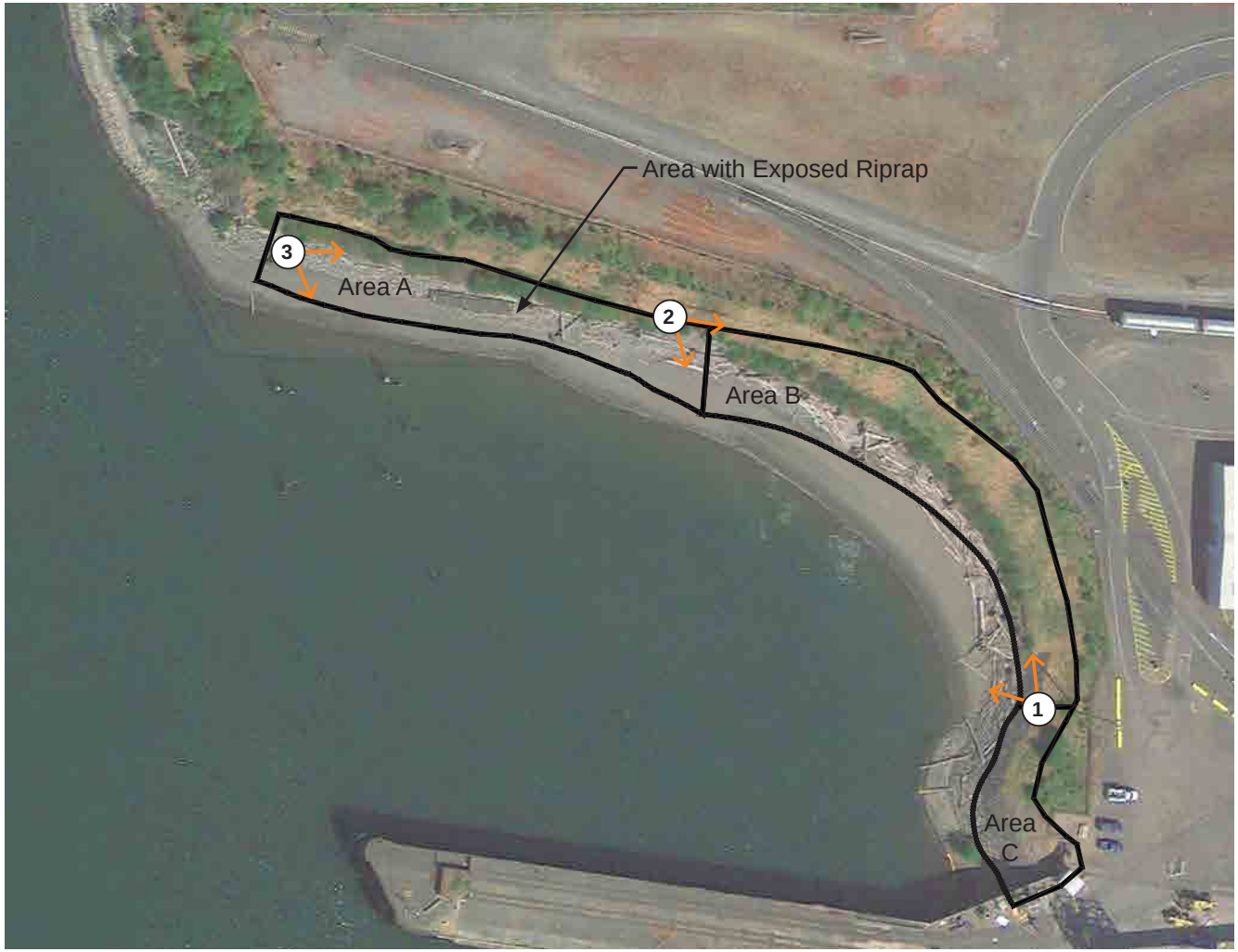
1. Horizontal Datum: Port of Portland Local Projection (International Feet) Vertical Datum: NGVD 29-47
2. Bathymetric survey by Port of Portland dated November 2007.
3. Elevation 16.6 NGVD is Ordinary High Water (OHW).

0 60
Scale in Feet

K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-004-WB.dwg Figure 6
May 17, 2013 5:13pm tgriga

ANCHOR QEA

Figure 6
Pre-Construction Wheeler Bay Habitat Conditions
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



Source: Google Earth Pro 2012

Not to Scale

Figure 7
Wheeler Bay Shoreline After Phase I Construction
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

ANCHOR QEA

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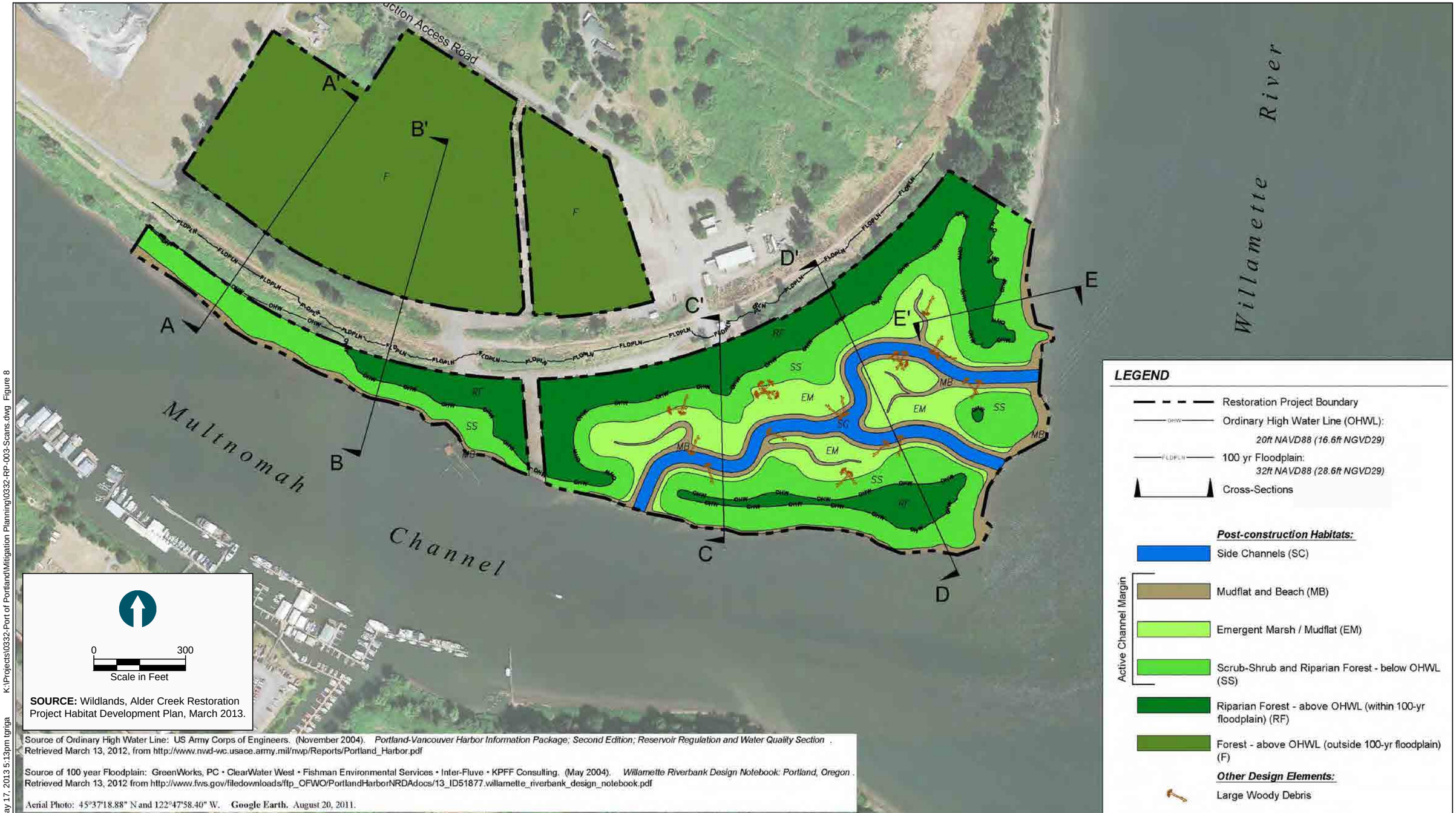

SOURCE: Wildlands, Alder Creek Restoration Project Habitat Development Plan, March 2013.

Source of Ordinary High Water Line: US Army Corps of Engineers. (November 2004). *Portland-Vancouver Harbor Information Package; Second Edition; Reservoir Regulation and Water Quality Section* . Retrieved March 13, 2012, from http://www.nwd-wc.usace.army.mil/nwp/Reports/Portland_Harbor.pdf

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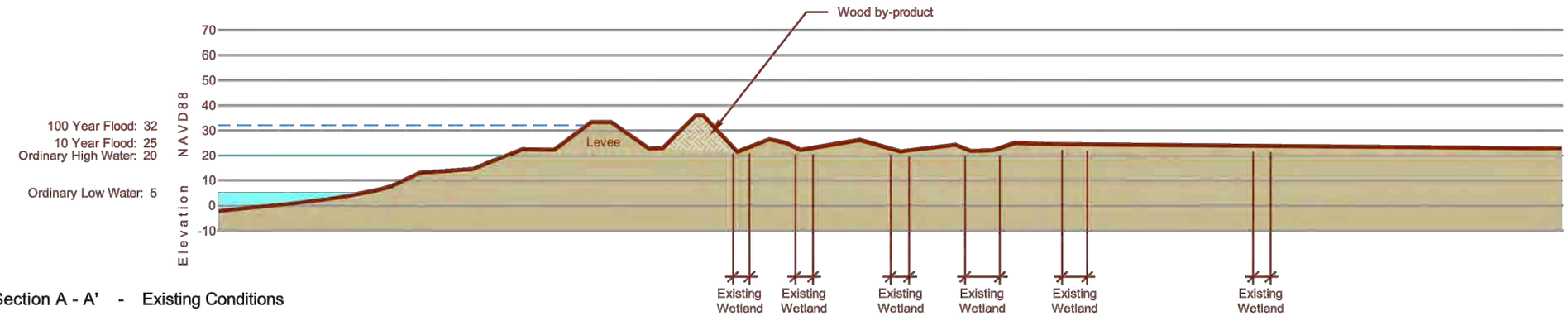
Aerial Photo: 45°37'18.88" N and 122°47'58.40" W. **Google Earth.** August 20, 2011.

K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-003-Scans.dwg Figure 8

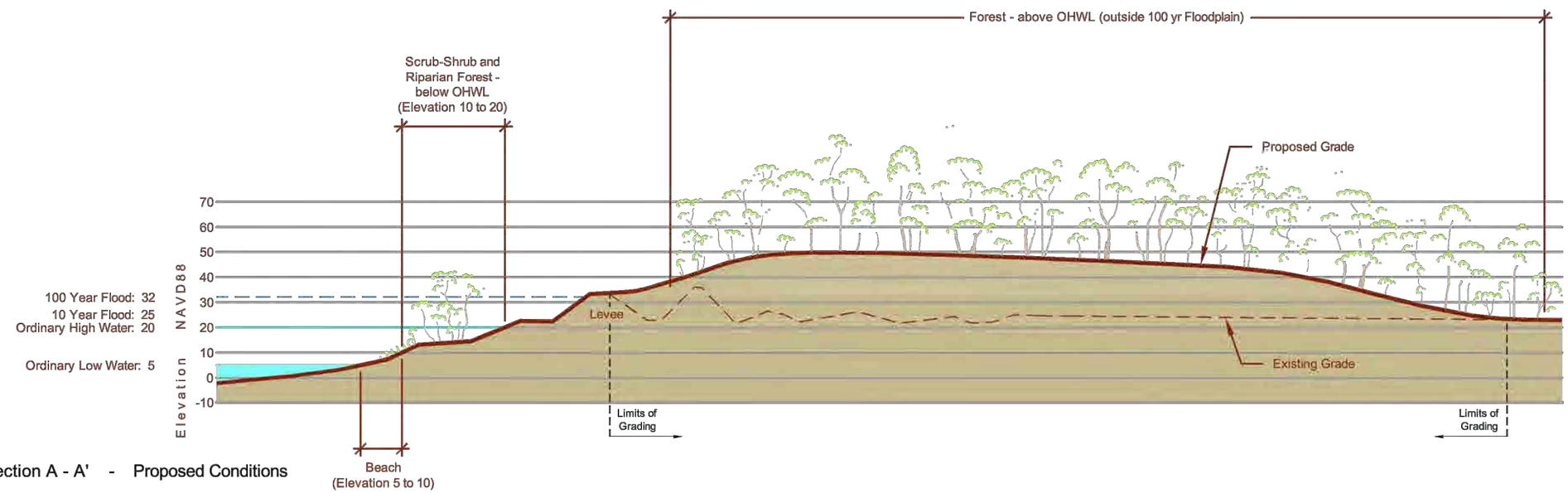
May 17, 2013 5:13pm tgriga

ANCHOR QEA

Figure 8
Alder Creek Restoration Project Site Plan
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



Cross Section A - A' - Existing Conditions



Cross Section A - A' - Proposed Conditions

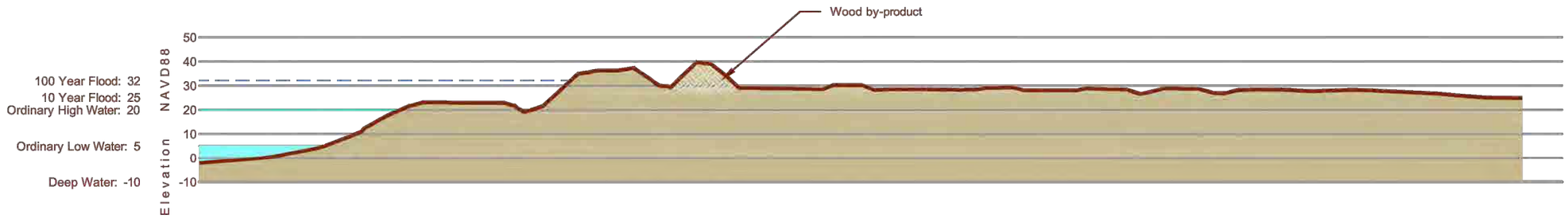
0 50
Scale in Feet

SOURCE: Wildlands, Alder Creek Restoration Project Habitat Development Plan, March 2013.

May 17, 2013 5:13pm tgriga K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-003-Scans.dwg Figure 9a

ANCHOR QEA

Figure 9a
Alder Creek Restoration Project Cross Section A-A'
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



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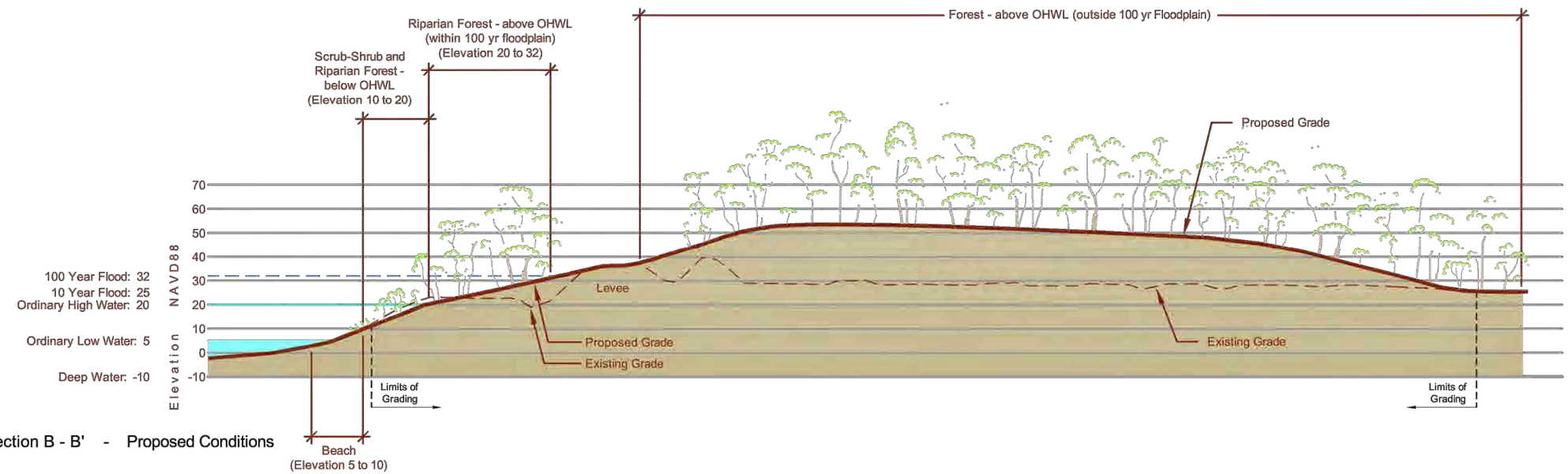

Cross Section B - B' - Proposed Conditions

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Scale in Feet

SOURCE: Wildlands, Alder Creek Restoration Project Habitat Development Plan, March 2013.

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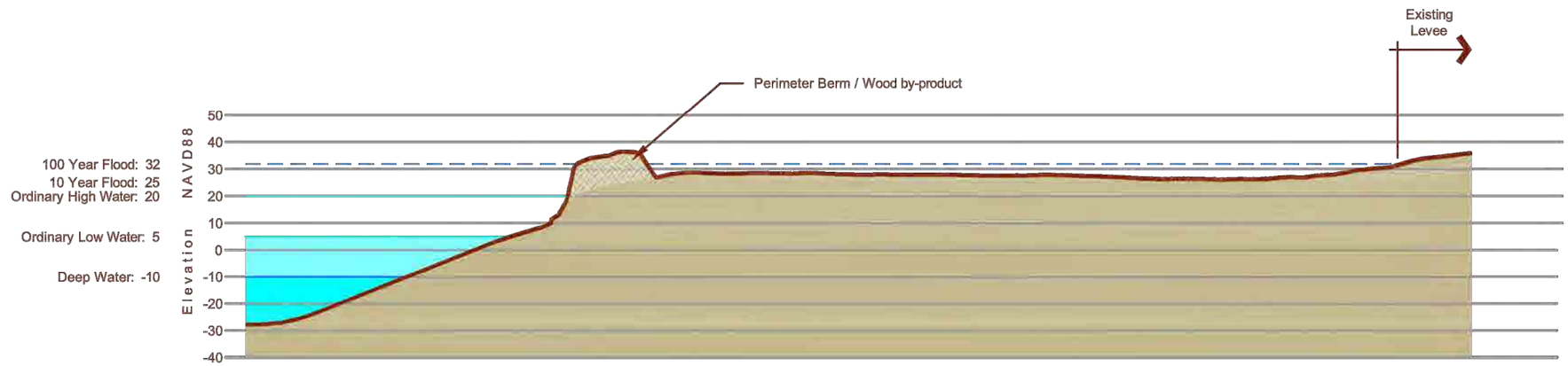
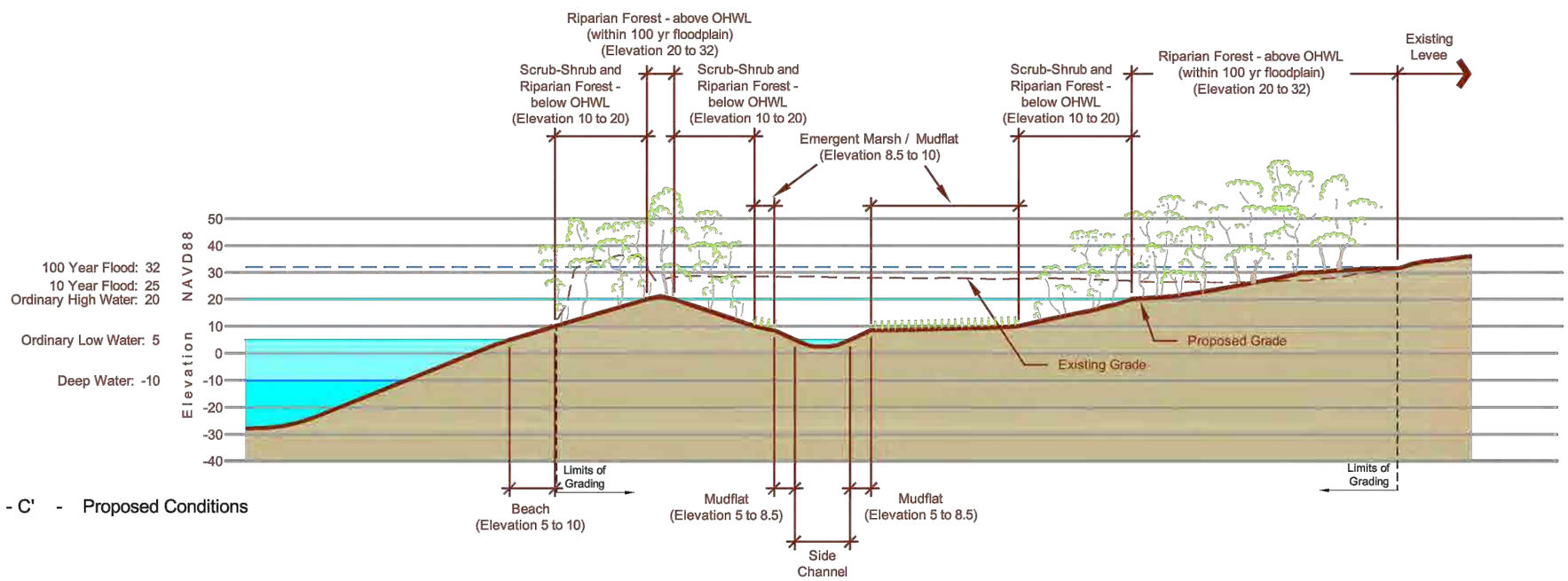
ANCHOR QEA

Figure 9b
Alder Creek Restoration Project Cross Section B-B'
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



Cross Section C - C' - Existing Conditions



Cross Section C - C' - Proposed Conditions

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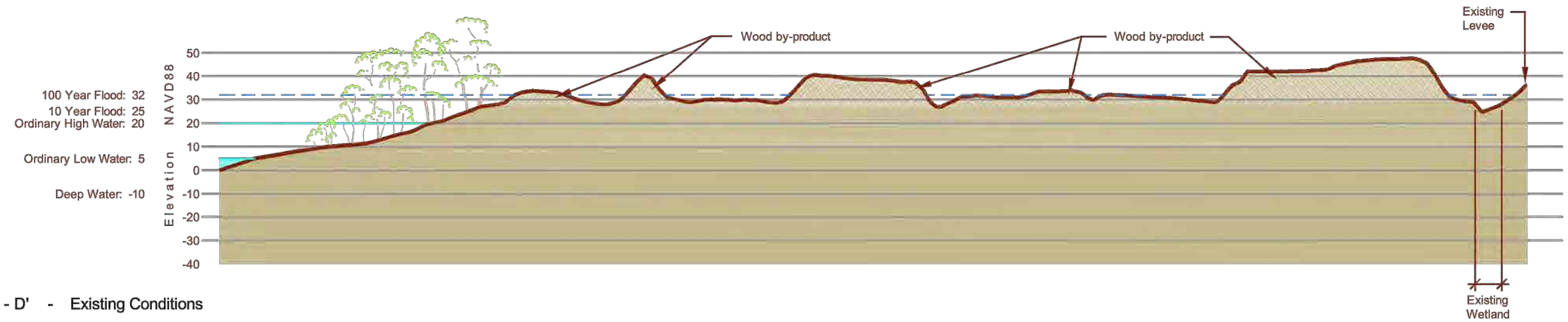
Scale in Feet

SOURCE: Wildlands, Alder Creek Restoration Project Habitat Development Plan, March 2013.

May 17, 2013 5:13pm tgriga K:\Projects\0332-Port of Portland\Mitigation Planning\0332-RP-003-Scans.dwg Figure 9c

ANCHOR QEA

Figure 9c
Alder Creek Restoration Project Cross Section C-C'
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



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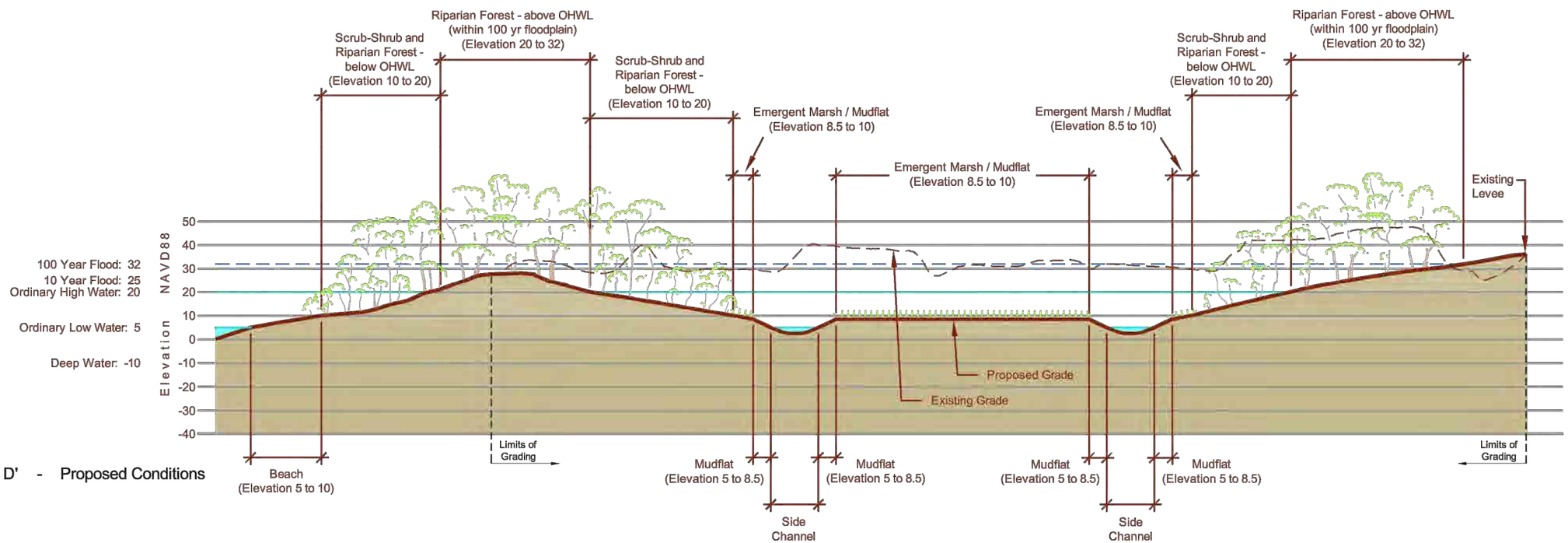

Cross Section D - D' - Proposed Conditions

SOURCE: Wildlands, Alder Creek Restoration Project Habitat Development Plan, March 2013.

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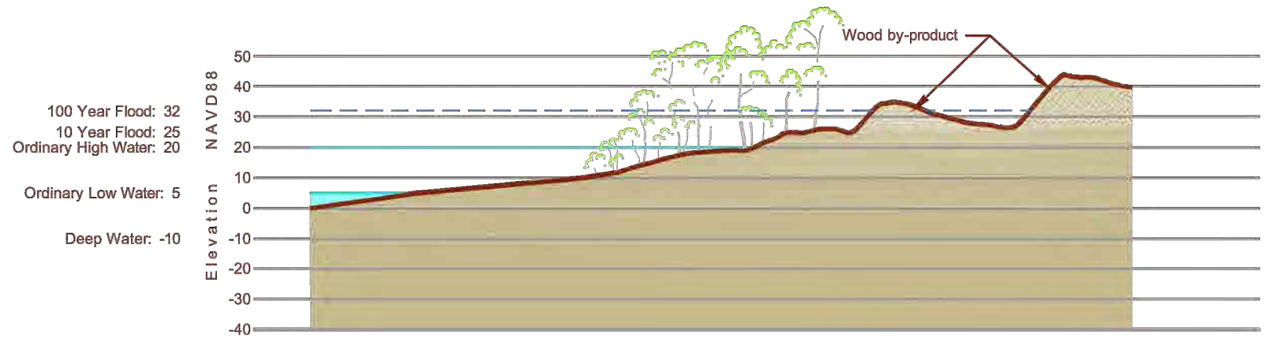
Figure 9d
Alder Creek Restoration Project Cross Section D-D'
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon



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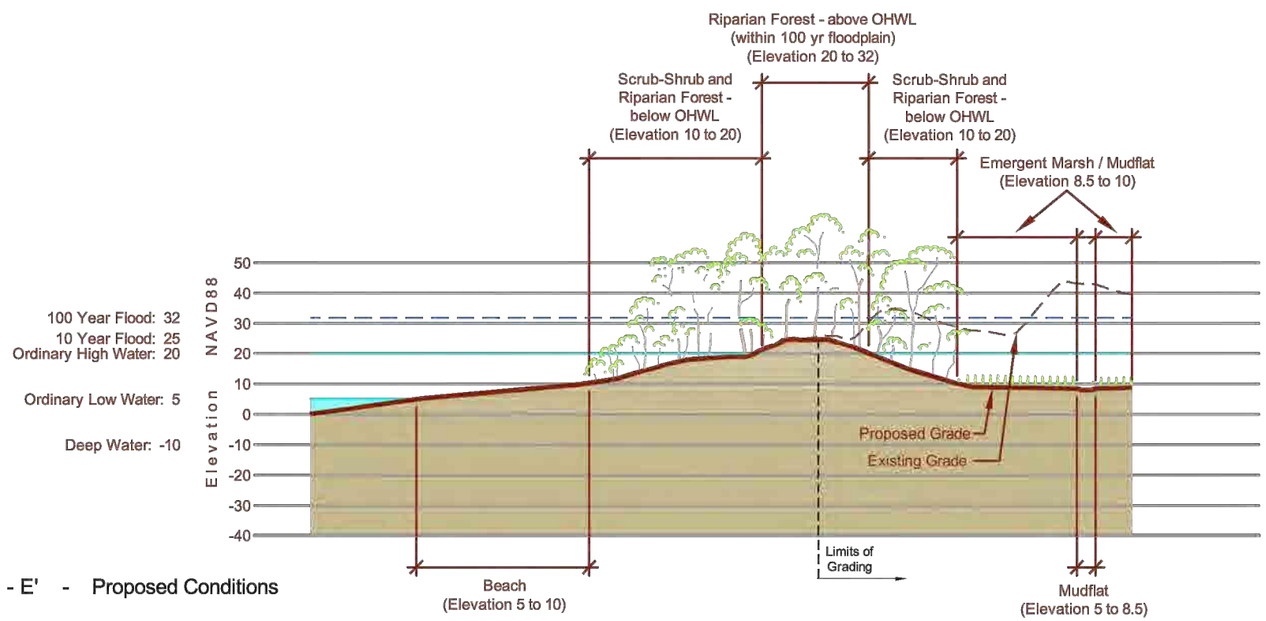

Cross Section E - E' - Proposed Conditions

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Scale in Feet

SOURCE: Wildlands, Alder Creek Restoration Project Habitat Development Plan, March 2013.

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ANCHOR QEA

Figure 9e
Alder Creek Restoration Project Cross Section E-E'
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

Source of Ordinary High Water Line:
US Army Corps of Engineers. (November 2004). *Portland-Vancouver Harbor Information Package; Second Edition; Reservoir Regulation and Water Quality Section* . Retrieved March 13, 2012, from http://www.nwd-wc.usace.army.mil/nwp/Reports/Portland_Harbor.pdf
and
Wetland and Other Waters Delineation Report: Alder Creek Mill Restoration Site . URS Corporation, Portland, OR. December 8, 2011.

Aerial Photo: 45°37'18.88" N and 122°47'58.40" W. **Google Earth**. August 20, 2011.

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Figure 10
Alder Creek Site Existing Conditions Plan
Terminal 4 Phase I Removal Action Draft Mitigation Work Plan
Port of Portland, Portland, Oregon

APPENDIX A
BIOLOGICAL OPINION

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Northwest Region
7600 Sand Point Way N.E., Bldg. 1
Seattle, WA 98115

Refer to NMFS No.:
2007/08174

July 22, 2008

Sean Sheldrake
U.S. Environmental Protection Agency
Region 10
1200 Sixth Avenue, Suite 900
Seattle, Washington 97101-3140

Re: Endangered Species Act Section 7 Formal Consultation and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation for the U.S. Environmental Protection Agency and Port of Portland Terminal 4 Superfund Phase I of the Removal Action, Willamette River (HUC 17090012), Multnomah County, Oregon

Dear Mr. Sheldrake:

The enclosed document contains a biological opinion (Opinion) prepared by the National Marine Fisheries Service (NMFS) pursuant to section 7(a)(2) of the Endangered Species Act (ESA) on the proposed authorization of the Superfund Phase 1 Removal Action by the U.S. Environmental Protection Agency (EPA) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9601, *et seq*. (CERCLA or Superfund). In this Opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of seven species of ESA-listed fishes that reside in the Willamette River: Upper Willamette River (UWR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River (LCR) Chinook salmon, LCR steelhead (*O. mykiss*), UWR steelhead, Columbia River (CR) chum salmon (*O. keta*), LCR coho salmon (*O. kisutch*), and green sturgeon (*Acipenser medirostris*).

Further, NMFS concludes that the proposed action will not result in the destruction or adverse modification of critical habitats designated for five of these species. At this time, critical habitat has not been proposed or designated for LCR coho salmon or green sturgeon.

NMFS also concludes that the proposed action is not likely to jeopardize the continued existence of seven species of ESA-listed salmonid fishes that reside in the Columbia River: Upper Columbia River (UCR) Chinook salmon, Snake River (SR) spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR Basin steelhead, UCR steelhead, Middle Columbia River steelhead, and SR sockeye salmon (*O. nerka*). The NMFS concludes that the proposed action will not result in the destruction or adverse modification of critical habitats designated for these species.

As required by section 7 of the ESA, an incidental take statement prepared by NMFS is provided with the Opinion. The incidental take statement describes reasonable and prudent measures NMFS considers necessary or appropriate to minimize incidental take associated with the proposed action. It also sets forth nondiscretionary terms and conditions, including reporting requirements, that the Federal agency and applicant, if any, must comply with to carry out the reasonable and prudent measures. Incidental take from actions by the action agency and applicant that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's likely effects on essential fish habitat (EFH) pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA), and includes two conservation recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These conservation recommendations are an identical subset of the ESA terms and conditions. Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations.

If the response is inconsistent with the EFH conservation recommendation, the EPA must explain why the recommendation will not be followed, including the scientific justification for any disagreements over the effects of the action and the recommendation.

If you have questions regarding this consultation, please contact Dr. Nancy Munn in the Willamette Basin Habitat Branch of the Oregon State Habitat Office, at 503-231-6269.

Sincerely,

for D. Robert Lohn
Regional Administrator

cc: Rob Neely, NOAA
Alex Cyril, ODEQ
Todd Alsbury, ODFW

Endangered Species Act-Section 7 Consultation
Biological Opinion

&

Magnuson-Stevens Fishery Conservation and Management Act
Essential Fish Habitat Consultation

U.S Environmental Protection Agency and Port of Portland Terminal 4
Superfund Phase I of the Removal Action,
Willamette River (HUC 17090012), Multnomah County, Oregon

Lead Action Agency:	U.S. Environmental Protection Agency
Consultation Conducted By:	National Marine Fisheries Service Northwest Region
Date Issued:	July 22, 2008
Issued by:	for Michael Dehar D. Robert Lohn Regional Administrator
NMFS No.:	**2007/08174**

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INTRODUCTION

The biological opinion (Opinion) and incidental take statement portions of this consultation were prepared by the National Marine Fisheries Service (NMFS) in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531, *et seq*.), and implementing regulations at 50 CFR 402. With respect to critical habitat, the following analysis relied only on the statutory provisions of the ESA, and not on the regulatory definition of "destruction or adverse modification" at 50 CFR 402.02.

The essential fish habitat (EFH) consultation was prepared in accordance with Section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801, *et seq*.) and implementing regulations at 50 CFR 600.

The docket for this consultation is on file at the Oregon State Habitat Office in Portland, Oregon.

Background and Consultation History

The NMFS received a letter and a biological assessment (BA) on December 27, 2007, from the U.S. Environmental Protection Agency (EPA) requesting formal consultation under the ESA and MSA on the proposed authorization of the Port of Portland's (Port) Terminal 4 Superfund Phase 1 Removal Action under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, 42 U.S.C. § 9601, *et seq*. (CERCLA or Superfund). The NMFS received additional information on March 4, 2008, and April 9, 2008. Terminal 4 is along the east bank of the Willamette River in the City of Portland, Oregon (Figure 1), downstream from the St. Johns Bridge and between river miles (RMs) 4 and 5.

The EPA concluded that the proposed action was "likely to adversely affect" Upper Willamette River (UWR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Lower Columbia River (LCR) Chinook salmon, LCR steelhead (*O. mykiss*), UWR steelhead, Columbia River (CR) chum salmon (*O. keta*), and LCR coho salmon (*O. kisutch*) (hereafter collectively referred to as "listed salmonids"). The EPA also concluded that the proposed action was "not likely to adversely affect" Upper Columbia River (UCR) Chinook salmon, Snake River (SR) spring/summer run Chinook salmon, SR fall-run Chinook salmon, SR Basin steelhead, UCR steelhead, Middle Columbia River (MCR) steelhead, and SR sockeye salmon (*O. nerka*). The Opinion also addresses effects to critical habitat designated for all of the species listed above with the exception of LCR coho salmon; critical habitat has not been proposed or designated for LCR coho salmon. In the December 27, 2007, letter, the EPA did not provide information on, or make an effect determination for, green sturgeon (*Acipenser medirostris*).

Proposed Action

The proposed action includes permitting of all methods and actions described in the following paragraphs. This is a complex project and the following project description does not include all of the design details used to analyze the effects of the action. The Design Analysis Report (Anchor Environmental, April 9, 2008) prepared for the Port and the Water Quality Monitoring and Compliance Conditions Plan (Parametrix, March 5, 2008) prepared for EPA provide project

details that NMFS used to complete this Opinion. Subsequent refinements to these documents are not likely to alter the effects analysis.

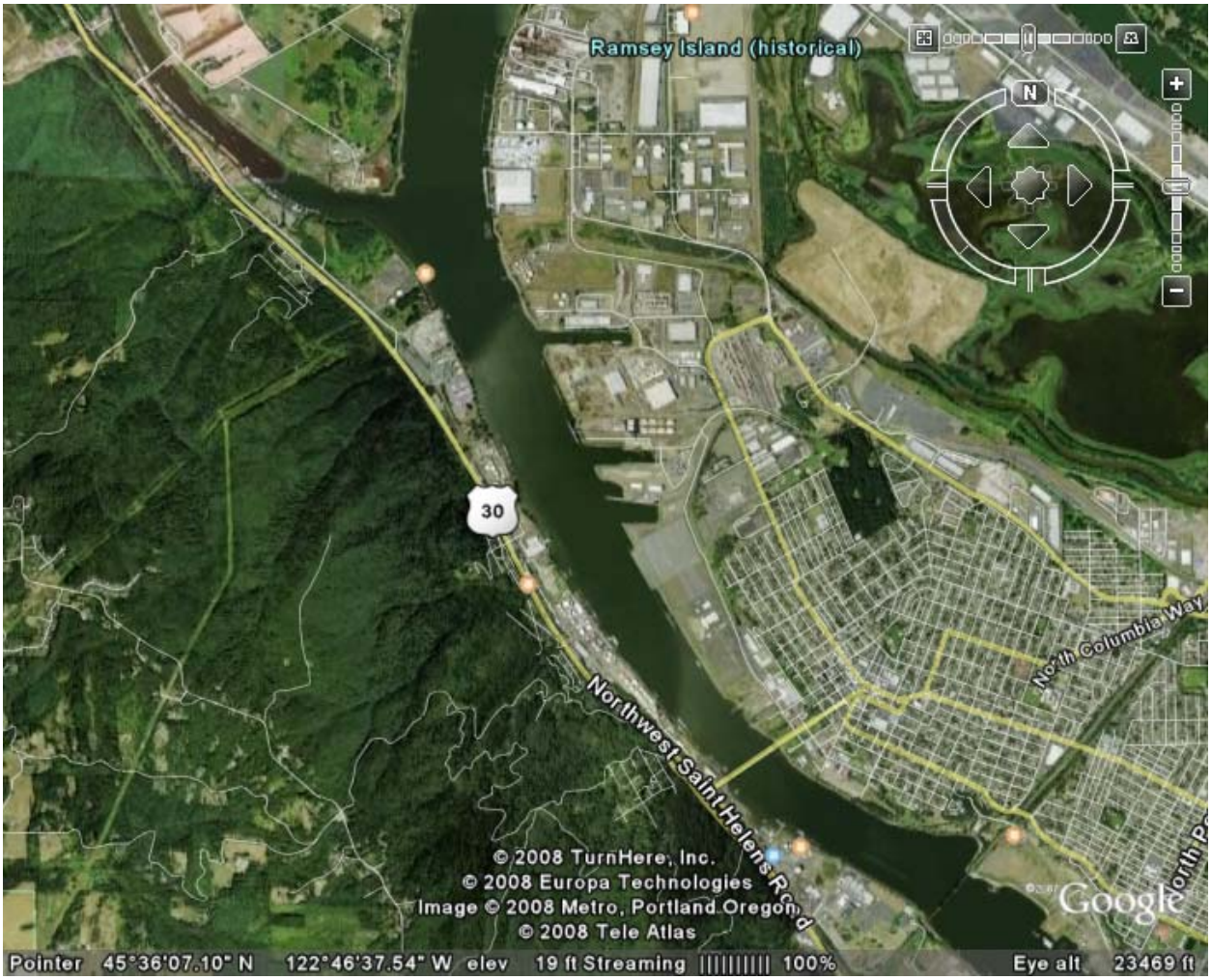
Background. The proposed action is Phase I of a removal action to address contaminated sediments at the Port's Terminal 4 between rivermiles (RMs) 4 and 5 on the Willamette River. The site is within the Portland Harbor Superfund Site, which is on the CERCLA National Priorities List. In 2006, EPA evaluated and selected a Non-Time Critical Removal Action for Terminal 4. This selection was detailed in the EPA Action Memorandum issued on May 11, 2006, and included a combination of monitored natural recovery, capping, and dredging with placement of contaminated sediments in a confined disposal facility (CDF) to be built on site. Since December 2006, the Port and EPA teams have been working through technical questions and issues associated with the design. Some of these issues are linked to the overall harbor-wide remedial investigation/feasibility (RI/FS) process, and therefore, EPA has agreed to revise the schedule for implementation of some portions of the Terminal 4 removal action.

At this time, EPA is requiring the Port to implement an abatement action during the 2008 in-water work window to reduce risks at Terminal 4. As a consequence, the removal action will be implemented in two phases. Phase I (the proposed action) is an abatement action planned for 2008. Phase II may include building the CDF, and will commence when the project is realigned with the harbor-wide RI/FS process. EPA will scope the Phase II action when the Phase I action is complete and the extent and type of contaminants remaining in Slip 3 and the Willamette River are defined. EPA is also waiting for the RI/FS process so the determination can be made whether a CDF is needed for placement of harbor-wide sediments. Therefore, consultation for Phase II will be conducted at a later date.

Phase I of the removal action will occur between July and October 31, 2008. EPA expects in-water work to last 4 weeks, and the entire project will last 6 weeks. Phase I includes:

1. Dredging and off-site disposal of sediments exhibiting the highest chemical concentrations, including sediments from Berth 411 and the area north of Berth 414.
2. Construction of a nearshore cap to isolate petroleum-based sediments from aquatic receptors and control a potential ongoing source to nearby areas. This is at the head of Slip 3.
3. Stabilization of a portion of the bank within Wheeler Bay to minimize contaminant migration to the river.
4. Dredging and off-site disposal of contaminated sediments from Berth 410.

Figure 1. The Port of Portland's Terminal 4 site at RM 5 in the Willamette River.

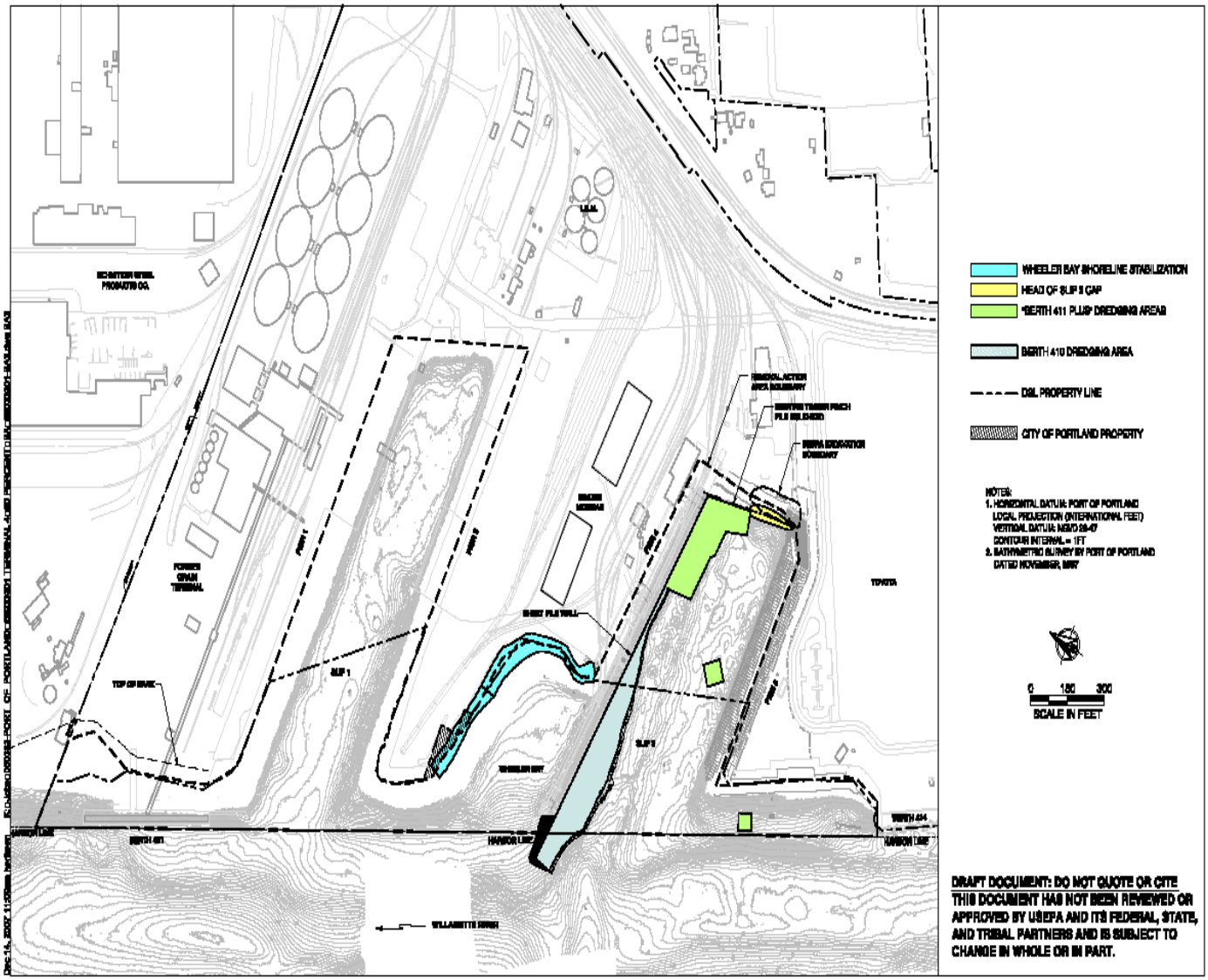


<u>Dredging</u>. The highest-risk surface sediments (*i.e.*, surface sediments with probable effects concentration (PEC) exceedance ratios greater than 10) within the removal action area are located at the head of Slip 3 and along Berth 411, and within an area north of Berth 414 (Figure 2). The Port proposes to remove these contaminated sediments. The Port also proposes to dredge Berth 410 because dredging is necessary to maintain navigable water depths for deep draft cargo vessels. The majority of the proposed dredging footprint is within the EPA-identified removal action area. Sediment accumulation at Terminal 4 is sufficient to require dredging approximately every 2 years or less.

The Port proposes to dredge Berth 411 plus ("Berth 411 Plus") two additional areas (indicated in green on Figure 2) with high concentrations of chemicals of concern (COCs), and dispose of them at an EPA-approved upland landfill. Sediments in the dredging area will be removed down to dredge elevations established using existing and proposed cores located within the footprints. Elevations will be set to remove materials above a PEC exceedance ratio of 10 within the footprints. The current expected depth of removal is between 1 and 3 feet of sediment. The EPA

expects dredge cuts to extend out to the boundary of the dredge prism with temporary side slopes of 3:1 (H:V) to 2:1. No dredging is proposed below -46 feet National Geodatic Vertical Datum (NGVD) within 50 feet of the sheetpile wall, because geotechnical analyses concluded that dredging below -46 feet NGVD within 50 feet of the sheetpile wall will compromise its stability. If newly-exposed surface concentrations are predicted to be higher than 20 times PEC, the Port may place a 6-inch sand layer over the area. The Port expects to remove approximately 7,400- to 8,400 cubic yards (cy) for this dredging, covering an area of 50,110 square feet. Existing and finished elevations for the three dredging areas are provided in Table 1.

Figure 2. Areas of Removal Action activities at Terminal 4.



ANCHOR

Figure 3
Summary of the Proposed Phase I Removal Action
Phase I of the Removal Action - Biological Assessment
Portland, Oregon

Table 1. Existing and finished dredging elevations at Terminal 4.

Elevation (NGVD)	Berth 411 Area Plus (50,110 square feet, 7,400 to 8,400 cy removed)			Berth 410
	Head of Slip 3	Adjacent to Pier 5	North of Berth 414	
Existing	-43 to -45 feet	-38 to -39 feet	-16 to -25 feet	-34 to -58 feet
Finished	-45 to -50 feet	-40 to -42 feet	-18 to -28 feet	-42 feet
Volume Removed	5,200 to 10,000 cubic yards			9,000 cubic yards
Area Affected	75,000 square feet			

Berth 410 is used to load soda ash for export. This berth requires dredging approximately every 2 years to ensure continued use by deep draft cargo vessels. Approximately 4,000 cubic yards of sediments was removed in 2005. The berth requires dredging now to remove the navigational impediments. This area generally does not coincide with the area with the highest concentrations of contaminants. The existing surface concentrations are generally less than 1 times the PEC for metals, except for one location where the metals are 4.3 times the PEC; the surface concentrations for polynuclear aromatic hydrocarbons (PAHs) range from 1.8 to 2.8 times the PEC. The Port predicts that the final (post-dredging) surface chemical concentrations should be less than or equal to the existing surface concentrations, except in the east end of the dredging area near Berth 411 that may have sediments with high concentrations of PAHs exposed after dredging.

A clamshell bucket suspended from a crane mounted on a barge will be used to dredge the sediment. No in-water rehandling will be conducted. The depth of the bucket will be monitored by markings on the cable holding the bucket, and the dredge will be equipped with a positioning computer system designed to monitor the amount of material moved from each location. The sediments will be placed in a flat-deck barge with watertight sideboards or in a bin-barge with one or multiple cells. The barge will be equipped to hold dredged material and water, and the material will be transported by barge or a combination of barge and truck/train to an EPA-approved landfill for disposal. The contractor will arrange and coordinate the offloading site, which is expected to be on the Columbia River, upstream of the confluence with the Willamette River. At the offloading site, the barge will either be offloaded and treated to reduce water in the sediment prior to placement into trucks or railcars, or will be offloaded directly into trucks or railcars for transportation to an approved landfill. Depending on the water content of the sediments, an additive may be added to the dredged material to absorb excess water that would be disposed of with the dredged material. Alternatively, excess water may be released into a municipal sanitary sewer system, and the trucks or rail cars may be lined with plastic sheeting to ensure that no release of water or sediments will occur during transportation.

The Port will perform post-dredge surveys to confirm the estimated amount of sediments removed from target areas, and to ensure that target depths are achieved.

Construction of Nearshore Cap. The head of Slip 3 is the site of a historical petroleum seep, and the Port has taken remedial action to minimize this source. However, petroleum-contaminated sediments remain in the water below 3 feet NGVD. The Port proposes to stabilize these sediments with a rock cap. The Port will construct a wedge against the outer edge of the

existing wood bulkhead. The wedge will be a 12-inch layer containing 70 cy of fine to medium grain sand overlain by approximately 220 cy of riprap. This wedge will cover approximately 1,500 square feet.

After the bulkhead is stabilized, the Port will work upslope (behind) the bulkhead. The Port will remove the existing riprap and filter blanket to expose the existing sand and organoclay unit. Sandy gravel mixed with organoclay will be placed against the existing sand fill/organoclay unit and on the slope down toward the timber bulkhead. The sandy gravel mix will be isolated with a layer of filter material, and then a layer of armor material placed on top. Approximately 435 cy of material, including 100 cy of filter material, 85 cy of sandy gravel and 250 cy of rock will be placed over the currently armored area of 6,100 square feet. The placement will start at lower elevations, working to higher elevations.

Cap material will be placed mechanically either from the upland or from a barge using a clamshell bucket. The clamshell will be used for areas below the existing timber bulkhead. For each lift, the bucket will be cracked above the water surface while moving side to side to spread the material, and with sufficient control to meet the design thickness. Following placement of the cap, the Port will take a bathymetric survey of capped aquatic areas. Excavated riprap material that is contaminated (approximately 200 cy) will either be loaded directly to a barge, or contained on-site in a stockpile and then loaded to a truck or barge for transport to an appropriate landfill.

Due to the physical configuration of Slip 3 (deep water perpendicular to the river) and potential vessel traffic in the dredging area, the Port considers operational controls (as opposed to silt curtains, etc.) the most effective measures for control of turbidity during capping.

Wheeler Bay Shoreline Stabilization. The Port proposes to stabilize the shoreline of Wheeler Bay through redgrading the surface, planting and placement of features to help with stabilization, and placing of armor material in areas where the potential for erosion is high due to steepness or proximity to erosion-generating forces.

Wheeler Bay is a potential contaminant source to the nearshore sediments because of contaminants (PAHs, metals, dichlorodiphenyltrichloroethane (DDT), dichlorodiphenyldichloroethylene (DDE) and dichlorodiphenyldichloroethane (DDD)) and the potential for erosion. This Phase I action only addresses contaminated sediment in Wheeler Bay above +10 feet NGVD, partially due to a lower likelihood of recontamination. Contaminated sediment below this elevation will be addressed in Phase II of the removal action.

The bank excavation during regrading will be limited to the area 40 feet from the center of the existing rail alignment or a maximum distance of 25 feet from the top of the bank. Regrading of the contaminated sediment/soil will occur between elevations +30 feet NGVD to +10 feet NGVD and will occur in the dry. Grading and excavation will occur over 43,300 square feet, approximately half of which will need to be cleared and grubbed to removed concrete or other debris.

Once graded, 4,300 cy of material will be placed; there will be 2,000 cy of gravelly sand between elevations +30 and +10 feet NGVD and a final surface treatment of either rock armor (1,000 cubic yards over 13,300 square feet) or coir erosion control blanket (30,000 square feet) between elevations +15 to +20 feet NGVD. The armor material will stabilize steep slopes and areas subject to erosion generated by river flow and vessel-induced waves. Approximately half of the 13,300 square feet to be covered by armor currently has some form of rock.

The Port will install live willow stakes in a band approximately 5 feet wide along the shoreline between elevations +15 to +20 feet NGVD, covering approximately 10,800 square feet. The Port will install a 2-foot layer of high-quality, natural, imported topsoil or a manufactured topsoil mix in areas where willow live stakes will be planted. The Port will place 4 to 6 inches of mulch on top of the topsoil, and install a temporary below-ground irrigation system and keep it available until the willows are established. The Port will also hydroseed in a jute mat in a band between elevations +20 to +30 feet NGVD, covering approximately 13,000 square feet.

The Port will install large wood along the shoreline of Wheeler Bay between elevations of +10 to +15 feet NGVD, within a 19,500 square foot area.

The Port will use trackhoes and bulldozers to clear, grub and regrade the shoreline area. This will be done in the dry. Excess material will be stockpiled and taken to an appropriate landfill for disposal. Construction equipment will not enter the water, and erosion control measures will be implemented.

Habitat Improvements. The Port will plan, carry out, and manage compensatory mitigation activities using performance standards and criteria described in 40 CFR Part 230 to compensate for the degradation or loss of 0.33 acres of shallow-water habitat and other aquatic resources that will be adversely affected by the proposed removal action. Among other things, the compensatory mitigation plan will be based on: (1) Measurable, enforceable, ecological performance standards, including a mitigation ratio of 1.5:one to offset resource losses due to the time lag between permitted impacts and completion of the compensatory mitigation actions; (2) regular monitoring to ensure completion; (3) assurances of long-term protection of compensation sites; (4) financial assurances; and (5) identification of the parties responsible for specific project tasks. The Port will submit this Plan to NMFS for approval or disapproval within 2 years of the start of operations, and complete all actions necessary to mitigate the adverse effects of operations within 5 years of plan approval.

The Port will also place sand and gravel over the riprap surface of the Wheeler Bay bank stabilization and cap to create a more natural habitat. The Port recognizes that the long-term viability of sand placement over a riprap surface depends on site-specific conditions such as wave action, the shape of the shoreline, nearby river activities, and river dynamics. The Port will place the sand at this location because the Wheeler Bay conditions may be conducive to sand staying in place. The Port will monitor the area as a pilot project to determine whether the site-specific conditions are conducive to maintaining a sand habitat layer over the riprap. If monitoring demonstrates that a sandy surface can be maintained long-term, this may be considered by NMFS and EPA when determining the appropriate mitigation project for the Wheeler Bay bank stabilization and cap.

Construction Sequencing. Most of the work at the head of Slip 3 and all of the Wheeler Bay work will occur from land. Within Slip 3, the placement of armor in the water at the bulkhead will occur from a barge. The dredging work will occur from the water independent of the capping and shoreline stabilization work.

The EPA expects the Slip 3 cap work to require 2 weeks to complete, and will occur simultaneously with the dredging. The EPA also expects the dredging to require 3 to 4 weeks, assuming the contractor can work 12 hours per day, 6 days per week. The Wheeler Bay shoreline stabilization work will begin after the Slip 3 work is complete, and will take about 4 weeks to complete. The EPA expects the entire project to take 6 weeks to complete.

Monitoring. The Port will monitor to evaluate short-term impacts of construction and the effectiveness of the conservation measures.

1. The Port will monitor water quality during dredging, capping and offloading, as described in the Water Quality Monitoring and Compliance Conditions Plan (Parametrix 2008).
2. The Port will conduct bathymetric and/or land-based surveys after dredging and capping to confirm specified elevations are achieved.
3. The Port will monitor the loading and unloading areas. The Port will prepare a dredged and stockpiled material handling plan that will include best management practices (BMPs) that will be implemented to minimize the potential for off-site tracking of contaminated sediment. Monitoring activities will verify the effectiveness of the BMPs.
4. The Port will conduct long-term monitoring at the head of Slip 3 to verify the physical integrity of the cap and to ensure the cap functions as designed.
5. The Port will monitor Wheeler Bay by conducting inspections to evaluate the physical integrity of the stabilized area, to check for erosion, and to monitor the establishment of vegetation and the stability and presence of large wood as designed.

Conservation Measures. The Port proposes to incorporate the following to minimize the effects of the proposed action. These measures are a subset of measures proposed in the biological assessment.

1. All work will occur during the summer in-water work window of July 1 through October 31 of 2008.
2. The Port will use a dredge sequence strategy to minimize sediment with higher contamination levels from dispersing into adjacent areas. Dredging will begin at the head of Slip 3 and work towards the mouth. Slopes will be dredged beginning with the highest elevation and working toward the lowest elevation. Slopes will not be oversteepened.
3. The potential for scour will be limited by controlling contractor vessel draft and movements.
4. During transport and handling of sediment, adequate containment measures will be used to minimize spillage.
5. The Port will require the contractor to conduct a surface debris survey prior to dredging.
6. The Port will use a geographical information system (GPS) system to ensure material removal from the correct locations.

7. The dredge bucket will be swung directly to the haul barge after it breaks the surface, using the minimal swing distance. The contractor will not pause the bucket as it breaks the surface of the water.
8. The Port will not allow bottom or beach stockpiling of dredged material.
9. The Port will not overfill the bucket, and will not take multiple bites with the clamshell bucket.
10. The Port will not allow the barge to be filled beyond 85 percent capacity.
11. The Port will not allow material to leak from the bins or overtop the walls of the barge.
12. During offloading, the Port will use metal spill aprons, upland spill control curbing and collection systems, and other spill control measures. If a bucket is used, the Port will use a dribble apron. The Port will not allow material to re-enter the river at the off-loading facility.
13. The Port will not create or discharge any water.
14. The Port will place cap materials in a controlled and accurate manner, slowly releasing the material from a clamshell bucket, starting at lower elevations and working toward higher elevations.
15. Multiple means will be used to verify adequate coverage during and following cap placement.
16. Cap materials will be imported, clean granular material.
17. Surface booms, oil-absorbent pads, and similar materials will be on site for any sheens that may occur on the surface of the water during construction.
18. No construction equipment will enter the water during the shoreline stabilization activities in Wheeler Bay, and erosion control measures will be in place.
19. The Port will install a passive fish deterrent system prior to dredging that is intended to discourage juvenile salmonids from entering Slip 3 during dredging and construction. The system will consist of a leader net that is intended to guide fish migrating downstream away from the mouth of Slip 3.

NMFS relied on the foregoing description of the proposed action, including all stated minimization measures, to complete this consultation. To ensure that this consultation remain valid, NMFS requests that the action agency or applicant keep NMFS informed of any changes to the proposed action.

Action Area

‘Action area’ means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The Port’s Terminal 4 is between RMs 4 and 5 along the east bank of the Willamette River. The Port has not chosen a sediment disposal facility, but will likely use one of the several subtitle D landfills upstream from Terminal 4 on the Columbia River. No in-water work or discharge of any material is proposed for the Columbia River. For this consultation, the action area is defined to include Terminal 4, the sediment transport corridor, and the offloading area. Based on a worst-case scenario for dispersal of sediments and associated contaminants, the action area extends from 0.5 miles upstream of Terminal 4, Slip 3, (RM 5.5) downstream to the mouth of the Willamette River, and upstream on the Columbia River to the offloading location, to include an area 0.25 mile upstream from the location.

The listed salmonids described in Table 2 use the action area for adult migration, and juvenile rearing and migration. The action area is designated EFH for Chinook salmon and coho salmon (PFMC 1999), and is an area where environmental effects of the proposed action may adversely affect EFH of those species.

Table 2. Federal Register notices for final rules that list threatened and endangered species, designate critical habitats, or apply protective regulations to listed species considered in this consultation. (Listing status: 'T' means listed as threatened under the ESA; 'E' means listed as endangered.)

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon (*Oncorhynchus tshawytscha*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River spring-run	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River spring-run	E 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	ESA section 9 applies
Snake River spring/summer run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Chum salmon (*O. keta*)			
Columbia River	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Coho salmon (*O. kisutch*)			
Lower Columbia River	T 6/28/05; 70 FR 37160	Not applicable	6/28/05; 70 FR 37160
Sockeye salmon (*O. nerka*)			
Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Lower Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Willamette River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Middle Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Upper Columbia River	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Green sturgeon (*Acipenser medirostris*)			
Southern Distinct Population[1]	T 4/7/06; 71 FR 17757	Not applicable	Not applicable

ENDANGERED SPECIES ACT

The ESA establishes a national program to conserve threatened and endangered species of fish, wildlife, plants, and the habitat on which they depend. Section 7(a) (2) of the ESA requires Federal agencies to consult with U.S. Fish and Wildlife Service, NMFS, or both, to ensure that their actions are not likely to jeopardize the continued existence of endangered or threatened species or adversely modify or destroy their designated critical habitats. Section 7(b) (4) requires the provision of an incidental take statement that specifies the impact of any incidental taking and includes reasonable and prudent measures to minimize such impacts.

[1] A 4(d) rule allowing for "take" of green sturgeon has not yet been issued.

Biological Opinion

To complete the jeopardy analysis presented in this Opinion, NMFS reviewed the status of each listed species of Pacific salmon and steelhead considered in this consultation, the environmental baseline in the action area, the effects of the action, and cumulative effects (50 CFR 402.14(g)). From this analysis, NMFS determined whether effects of the action were likely, in view of existing risks, to appreciably reduce the likelihood of both the survival and recovery of the affected listed species.

For the critical habitat adverse modification analysis, NMFS considered the status of the entire designated area of the critical habitat considered in this consultation, the environmental baseline in the action area, the likely effects of the action on the function and conservation role of the affected critical habitat, and cumulative effects. The NMFS used this assessment to determine whether, with implementation of the proposed action, critical habitat would remain functional, or retain the current ability for the primary constituent elements (PCEs) to become functionally established, to serve the intended conservation role for the species (Hogarth 2005).

Status of the Species and Critical Habitat

This section defines the biological requirements of each listed species affected by the proposed action, and the status of each designated critical habitat relative to those requirements. Any ESA-listed species facing a high risk of extinction and critical habitats with degraded conservation value are more vulnerable to the aggregation of effects considered under the environmental baseline, the effects of the proposed action, and cumulative effects.

Status of the Species. The NMFS reviews the condition of the listed species affected by the proposed action using criteria that describe a 'viable salmonid population' (VSP) (McElhany *et al*. 2000). Attributes associated with a VSP include abundance, productivity, spatial structure, and genetic diversity that maintain its capacity to adapt to various environmental conditions and allow it sustain itself in the natural environment. These attributes are influenced by survival, behavior, and experiences throughout the entire life cycle, characteristics that are influenced, in turn, by habitat and other environmental conditions.

LCR Chinook salmon. The range of this species includes all naturally-spawned populations of Chinook salmon from the Columbia River and its tributaries from its mouth at the Pacific Ocean upstream to a transitional point between Washington and Oregon, east of the Hood River and the White Salmon River, and includes the Willamette River to Willamette Falls, Oregon, exclusive of spring-run Chinook salmon in the Clackamas River. Historical records of Chinook salmon abundance are sparse, but cannery records suggest a peak run of 4.6 million fish in 1883. Although fall-run Chinook salmon are still present throughout much of their historical range, they are still subject to large-scale hatchery production, relatively high harvest, and extensive habitat degradation. The spring-run populations are largely extirpated as a result of dams that block access to their higher elevation habitat. Abundances largely declined during 1998-2000 and trend indicators for most populations are negative, especially if hatchery fish are assumed to have a reproductive success equivalent to that of natural-origin fish. However, 2001 and 2002 abundance estimates increased for most LCR Chinook salmon populations over the

previous few years (Good *et al*. 2005). In 2003, 2,873 fall-run Chinook salmon spawned in the main channel of the Columbia River between RM 113 and RM 143.

Factors limiting recovery for LCR Chinook salmon are reduced access to spawning/rearing habitat in tributaries, hatchery impacts, loss of habitat diversity and channel stability in tributaries, excessive sediment in spawning gravel, elevated water temperature in tributaries, and harvest impacts on fall Chinook (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded estuarine and nearshore habitat; floodplain connectivity, and function; channel structure and complexity; riparian areas and large wood; stream substrate, streamflow; fish passage; and harvest and hatchery impacts as the major factors limiting the recovery of this species.

Most of the LCR Chinook salmon are part of the Clackamas fall run population. Based on a recent viability status report (McElhany *et al*. 2007), there are no reliable abundance data for this population, but estimates put the population in the "extirpated or nearly so" persistence category based on the minimum abundance threshold. There is no abundance or productivity evidence supporting the existence of a viable natural-origin population in the Clackamas. This population is at significant risk based on the criteria for diversity, spatial structure, and abundance and productivity, and from the perspective of all viability criteria, LCR Chinook in Oregon are at high risk (McElhany *et al*. 2007). Habitat degradation in the basin has reduced the spatial distribution of suitable habitats for fall Chinook. Further habitat changes in the Willamette River and in the Columbia River mainstem and estuary would likely have a significant effect on fall Chinook salmon (McElhany *et al*. 2007).

UWR spring-run Chinook salmon. The UWR spring-run Chinook salmon includes seven populations of native spring-run populations above Willamette Falls and in the Clackamas River. All the populations are in a single stratum since they share a similar life history pattern (spring run) and a single ecozone (McElhany *et al*. 2003, Myers *et al*. 2006).

Numbers of spring Chinook salmon in the Willamette River basin are extremely depressed (McElhany *et al*. 2007). Historically, the spring run of Chinook may have exceeded 300,000 fish (Myers *et al*. 2003). The current abundance of wild fish is less than 10,000 fish, and only two populations (McKenzie and Clackamas) have significant natural production. The UWR Chinook have been adversely affected by the degradation and loss of spawning and rearing habitat (loss of 30 to 40%) associated with hydropower development, and interaction with a large number of natural spawning hatchery fish. Other limiting factors include altered water quality and temperature, lost and degraded floodplain connectivity and lowland stream habitat, and altered streamflow in the tributaries (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded flooplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, water quality, fish passage, and hatchery impacts as the major factors limiting recovery of this species.

McElhany *et al*. (2007) analyzed the population criteria (diversity, spatial structure, and abundance and productivity) for UWR Chinook salmon and found that the risk of extinction is high. The Clackamas population exhibited the lowest extinction risk. However, five of the

seven populations were clearly in the high risk category, and thus the ESU can be characterized as having a high risk of extinction.

Chinook salmon generally spawn and rear in mainstem reaches of large river systems such as the Willamette River and the Clackamas River. Juvenile Chinook salmon that have emerged from spawning sites in the upper Willamette River watershed use the lower mainstem Willamette River and Columbia Slough through Portland for temporary rearing as they migrate to the ocean.

CR chum salmon. The Oregon portion of the CR chum ESU historically contained 8 populations of CR chum salmon (McElhany *et al.* 2007), with over a million chum returning in some years to the Columbia River (McElhany 2005). Recently only a few hundred to a few thousand chum have returned each year to the Columbia, mainly to the Washington side of the Columbia River. All of the historical Oregon populations are considered extirpated or nearly so. All of the Oregon chum salmon populations are in the very high risk category, and the ESU is also at very high risk of extinction (McElhany *et al.* 2007).

The factors limiting recovery for CR chum salmon are altered channel form and stability in tributaries, excessive sediment in tributary spawning gravels, altered stream flow in tributaries and the mainstem Columbia River, loss of some tributary habitat types, and harassment of spawners in the tributaries and mainstem (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded estuarine and nearshore marine areas, floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, stream substrate, streamflow, and fish passage as the major factors limiting recovery of this species.

LCR coho salmon. This ESU includes 25 populations that historically existed in the Columbia River basin from the Hood River downstream (McElhany *et al.* 2007). The boundaries do not extend into the upper Willamette portion of the basin because Willamette Falls is a natural barrier to fall migrating salmonids. In general, wild coho in the Columbia River basin have been in decline for the last 75 years. The number of wild coho returning historically was at least 600,000 fish (Chapman 1986). As recently as 1996, the total return of wild fish may have been as few as 400 fish (Chilcote 1999). Of the 25 historical populations, only the Clackamas and Sandy rivers show direct evidence that coho production is not reproductively dependent on the spawning of stray hatchery fish (McElhany *et al.* 2007). However, in the last 5 years there has been an increase in the abundance of wild coho in the Clackamas and Sandy rivers, plus a reappearance of moderate numbers of wild coho in the Scappoose and Clatskanie rivers after a 10-year period in the 1990s when they were largely absent (McElhany *et al.* 2007).

The NMFS (2007) identified floodplain connectivity and function; degraded channel structure and complexity, degraded riparian areas and large wood recruitment, degraded stream substrate, degraded streamflows, degraded water quality, and harvest and hatchery impacts as the major factors limiting recovery of LCR coho salmon.

The Clackamas population would be the most likely population found in the action area. Based on a recent analysis, this population is most likely in the low risk category for abundance and productivity, although all the other populations are in the high or very high risk category (McElhany *et al.* 2007). Spatial structure scores are reduced because of significant habitat

degradation in lower basin tributaries such as Johnson and Kellogg creeks, and other urbanized portions of the lower Willamette River, Multnomah Channel and Sauvie Island. This habitat loss has reduced the population's diversity score. Despite this, the Clackamas is the only population in Oregon's portion of the species that is most likely in the viable category, and thus the risk of extinction for coho in Oregon remains high (McElhany *et al.* 2007).

LCR steelhead. This species includes all naturally spawning populations of steelhead in streams and tributaries of the Columbia River between, and including, the Cowlitz and Wind Rivers in Washington, along with, and including, the Willamette River and Hood River in Oregon. Excluded are steelhead in the upper Willamette River basin above Willamette Falls and steelhead from the Little and Big White Salmon Rivers in Washington (NMFS 2004).

Five populations of winter steelhead and one population of summer steelhead exist in Oregon (McElhany *et al.* 2007). The population most likely present in the action area is the Clackamas River population, which is part of the Cascade winter stratum.

In general, wild steelhead numbers are depressed from historical levels but probably exist in most of their historical range, and all historical populations are believed to be extant. However, up until recent years the presence of naturally spawning hatchery fish in most populations has been high (McElhany *et al.* 2007).

The Clackamas population is at low risk for abundance and productivity, although the future impacts of human population growth and climate change add a degree of uncertainty (McElhany *et al.* 2007). Loss of accessibility is limited to higher order streams, primarily due to watershed development in the lower basin. The upper Clackamas River basin contains most of the historically-productive habitat, and most of that habitat is of high quality today. For the species, the overall risk classification for Oregon LCR steelhead is moderate, with the Clackamas population at the lowest risk.

Factors limiting recovery for LCR steelhead are degraded floodplain and stream channel structure and function, reduced access to spawning/rearing habitat, altered streamflow in tributaries, excessive sediment and elevated water temperatures in tributaries, and hatchery impacts (NMFS 2005, NMFS 2006). The NMFS (2007) identified degraded floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, stream substrate, streamflow, water quality, fish passage and predation/competition as the major factors limiting recovery of this species.

UWR steelhead. This species consists of four populations: the Molalla, North Santiam, South Santiam, and Calapooia. All populations of UWR steelhead migrate through and rear in the action area. These populations are depressed from historical levels, with adverse impacts from the alteration and loss of spawning and rearing habitat associated with hydropower development. Based on recent analyses of the population criteria, McElhany *et al*. (2007) concluded that the species risk of extinction is moderate, with the highest risk category being genetic diversity.

Habitat loss, hatchery steelhead introgression, and harvest are the major contributors to the decline of this species. Willamette Falls (RM 26.5) is a known migration barrier. Winter-run steelhead and spring-run Chinook salmon historically occurred above the falls, whereas summer-run steelhead, fall-run Chinook, and coho salmon did not. Detroit and Big Cliff dams have cut off access to 335 miles of spawning and rearing habitat in the North Santiam River. In general, habitat in this species has become substantially simplified since the 1800s by removal of large wood to increase the river's navigability.

NMFS (2007) identified degraded floodplain connectivity and function, channel structure and complexity, riparian areas and large wood recruitment, streamflow, fish passage, and predation/competition and disease as the major factors limiting recovery of this species.

***UCR spring-run Chinook salmon*.** Based on redd count data series, spawning escapements for the three populations identified by (Ford *et al.* 2001) for this species (Wenatchee, Entiat, and Methow rivers) have declined an average of 5.6%, 4.8%, and 6.3% per year, respectively, since 1958. Adult returns increased substantially in 2000 and 2001 compared to lows in 1996 to 1999, but the short-term trends analyzed by the biological review team (BRT) for 1996-2001 remained negative (Good *et al.* 2005).

Based on 1980-2000 returns, the average annual growth rate for this species is estimated as 0.85 (a growth rate of less than 1.0 is non-viable) (Good *et al.* 2005). Assuming that population growth rates were to continue at 1980-2000 levels, UCR spring-run Chinook salmon populations are likely to have very high probabilities of decline within 50 years (87 to 100%) (Good *et al.* 2005), and the species is likely to go extinct.

Current abundances for populations in the UCR Chinook species are well below the minimum thresholds defined in the draft viability criteria of the Interior Columbia River Basin Technical Recovery Team (ICTRT). Actually achieving abundance and productivity criteria will require a sustained and significant response by the populations (ICTRT 2006).

The risk estimates reflect strong ongoing concerns regarding abundance and growth rate/productivity (high to very high risk) and somewhat less (but still significant) concerns for spatial structure (moderate risk) and diversity (moderately high risk) (Good *et al.* 2005).

The NMFS identified mortality in the Columbia River hydropower system, tributary riparian degradation and loss of in-river wood, altered tributary floodplain and channel morphology, reduced tributary stream flow and impaired passage, and harvest impacts as the major factors limiting recovery of this species (NMFS 2007).

SR spring/summer run Chinook salmon. The ICTRT identified 32 populations in 5 major population groups (MPGs) (Upper Salmon River, South Fork Salmon River, Middle Fork Salmon River, Grande Ronde/Imnaha, Lower Snake Mainstem Tributaries) for this species. Historical populations above Hells Canyon Dam are extinct (ICTRT 2003).

Although direct estimates of historical annual SR spring/summer run Chinook salmon returns are not available, returns may have declined by as much as 97% between the late 1800s and 2000.

According to Matthews and Waples (1991), total annual SR spring/summer run Chinook salmon production may have exceeded 1.5 million adult fish in the late 1800s. Total (natural plus hatchery origin) returns fell to roughly 100,000 spawners by the late 1960s (Fulton 1968) and were below 10,000 by 1980. Between 1981 and 2000, total returns fluctuated between extremes of 1,800 and 44,000 fish. The 2001 and 2002 total returns increased to over 185,000 and 97,184 adults, respectively. However, over 80% of the 2001 return and over 60% of the 2002 return originated in hatcheries. Despite the recent increases in total returns of SR spring/summer run Chinook salmon returns, current abundance levels for populations in the Snake River Chinook species are well below the minimum thresholds defined in the ICTRT viability criteria (ICTRT 2006). Actually achieving abundance and productivity criteria will require a sustained and significant response by the populations (ICTRT 2006).

The NMFS identified mortality from the mainstem lower Snake River and Columbia River hydropower systems, reduced tributary stream flows, altered tributary channel morphology, excessive sediment in tributaries, degraded tributary water quality, and harvest- and hatchery-related adverse effects as the major factors limiting recovery of this species (NMFS 2007).

SR fall-run Chinook salmon. The BRT found moderate risk to the species for productivity and moderately high risks for abundance, spatial structure, and diversity (Good *et al.* 2005). The paragraphs below summarize information from BRT, the ICTRT, and other sources on the status of SR fall-run Chinook salmon in terms of those four viability components.

The estimated annual return for the period 1938 to 1949 was 72,000 fish, and by the 1950s, numbers had declined to an annual average of 29,000 fish. Numbers of SR fall-run Chinook salmon continued to decline during the 1960s and 1970s as approximately 80% of their historical habitat was eliminated or severely degraded by the construction of the Hells Canyon hydropower complex (1958 to 1967) and the lower Snake River dams (1961 to 1975). Counts of natural-origin adult SR fall-run Chinook salmon at Lower Granite Dam were 1000 fish in 1975, and ranged from 78 to 905 fish (with an average of 489 fish) over the ensuing 25-year period through 2000 (Good *et al.* 2005). Numbers of natural-origin SR fall-run Chinook salmon have increased over the last few years, with estimates at Lower Granite dam of 2,652 fish in 2001 (Good *et al.* 2005), 2,095 fish in 2002, and 3,895 fish in 2003. Despite the recent increases in total returns of SR fall Chinook salmon, current abundance levels for populations in the Snake River Chinook species are well below the minimum thresholds defined in the ICTRT viability criteria (ICTRT 2006).

The NMFS identified mortality in the mainstem lower Snake River and Columbia River hydropower systems, degraded water quality, reduced spawning/rearing habitat due to the lower Snake River hydropower system, and harvest as the major factors limiting recovery of this species (NMFS 2007).

SR Basin steelhead. The SRB steelhead species does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with these steelhead. The ICTRT (2003) identified 23 populations in six MPGs in this species.

Annual return estimates are limited to counts of the aggregate return over Lower Granite Dam, and spawner estimates for the Tucannon, Grande Ronde, and Imnaha rivers. The 2001 return over Lower Granite Dam was substantially higher than the low levels seen in the 1990s, but the recent 5-year mean abundance was approximately 29% of the interim recovery target level. Abundances in surveyed sections of the Grande Ronde, Imnaha and Tucannon rivers improved in 2001. However, recent 5-year abundance and productivity trends (through 2001) were mixed. The majority of long-term population growth rate estimates for the nine available series were below replacement. The majority of short-term population growth rates (through 2001) were marginally above replacement or well below replacement, depending upon the assumption made regarding the effectiveness of hatchery fish in contributing to natural production (Good *et al.* 2005). In spite of the recent increases in SRB steelhead returns, the BRT believed that the species remains at moderate risk for abundance, productivity, and diversity. The BRT was also concerned about the predominance of hatchery-origin fish in this species, the inferred displacement of naturally-produced fish by hatchery-origin fish, and potential impacts on species diversity (Good *et al.* 2005).

Cooney (2004) reported continuing high returns of natural-origin SRB steelhead (both A- and B-run fish) during 2002 and 2003, compared to those observed during much of the 1990s. In their preliminary report, Fisher and Hinrichsen (2004) estimated that the geometric mean of the natural-origin run was 37,784 fish during 2001 to 2003, a 253% increase over the 1996 to 2000 period (10,694 fish). The slope of the population trend increased 9.3% (from 1.00 to 1.10) when the counts for 2001 to 2003 were added to the 1990 to 2000 data series. These data indicate that, at least in the short term, the natural-origin run has been increasing.

The NMFS identified mortality from the mainstem Columbia River hydropower system, reduced tributary stream flows, altered tributary channel morphology, excessive sediment in tributaries, degraded tributary water quality, and harvest and hatchery related adverse effects as the major factors limiting recovery of this species (NMFS 2005).

UCR steelhead. This species is currently limited to four extant populations in one MPG. The MPG historically included a fourth population in the Crab Creek drainage, which probably is functionally extinct. Two additional MPGs likely existed, but access to the tributaries that supported them is now cut off by Grand Coulee and Chief Joseph dams (ICTRT 2006).

While total abundance within this species has been relatively stable or increasing, it appears to be occurring only because of major hatchery supplementation programs. The major concern for this species is the replacement failure of natural stocks. The BRT members were also strongly concerned about the problems of genetic homogenization due to hatchery supplementation, apparent high harvest rates on steelhead smolts in rainbow trout fisheries, and the degradation of freshwater habitats within the region, especially the effects of livestock grazing, irrigation diversions and hydroelectric dams (Good *et al.* 2005).

The most serious risk identified by Good *et al.* (2005) was growth rate/productivity, estimated to be high to very high. Other VSP factors were also relatively high, ranging from moderate for spatial structure to moderately high for diversity. The years 1999-2001 have seen an increase in the number of naturally-produced fish. However, the recent mean abundance in the major river

basins is still only a fraction of interim recovery targets. Furthermore, overall adult returns are still dominated by hatchery fish, and detailed information is lacking regarding productivity of natural populations. The ratio of naturally-produced adults to the number of parental spawners (including hatchery fish) remains low for UCR steelhead. The BRT did not find data to suggest that the extremely low replacement rate of naturally-spawning fish (estimated adult:adult ratio was only 0.25-0.3 at the time of the last status review update) has improved substantially (Good *et al.* 2005).

The UCR steelhead species continues to have problems including genetic homogenization from hatchery supplementation, high harvest rates on steelhead smolts in rainbow trout fisheries, and the degradation of freshwater habitats (Good *et al.* 2005).

The NMFS identified mortality from the mainstem Columbia River hydropower system, reduced tributary stream flows, tributary riparian degradation and loss of in-river wood, altered tributary floodplain and channel morphology, excessive sediment, and degraded tributary water quality as the major factors limiting recovery of this species (NMFS 2007).

MCR steelhead. The MCR steelhead do not include resident forms of *O. mykiss* (rainbow trout) co-occurring with these steelhead. The ICTRT (2003) identified 15 populations in four MPGs (Cascades Eastern Slopes Tributaries, John Day River, Walla Walla River, and Umatilla River, and the Yakima River) and one unaffiliated independent population (Rock Creek) in this species. There are two extinct populations in the Cascades Eastern Slope MPG: the Deschutes River above Pelton Dam, and the White Salmon River.

Natural returns to the Yakima River, once a major historical production center for the species, continue to be less than 20% of the interim recovery abundance target for the subbasin (Good et al. 2005). The presence of substantial numbers of out-of-basin (and largely out-of-species) natural spawners in the Deschutes River raised substantial concern withinthe BRT regarding the genetic integrity and productivity of the native Deschutes River population (Good *et al*. 2005).

The 5-year average return (geometric mean) of natural MCR steelhead for 1997 to 2001 was up from previous years' basin estimates (Good *et al.* 2005). Despite recent increases in MCR steelhead returns, the BRT believed that the species remains at moderate risk for all four VSP parameters (Good *et al.* 2005).

The NMFS identified mortality in the Columbia River hydropower system, reduced stream flow in tributaries, altered tributary channel morphology, excessive sediment in tributaries, degraded tributary water quality, and harvest and hatchery related adverse effects as the major factors limiting recovery of this species (NMFS 2005).

SR sockeye salmon. Five lakes in Idaho's Stanley Basin historically contained sockeye salmon: Alturas, Pettit, Redfish, Stanley and Yellowbelly (Bjornn *et al*. 1968). Today, they only occur in Redfish Lake. Sockeye counts at the Redfish Lake weir in 1985, 1986, and 1987 were 11, 29, and 16, respectively (Good *et al.* 2005). The first adult returns from the captive brood stock program returned to the Stanley Basin in 1999. From 1999 through 2005, 345 captive brood program adults that had migrated to the ocean returned to the Stanley Basin.

Recent annual abundances of natural origin sockeye salmon to the Stanley Basin have been extremely low. No natural origin, anadromous adults have returned since 1998, and the abundance of residual sockeye salmon in Redfish Lake is unknown. This species is entirely supported by adults produced through the captive propagation program. Recent smolt-to-adult survival of sockeye originating from the Stanley Basin lakes has rarely been greater than 0.3% (Hebdon *et al.* 2004). The current average productivity likely is substantially less than the productivity required for any population to be at low (1 to 5%) extinction risk at the minimum abundance threshold. The BRT determined that the SR sockeye salmon remains in danger of extinction (Good *et al.* 2005).

The NMFS identified reduced tributary stream flow, impaired tributary passage and blockages to migration, and mortality from the Columbia River hydropower system as the major factors limiting recovery of this species (NMFS 2005).

General salmon and steelhead usage of the action area. LCR and UWR steelhead and Chinook salmon, and LCR coho salmon adults migrate through the lower Willamette River on their way to and from spawning grounds in tributaries of the Willamette River. Steelhead are not known to spawn in the mainstem of the Willamette River in the vicinity of the City of Portland (City). Chinook salmon may spawn not far upstream from the City boundary, perhaps in the lower end of the Clackamas River or in the Willamette River just below Willamette Falls, where suitable gravel-type substrate for spawning may occur, and perhaps in Johnson Creek. Coho salmon go up the Clackamas River to spawn. Recent observations of coho salmon juveniles in Miller Creek (tributary at RM 3 on the Willamette River) and in Johnson Creek by City biologists suggest that coho spawning may occur in small tributaries in the City. Chum salmon may use the first few miles of the Willamette River for juvenile rearing, but any occurrences would be very rare.

Adult Chinook and steelhead have been documented holding in the lower mainstem Willamette River for a period of time before moving upriver. Adults migrate upstream to spawn during early spring (spring Chinook), early fall (coho), and late fall through winter (steelhead), and spawn in early to mid-fall (Chinook and coho) and spring (steelhead). Adult steelhead have been documented entering the mouth of the Clackamas River with a darkened coloration, indicating that they have been in freshwater for some time.

Fry emerge from the gravel in late spring/early summer, rear in the natal stream for 1 to 3 years, and outmigrate during spring and fall freshets. These juvenile steelhead, Chinook salmon, and coho salmon migrate to the Pacific Ocean via the Willamette River.

From May 2000 through July 2003, the Oregon Department of Fish and Wildlife (ODFW) and the City of Portland conducted a study of salmonids in the lower Willamette River (Friesen *et al*. 2005). Of the more than 5,000 juvenile salmonids collected during the study, over 87% were Chinook salmon, 9% were coho salmon, and 3% were steelhead. ODFW concluded that the Chinook salmon juveniles were largely spring-run stocks that rear in fresh water for a year or more before migrating to the ocean. Chinook salmon juveniles caught exhibited a bimodal distribution in length indicating the presence of both subyearlings and yearlings. Although at

lower abundance, coho salmon juveniles also exhibited this bimodal distribution of yearlings and subyearlings.

The study's key finding is that the lower Willamette River is no longer appropriately considered simply a migration corridor. The presence of naturally-spawned Chinook salmon from November through July, as well as significant evidence of fish growth, contradicts a longstanding assumption that spring Chinook salmon primarily reared in their natal streams over the winter and migrated out of the Willamette River during the spring, and that, therefore, Chinook salmon were not present in the lower river outside of the spring migration period. In this study, juvenile Chinook salmon were present in every month sampled from May 2000 through July 2003. Juvenile salmon were captured more frequently during winter and spring than during other seasons. Coho salmon and steelhead were generally present only during winter and spring.

As in the Columbia River, yearling and older juvenile salmon and steelhead in the Willamette River tend to be found in mid-channel areas, whereas subyearling fish tend to be most abundant at nearshore sites (Dawley *et al*. 1986, Dauble *et al*.1989, Friesen *et al*. 2005). Off-channel habitats such as alcoves, lagoons, backwater areas, and secondary channels are more important areas for juvenile refuge and rearing than mid-channel areas (Friesen 2005, Vile *et al.* 2004). Friesen *et al*. 2005 found significantly higher stomach fullness for juvenile Chinook salmon captured in off-channel sites in the lower Willamette River than at sites in the main river channels. Some of the larger juveniles may spend extended periods of time in off-channel habitat.

Mean migration rates of juvenile salmon ranged from 2.7 km/day for steelhead to 8.6 km/day for subyearling Chinook salmon. Residence time in the lower Willamette River ranged from 4.9 days for Chinook to 15.8 days for steelhead. Catch rates of juvenile salmon were significantly higher at sites composed of natural habitat (*e.g.*, beach, alcoves).

During the ODFW study (Friesen 2005), there were a few cases where yearling salmon did exhibit some form of habitat preference (coho salmon preferred beach habitat and rock outcrops and avoided riprap and artificial fill; abundance of all species was low at seawall sites). However, yearling Chinook and steelhead were not strongly associated with the shoreline and did not exhibit obvious preferences for the different habitat types in the lower river. Juvenile salmon tended to move along the east bank of the river.

Green sturgeon. Green sturgeon is a widely-distributed and marine-oriented species found in nearshore waters from Baja California to Canada (NMFS 2007). Their estuarine/marine distribution and the seasonality of estuarine use range-wide are largely unknown. Green sturgeon are anadromous, spawning in the Sacramento, Klamath and Rogue rivers in the spring (NMFS 2007). Spawning occurs in deep pools or holes in large, turbulent river mainstreams. Specific characteristics of spawning habitat are unknown but likely includes large cobbles, but can range from clean sand to bedrock (NMFS 2007).

There are two distinct population segments (DPS) defined for green sturgeon – a northern DPS (NDPS) with spawning populations in the Klamath and Rogue rivers and a southern DPS (SDPS)

that spawns in the Sacramento River (NMFS 2007). The SDPS was listed as threatened in 2006. According to the listing final rule (71 FR 17757), the SDPS includes all spawning populations of green sturgeon south of the Eel River in California. The NDPS remains a species of concern. McLain (2006) noted that SDPS green sturgeon were first determined to occur in Oregon and Washington waters in the late 1950s when tagged San Pablo Bay green sturgeon were recovered in the Columbia River estuary (CDFG 2002). Preliminary work by Israel and May (2006) has determined that 80% or greater of green sturgeon in the Columbia River estuary during late-summer and early fall months were SDPS origin.

Green sturgeon congregate in coastal waters and estuaries, including non-natal estuaries, where they are vulnerable to capture in salmon gillnet and white sturgeon (*Acipenser transmontanus*) sport fisheries.

Sturgeon migrations are probably related to feeding and spawning (Beamis and Kynard 1997). They suggested that green sturgeon move into estuaries of non-natal rivers to feed. Green sturgeon captured during the sport season for white sturgeon could suggest they are feeding in the estuary. However, contradictory evidence in the form of empty stomach contents of green sturgeon captured in the Columbia River gillnet fishery suggests that these green sturgeon were not actively foraging in the estuary (Corps (2007).

Information from fisheries-dependent sampling suggests that green sturgeon only occupy large estuaries during the summer and early fall in the northwestern United States. Commercial catches of green sturgeon peak in October in the Columbia River estuary, and records from other estuarine fisheries (*i.e*., Willapa Bay and Grays Harbor, Washington) support the idea that sturgeon are only present in these estuaries from June until October (Moser and Lindley 2007). However, most green sturgeon taken are as by-catch in fisheries for salmonids, *Oncorhynchus* spp. and white sturgeon (Moyle 2002; Adams *et al*., 2002). Consequently, data from fisheries-dependent sampling may be a poor indicator of green sturgeon distribution in estuaries. Green sturgeon enter the Columbia River at the end of spring with their numbers increasing through June (Corps 2007). The greatest numbers are caught in the estuary in July through September. The majority of green sturgeon are caught in the lower reaches of the Columbia (29,132 from RM 1-20 and 8,086 from RM 20-52) based upon harvest information from 1981-2004 (Corps 2007). A few green sturgeon may be found as far upriver as Bonneville Dam, but there are no known spawning populations in the Columbia River and its tributaries (Corps 2007).

Because the presence of green sturgeon within the action area is extremely remote, NMFS has determined that the proposed action is “not likely to adversely affect” green sturgeon and they are not considered further in this Opinion.

Status of Critical Habitat. The NMFS reviews the status of critical habitat affected by the proposed action by examining the condition and trends of PCEs throughout the designated area. The PCEs consist of the physical and biological elements identified as essential to the conservation of the species in the documents identifying critical habitat (Tables 3 and 4).

Table 3. (PCEs of critical habitats designated for Pacific salmon and steelhead species considered in the Opinion (except SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon), and corresponding species life history events.

Primary Constituent Elements		**Species Life History Event**
Site Type	**Site Attribute**	
Freshwater spawning	substrate, water quality, water quantity	adult spawning, embryo incubation, alevin development
Freshwater rearing	floodplain connectivity, forage, natural cover, water quality, water quantity	fry emergence, fry/parr growth and development
Freshwater migration	free of artificial obstructions, natural cover, water quality, water quantity	adult sexual maturation, Adult upstream migration, holding, kelt (steelhead) seaward migration, fry/parr seaward migration
Estuarine areas	Forage, free of obstruction, natural cover, salinity, water quality, water quantity	adult sexual maturation, adult "reverse smoltification", adult upstream migration, holding, kelt (steelhead) seaward migration, fry/parr seaward migration, fry/parr smoltification, smolt growth and development, smolt seaward migration
Nearshore marine areas	forage, free of obstruction, natural cover water quantity water quality	adult sexual maturation, smolt/adult transition
Offshore marine areas	forage, water quality	adult growth and development

Table 4. PCEs of critical habitats designated for SR spring/summer run Chinook salmon, SR fall-run Chinook salmon, and SR sockeye salmon, and corresponding species life history events.

Primary Constituent Elements		Species Life History Event
Site	**Site Attribute**	
Spawning and juvenile rearing areas	access (sockeye), cover/shelter, food (juvenile rearing), riparian vegetation, space (Chinook), spawning gravel, water quality, water temperature (sockeye), water quantity	adult spawning, embryo incubation, alevin development, fry emergence, fry/parr growth and development, fry/parr smoltification, smolt growth and development
Juvenile migration corridors	cover/shelter, food, riparian vegetation, safe passage space, substrate, water quality, water quantity, water temperature, water velocity	fry/parr seaward migration, smolt growth and development, smolt seaward migration
Areas for growth and development to adulthood	ocean areas – not identified	adult growth and development adult sexual maturation fry/parr smoltification Smolt/adult transition
Adult migration corridors	cover/shelter, riparian vegetation, safe passage, space substrate, water quality water quantity, water temperature, water velocity	adult sexual maturation, adult "reverse smoltification", adult upstream migration, Kelt (steelhead) seaward migration

The action area is within designated critical habitat for the affected species, except LCR coho salmon, for which critical habitat has not been proposed or designated. The PCEs potentially found at the project site are freshwater rearing and freshwater migration. The value of critical habitat for the species is limited by poor water quality, altered hydrology, lack of floodplain connectivity and shallow-water habitat, and lack of complex habitat to provide forage and cover.

The present condition of PCEs within designated areas and the human activities that have affected PCE trends are further described in the environmental baseline section below.

Environmental Baseline

The action area is within the lower Willamette River watershed between RM 5.5 and the confluence with the Columbia River, and upstream on the Columbia River to the off-loading site. The Willamette River watershed covers approximately 11,500 square miles in northwest Oregon, between the Coast and Cascade ranges. The river flows 187 miles from its headwaters to its mouth at the Columbia River. Most of the rainfall occurs in the fall, winter, and spring, with little rainfall during June, July, and August. The lowest river flow occurs during late summer. The 13 U.S. Army Corps of Engineers dams on tributary systems largely regulate flows in the mainstem Willamette River.

Significant changes have occurred in the watershed since the arrival of Europeans in the 1800s. The watershed was mostly forested land before the arrival of white settlers. Now, about half the basin is still forested. One-third of the basin is used for agriculture, and about 5% is urbanized or is in residential use. The river receives direct inputs from treated municipal wastes and industrial effluents. Nonpoint source pollution from agricultural, silvicultural, residential, urban and industrial land uses are also significant, especially during rainfall runoff. The industrial section of the Willamette River, including the action area, has been deepened and narrowed through channelization.

The Willamette River, from its mouth to Willamette Falls, is on the 2006 Oregon Department of Environmental Quality (ODEQ) 303(d) list as water quality limited for temperature (summer), bacteria, biological criteria (fish skeletal deformities), and toxics (mercury in fish tissue, dieldrin, aldrin, polycarbonated biphenyls (PCBs), DDT/ DDE, PAHs, manganese, iron, and pentachlorophenol. Results from ODEQ ambient monitoring data indicate that 68% of the values at RM 7, and 61% of the values at RM 13.2 collected during the summer exceed the temperature standard of 68°F. In the lower Willamette River, average turbidity tends to be highest in fall and winter. Monthly average turbidity ranges from 4-149 nephelometric turbidity units (NTUs). In September, 2006, EPA approved a total maximum daily load (TMDL) for mercury, bacteria, and temperature in the lower Willamette River (http://www.deq.state.or.us/wq/tmdls/willamette.htm).

In 1997, DEQ and the EPA took sediment samples within the Portland Harbor. The results of the study indicated that sediments in the harbor, including within the action area, contain concentrations of metals, PCBs, pesticides, herbicides, dioxins/furans, tributlytin (TBT), and PAHs above NMFS' contaminant guidelines (http://response.restoration.noaa.gov/book_shelf/121_sedi_qual_guide.pdf). Cleanup of the contaminated sediments is presently being addressed under the Federal Superfund process. The initial study area for the listing is between RM 3.5 to RM 9.5, although the final designation is likely to expand beyond this area.

The site characterization report (BBL 2004) evaluated the surface sediment concentrations in the vicinity of Terminal 4 and confirmed the degraded condition of the sediment. The EE/CA concluded that existing surface sediment contaminants have likely affected wildlife (including fish) by direct or indirect exposure due to direct contact, feeding, or bioaccumulation (BBL 2005). Two sediment quality guidelines have been used to characterize the sediments: the threshold effects concentration (TEC) is a low effects guideline that represents concentrations below which toxicity effects are unlikely to be observed in freshwater benthic invertebrates, and the PEC is a higher, probable effects guideline that represents concentrations above which toxicity effects are likely to be observed in freshwater benthos. Slip 3 has PEC exceedances for lead, zinc and PAHs, and Wheeler Bay has PEC exceedances for lead and PAHs.

Sediments within the Berth 411 dredging area were historically contaminated with pencil pitch, ores, diesel and other hydrocarbons. Subsurface samples in this area have PEC exceedances for lead, byrene, benzo(a)anthracene, and benzofluoranthene. Surface sediments exceeded screening levels for PAHs, metals, and some organics. Other studies found screening level exceedances for cadmium, lead, zinc, PCBs, and DDT (AMEC 2006, Hart Crowser 2002).

Physical habitat conditions within the lower Willamette River are also highly degraded. The river's banks have been channelized, off-channel areas removed, tributaries put into pipes, and the river disconnected from its floodplain as the lower valley was urbanized. Silt loading to the lower Willamette River has increased over historical levels due to logging, agriculture, road building, and urban and suburban development within the watershed. Limited opportunity exists for large wood recruitment to the lower Willamette River due to the paucity of mature trees along the shoreline, and the lack of relief along the shoreline to catch and hold the material. The lower Willamette River has been deepened and narrowed through channelization, diking and filling, and much of the shallow-water habitat has been converted to deep-water habitat; 79% of the shallow water through the lower river has been lost through historical channel deepening (Northwest Power and Conservation Council 2004). In addition, much of the historical off-channel habitat has been lost due to diking and filling of connected channels and wetlands. Columbia Slough, a tributary within the action area, is the closest remaining off-channel habitat. Connections between the slough and the river have been cut off, and dikes have been constructed along much of the slough.

Shallow-water habitats are important for juvenile listed salmonids because they provide food resources, such as benthic macroinvertebrates, zooplankton, and emergent insects, and refuge from predators in the main river. Although juvenile outmigrants may occupy the entire river, subyearling listed salmonids tend to migrate close to the water surface and near the shoreline. The reduction in current velocities aids juvenile fish by significantly reducing their energy requirements. Because juveniles are small and have relatively weak swimming abilities, feeding is most effective in areas where current velocities are slow. Most of the proposed dredge prism is greater than 20 feet deep and it unlikely to provide shallow-water feeding habitat.

The Willamette River is tidally-influenced within the action area. Juvenile and adult Chinook salmon, coho salmon, chum salmon, and steelhead use the action area as a migratory corridor and as rearing habitat for juveniles.

Slip 3 is deep-water habitat that is maintained by dredging for deep draft vessels. Wheeler Bay has moderate quality beach habitat that accumulates large wood. The section of the shoreline closest to Slip 3 is quite steep, and has some riprap to help prevent active erosion.

The Columbia River is also within the action area. The Columbia River is 1,210 miles long, and drains a watershed area of about 260,000 square miles. Habitat in the Columbia River has been significantly degraded by the development and operation of the Federal Columbia River Power System dams. The lower Columbia River estuary lost approximately 43% of its tidal marsh (from 16,180 acres historically to 9,200 acres today), and 77% of its historical tidal swamp habitats (from 32,020 acres historically to 6,950 acres today) between 1870 and 1970 (Thomas 1983). One example is the diking and filling of floodplains that were formerly connected to the tidal river. This practice eliminated large expanses of low-energy, off-channel habitat for Pacific salmon and steelhead rearing and migrating during high flows. Similarly, diking of estuarine marshes and forested wetlands within the estuary removed most of these important off-channel habitats.

Within the lower Columbia River, diking, river training devices (*e.g.*, pile dikes, riprap), railroads, and highways have narrowed and confined the river to its present location. Between the Willamette River and the mouth of the Columbia River, those human activities have confined 84,000 acres of floodplain that likely contained large amounts of tidal marsh and swamp. The lower Columbia River's remaining tidal marsh and swamp habitats are in a narrow band along the Columbia River and its tributaries' banks, and around undeveloped islands.

The Columbia River in the action area is on the ODEQ 303(d) list as water quality limited for temperature (summer months), dichloro-diphenyl-trichloroethane, PCBs, and arsenic. The Columbia River is on the Washington State Department of Ecology's 303 (d) list for dissolved oxygen, temperature, total dissolved gas, and fecal coliform. OWEB (2006) identified loss of floodplain, loss of estuarine wetlands, fine sediments from farm and forest roads, high stream temperatures, passage barriers and impaired low-gradient stream complexity as issues.

Effects of the Action

The proposed action will affect the listed salmonids considered in this opinion by causing physical, chemical and biological changes to the environmental baseline, and through direct effects. These effects include interaction with fish migrating through or rearing within the action area during in-water work, effects to benthic and pelagic forage opportunities, short-term negative water quality effects (*i.e.*, turbidity and increased exposure to contaminants), long-term positive benefits to sediment and water quality, and long-term negative effects to habitat quality. The greatest risk to rearing or migrating salmon and steelhead is the suspension of contaminated sediments, and the potential for direct harm (because the work area will not be isolated from the river). Dredging will also maintain the existing deep-water habitat, despite its being in a depositional area that has a potential to develop into shallow-water habitat, a rare habitat type in the lower Willamette River. The analysis below will first describe the potential for direct effects to listed salmonids, and then describe the effects of the action to water quality and habitat, and finally describe the potential for effects as a consequence of changes in water quality and habitat. The potential effects in the Willamette River and in the Columbia River will be addressed separately.

Effects on ESA-Listed Species.

The potential for harm to ESA-listed salmonids in the Columbia River is remote because no in-water work is proposed for the Columbia River. Contaminated sediment will be transported up the Columbia River to the transfer site. Conservation measures minimize the risk of spillage of contaminated sediment during transport and at the unloading site. With the measures in place, the greatest risk to listed ESA-salmonids in the Columbia River would be associated with an accidental spill of contaminated sediment during transfer from the barge. Accidental spills do happen, so the risk is real for indirect effects because of contaminant exposure. However, the potential for direct effects to ESA-listed fish in the Columbia River is unlikely.

There is potential for harm during dredging and other in-water activities in the Willamette River during the summer in-water work window of July 1 through October 31. Five species of juvenile ESA-listed salmonids, the more sensitive and vulnerable life stage, are present during this work

window (Table 5) although densities of juvenile salmonids are lower in the summer months compared with the winter months, and the summer in-water work window avoids peak smolt out-migration and peak adult migration for both Chinook salmon and steelhead (Friesen 2005).

Table 5. The presence/absence of ESA-listed salmonids in the lower Willamette River during the summer in-water work window (July 1 to October 31). 'Y' indicates the species is present, 'Y-' indicates that while the life stage may be present, peak migration is not at this time', 'N' indicates that the species is not likely to be present.

Species	**Presence During Summer In-water Work Window**	
	Adults	**Juveniles**
LCR	Y	Y-
UWR	Y	Y
CR Chum salmon	Y-	N
LCR Coho salmon	Y	Y-
UWR	N	Y-
LCR	Y-	Y-

If ESA-listed salmonids are present while dredging and in-water work is on-going, migration will be delayed or impaired (Quigley 2003, Hecht *et al*. 2007). Adults are better able to avoid work areas, but juvenile salmon and steelhead are less able to swim around disturbances, so their movements will be delayed. If they are delayed in areas with suitable cover and forage opportunities, then the delay will likely be energetically neutral. If cover and forage are not available as is true for Slip 3, then the delay means greater risk of predation, increased exposure to contaminants, and energetic costs associated with poor food availability and swimming in the current, which increase the risk or injury or mortality. Therefore, harassment of ESA-listed juvenile salmonids is likely to occur over a period of 4 to 6 weeks during dredging and other in-water activities in Slip 3. The Port will deploy mesh panels intended to direct juvenile salmonids moving downstream away from the mouth of Slip 3. However, the effectiveness of this measure is unknown, and at best, the panels will reduce the amount of harassment.

Entrainment of migrating and rearing fish by dredging equipment occurs when fish are trapped during the uptake of sediments and water by dredging machinery, which can cause injury or death. The probability of entrainment is largely dependent upon the likelihood of fish occurring within the dredging prism, fish densities, dredging depth, the entrainment zone, location of dredging within the river, equipment operations, time of year, and the species' life stage. Low densities of ESA-listed salmonids are likely to be present during dredging, although the species composition of the community will change depending on when during the work window the action is implemented. For example, juvenile chum salmon are most likely to be present in October. Fish are likely to be transitory in the entrainment zone, and the depth of dredging (from -16 feet to -50 feet) lowers the likelihood of fish presence, as does the deployment of mesh panels on the upstream edge of Slip 3. However, based on the near shore proximity of dredging operations, previous evidence that that dredging operations in the lower Columbia River will entrain juvenile salmon and steelhead (refer to NMFS biological opinion: 2004/01041), the proposed action is likely to harm some migrating and rearing juvenile salmon and steelhead.

Water Quality Effects on Habitat and Listed Salmonids. The proposed action will reduce water quality during and immediately following in-water activities in Slip 3 and during bankline stabilization work in Wheeler Bay. Dredging results in the suspension and transport of sediments along with any associated contaminants. Further, grading and the movement of heavy equipment along the shoreline could increase the mobilization of contaminants within the soil, particularly in the dissolved form.

The use of the dredge bucket will result in an increase in turbidity that will be localized and should dissipate within a few hours following cessation of the activity. Although there is some evidence that higher turbidity along the river bottom may persist for several days after the cessation of dredging (Parametrix 2006). The Port predicts the dredging will take 3 to 4 weeks, and elevated suspended concentrations are expected to persist during that period.

Berg and Northcote (1985) reported that increases in suspended sediment concentrations as low as 17 milligrams per liter (mg/L) resulted in significant increases in inflammation of the gills leading to respiratory stress when juvenile coho salmon were exposed to suspended sediment pulses for periods as short as 4 hours. Berg and Northcote (1985) also reported that increases in suspended sediment concentrations as low as 30 mg/L resulted in significant behavioral responses, such as changes in territorial behavior of juvenile coho salmon that were exposed to suspended sediment pulses for periods as short as 4 hours. Servizi and Martens (1991) reported less than 5% avoidance in juvenile coho salmon exposed to suspended sediment at a concentration of 2550 mg/L for a 96-hour period. Noggle (1978) reported that increases in suspended sediment concentrations at 1200 mg/L for a 96-hour period killed juvenile coho salmon. Finally, Berg (1982) reported that increases in suspended sediment at a concentration of 53.5 mg/L for a 12-hour period caused physiological stress and changes in behavior in coho salmon.

The Port predicts suspended sediment concentrations of 200 to 800 mg/L adjacent to the dredging, with an 83% decline within 25 meters, and an 88% decline within 100 meters (based on DREDGE, DRET and PLUMES models and data). Therefore, it is likely that sediment plumes generated by the dredging in the Willamette River will exceed suspended sediment concentrations greater than the 17 mg/L effects threshold for injury as described above. However, it is unlikely that migrating or rearing juvenile salmon and steelhead will remain in the sediment plume for a period sufficient to elicit an adverse physiological or behavioral response (4 to 96 hours) that would result in injury, since habitat quality in the action area is very low, and salmon and steelhead residence time in the action area is likely to be short-lived. Therefore, while some juvenile salmon and steelhead may be adversely affected from exposure to project-related sediment plumes, these adverse effects will not create the potential for injury, and therefore do not rise to the level where take will occur.

The concentration of contaminants in the water column will increase along with turbidity, thus increasing the exposure of listed salmonids and prey species. In addition, the concentration of dissolved contaminants will increase due to the disturbance of the substrate and the Wheeler Bay bankline. The sediments within the proposed dredge prism are contaminated with PAHs, cadmium, lead and zinc. These contaminants tend to be associated with the sediment particles, but may have a dissolved fraction as well. Elevated concentrations of both dissolved and

particulate contaminants are likely downstream or upstream from dredging, depending on the tidal stage during the dredging, and the increases in turbidity and particulate and dissolved contaminants are likely to remain elevated within the proposed action area for up to 24 hours following dredging. Therefore, turbidity and contaminant concentrations are likely to remain elevated throughout the 3 to 4 weeks of dredging.

PAHs in water tend to adsorb to sediments either in the water column or in bottom sediments. This adsorption generally makes them less bioavailable via direct contact with organisms. However, a portion of these PAHs are likely bioavailable to benthic fish and invertebrates through direct contact and diet. PAHs are bioaccumulated in benthic invertebrates, and are passed to salmonids through the food chain (Meador *et al.* 1995). Fish feeding in the project area are likely to ingest contaminated invertebrates and incidentally ingest elevated levels of PAHs or other contaminants that have adsorbed to particles in the water column. PAHs are metabolized and detoxified in vertebrates such as fish, and therefore are not bioaccumulated (Varanasi *et al.* 1989). However, some intermediate metabolites of PAHs are carcinogenic properties and cause other adverse effects in fish (Johnson 2000). Arkoosh *et al.* (1994) found that exposure to both PAHs and PCBs impaired immunity in juvenile fall Chinook salmon. Impaired immunity has been linked to increased susceptibility to disease and increased predation in the marine environment.

Fish exposed to hydrocarbons in their environment have exhibited fin erosion, liver abnormalities, cataracts, and immune system impairments leading to increased susceptibility to disease (Fabacher *et al.* 1991; Weeks and Warinner 1984, 1986; O'Conner and Huggett 1988). Work by Dr. Jim Meador and his colleagues (2006) has shown that exposure to petroleum PAHs can result in a significant reduction in weight and a reduction in lipid stores in juvenile Chinook salmon, which is likely to increase mortality for juvenile fish as they move through the estuary and into the ocean.

Cadmium, a non-essential metal, is found at relatively high concentration in sediments at Terminal 4. In aquatic ecosystems cadmium can bioaccumulate in mussels, oysters, shrimps, lobsters, and fish. The toxicity of cadmium is generally attributed to the free divalent cation, can enter fish through the chloride cells in the gills (Niyogi *et al.* 2004), and acculumates primarily in the kidney, liver, and gills. The susceptibility to cadmium can vary greatly between aquatic organisms, and the availability of cadmium depends on the hardness of the water. Exposure to low concentrations of led to population decreases in the amphipod *Hyalella azteca*, which can lead to food web consequences for fish species that prey on pelagic species (Mebane 2006). Some data also suggest adverse behavioral changes in fish following long-term exposures to low concentrations of cadmium (Mebane 2006).

Lead can be bioconcentrated from water, but does not bioaccumulate and tends to decrease with increasing trophic levels in freshwater habitats (Wong *et al*. 1978, Eisler 1988). Lead adversely affects algae, invertebrates, and fish (Horne and Dunson 1995, Freda 1991). Fish exposed to high levels of lead exhibit a wide-range of effects including muscular and neurological degeneration and destruction, growth inhibition, mortality, reproductive problems, and paralysis (Eisler 1988, EPA 1976). Lead reduces invertebrate reproduction and algal growth. Lead partitions primarily to sediments, but becomes more bioavailable under low pH, hardness and

organic matter content (among other factors). Lead bioaccumulates in algae, macrophytes, and benthic organisms, but the inorganic forms of lead do not biomagnify.

In many types of aquatic plants and animals, growth, survival, and reproduction can all be adversely affected by elevated zinc levels (Eisler 1993). Zinc in aquatic systems tends to be partitioned into sediment and less frequently dissolved as hydrated zinc ions and organic and inorganic complexes (MacDonald 1993). Acute toxicity (lethality) in rainbow trout has been observed for zinc concentrations as low as 53 µg/L (Bailey *et al.* 1999).

The biological assessment (page 79) states that the dredge elutriate testing indicate little or no short-term adverse effects to ESA-listed salmonids are likely from exposure to contaminants during dredging. However, these results are based on a comparison to water quality criteria that NMFS has not evaluated for protectiveness of ESA-listed juvenile salmonids. A technical memorandum prepared by Anchor Environmental, LLC (March 4, 2008) states that the concentrations of all parameters (metals and PAHs) will decline to below CERCLA guidance values by 50 meters from the dredging activity. The information provided above indicates that some ESA-listed salmonids will be exposed to project-related contaminants discharged into the Willamette River at concentrations where adverse effects could occur. Those adverse affects are not likely to kill any ESA-listed salmonids, but are likely to result in behavioral changes (*e.g.*, avoidance, altered feeding, delayed migration), physiological stress, and reduced fitness of juvenile salmonids.

The Port is proposing to install mesh panels as a fish deterrent system on the upstream edge of Slip 3 during dredging. The panels are intended to discourage the movement of juvenile salmonids into Slip 3, but the efficacy of this tool is not known. Some fish may continue moving downstream, but other fish may follow the downstream edge of the panels into Slip 3, and be exposed to areas of higher suspended sediment concentrations and contaminants.

In addition, sediment and soil in the bank regrading area are contaminated with PAHs, DDT, DDE and DDD. Amending the regraded contaminated soil with compost and hydroseeding may not prevent the movement of contaminated soil into the water during storm or wind events. The effectiveness of the hydroseeding to remove the regraded contaminated soil as a source was not evaluated in the biological assessment; the likely outcome is that the pathway to the river is reduced, but not eliminated.

The combined effects of increased suspended sediment and increased concentrations of particulate and dissolved contaminants are not known, but could be additive, synergistic (greater than additive), or antagonistic (less than the sum of their individual effects). Adult and juvenile listed salmonids (UWR and LCR Chinook salmon and steelhead, and LCR coho salmon) may avoid the area when possible, although subyearling Chinook salmon may be less effective at avoiding the area because of their poor swimming ability and greater densities than other species. The combined effects will likely be increased physiological stress, reduced feeding, and change in behavior (*e.g.*, avoidance), which frequently result in impaired growth, reduced lipid stores, and increased likelihood of mortality. However, too few fish will be affected by harassment or harm to produce a measureable effect on any of the affected populations or species.

The long-term effects of this removal action should be beneficial because of the removal of contaminated sediments and the isolation of sources of contamination to the river. However, this is not a final remedy; only the highest-risk sediments are being removed, and the newly exposed sediment surface may have contaminant concentrations greater than concentrations shown to cause adverse effects in fish. With EPA approval, the Port proposes to apply a 6-inch sand cap for exposed sediments with contaminant concentrations greater than 20 times the PEC. Therefore, until a final remedy is implemented, the newly exposed sediments may cause adverse effects to ESA-listed salmonids.

The transport of contaminated sediment in the Columbia River to the offloading site, and the transfer of sediment at the unloading site are unlikely to affect water quality or habitat in the Columbia River. Implementation of best management practices on the barge and at the off-loading site will minimize the risk of spills into the river. If a spill of contaminated sediment occurs, the effects will be short term and minimal because of dilution and the transitory presence of listed salmon in the Columbia River.

Effects to Physical Habitat, Prey Base and Listed Species. The area proposed for in-water work at Terminal 4 is primarily deep-water habitat. In deep-water habitat, the primary mode of feeding for juvenile ESA-listed salmonids is on planktonic or pelagic organisms (*e.g.*, *Daphnia* spp., *Corophium* spp.; Vile *et al*. 2004) rather than benthic. Increased turbidity during dredging will disrupt planktonic feeding of ESA-listed salmonids in the dredgearea, and this effect will last for up to 24 hours following the in-water activities, a period totally 3 to 4 weeks. It is unlikely that numeric changes in the pelagic community will be measurable following dredging because of the flow-induced movements of these animals, and their transient presence in the action area. Thus, pelagic feeding of listed salmonids in the deep-water dredging will be disrupted for a maximum of 4 weeks, but the effects are not likely to be measurable over the long term.

The benthic mode of feeding may also be used by listed salmonids within the action area, particularly in Wheeler Bay. Disruptions to benthic feeding during the summer are not likely, because dredging and construction should be completed in the main channel at that time. However, the placement of riprap will displace beach habitat that could provide benthic feeding opportunities in the winter. This loss is significant because Wheeler Bay is one of the few velocity refuges in the lower Willamette River, and this habitat type is a limiting factor for the listed salmonds that use the Willamette River. The existing contamination, disturbance of the substrate and deposition of fine sediment is from dredging, and the frequent ship activity near the mouth of the bay will likely slow the development of a healthy benthic community at the project site, and the effects to benthic productivity and availability of benthic invertebrates as prey items will last in perpetuity. In the biological assessment, the Port states that the existing habitat is of low quality, and that habitat quality will be maintained. The NMFS disagrees with these statements. The site provides a high-flow velocity refuge, and provides a good quality beach that accumulates a significant amount of wood. The Port will maintain some wood on the site, and the plantings will provide some shade, but the type of plantings proposed (primarily willows) will not contribute to habitat complexity over the long term, and the riprap will displace the more valuable beach habitat and winter feeding opportunities.

To compensate for this loss of habitat, the Port proposes to create or preserve an equivalent area (14,000 square feet) of shallow water habitat in the lower Willamette River or Columbia Slough. The availability of shallow water habitat for juvenile rearing is a limiting factor in the recovery of ESA-listed salmonids, and the new or preserved habitat will provide valuable rearing opportunities in the lower river. The net effect of the negative and positive habitat effects on viability factors for the population is likely to be neutral.

The addition of riprap at the back end of Slip 3 will not degrade habitat in that area in a manner that will adversely affect listed salmonids, because Slip 3 is maintained as deep water habitat, a habitat-type that is not limiting in the lower Willamette River.

No effects to physical habitat and the prey base will occur in the Columbia River.

Effects on Critical Habitat

Designated critical habitat within the action area for the salmonids considered in this Opinion consists of a freshwater rearing site and freshwater migration corridor and their essential physical and biological features as listed below. The effects of the proposed action on these features are summarized as a subset of the habitat-related effects of the action that were discussed more fully above. The water quality effects described will last for a maximum of four weeks during during and immediately following in-water dredging, and some effects may persist for the long-term until the final remedy is implemented. The dredging will cause short-term effects to deep-water benthic and pelagic habitat (disruption and loss of habitat). The bankline stabilization work will permanently replace some of the beach/bank habitat with riprap. The PCEs potentially affected by the proposed action are water quality, forage and space, natural cover, and free passage. The likely effects of the action on these essential features are listed below:

1. Water Quality. Suspended sediment will likely be highest within a few hundred feet of the dredging activities. Water quality may also be degraded by accidental spills from equipment or contaminants releases (Willamette River and Columbia River), or contaminants made more available during dredging (Willamette River only). Elevated concentrations of both dissolved and particulate contaminants are likely downstream or upstream from the terminal, depending on the tidal stage, and the increases in turbidity and particulate and dissolved contaminants are likely to remain elevated within the action area throughout the period of dredging which will be a maximum of 4 weeks. Over the long term, water quality in the action area should be improved because of the removal of the contaminated sediments from the river and the isolation of contaminant sources in Wheeler Bay and at the head of Slip 3.
2. Forage and Space. Increased suspended sediment will temporarily reduce food resources for juvenile listed salmonids in the action area, but impacts to the forage base would only occur for a few weeks during and immediately following dredging. The primary food resource in the deeper parts of the site are pelagic invertebrates, and recolonization from upstream areas will be fairly rapid. Pelagic feeding opportunities for juvenile listed salmonids are not limited at the watershed scale. The action area does provide good-quality benthic feeding habitat, which is limiting at the watershed scale. Some of this habitat that is inundated at higher flows will be permanently replaced with riprap. Also,

the newly-exposed sediment surface in dredged areas in Slip 3 may be a new source of contamination to the river and the benthic community. The longer-term consequence of the proposed action is a permanent loss of shallow-water habitat in Wheeler Bay, the continued potential of the Wheeler Bay bankline as a contaminant source area, and, in Slip 3, depositional areas that could potentially develop into shallow-water habitat will be maintained as deep-water habitat. Shallow-water rearing (resting and feeding) habitat is limiting at the reach scale, and the lack of opportunities for resting and feeding is an energetic cost to juvenile salmonids as they move toward the estuary. The creation or preservation of shallow water habitat will recreate shallow-water rearing opportunities over the long term. In addition, the proposed dredging will be maintaining the current condition of deep-water habitat.

3. Natural Cover. Suspended sediment may provide ESA-listed juvenile salmonids with temporary cover from predators. A likely response from adult salmonids would be avoidance of areas with high turbidity.
4. Free Passage. Suspended sediment and the mesh panel might delay migration of adults and juveniles during and immediately following dredging and capping activities. Adults are likely to avoid the active work area because of their strong swimming ability, but juveniles are less likely to avoid the area, and migration will more likely be delayed or impaired.

Factors limiting the salmonid populations in the lower Willamette River are water temperature, water quality, and channel modification (loss of shallow habitat). While this action will adversely affect water quality and channel modification, the effects to water quality are not to affect the conservation value of the lower Willamette River to listed salmonid populations. The adverse effects to sediment (turbidity and contaminant exposure) will be temporary and localized, and the proposed action will be maintaining the existing deep-water habitat at the site. However, riprap will be placed along approximately 14,000 square feet of beach habitat in Wheeler Bay (Willamette River). This will result in a permanent loss of a shallow water rearing habitat during winter months, a habitat type that is limiting at the reach scale and the watershed scale. The creation or preservation of 14,000 square feet of shallow water habitat will compensate for this loss.

Cumulative Effects

Between 2000 and 2006, the population of Multnomah County increased by 3.2%.[2] The NMFS assumes that future private and state actions will continue within the action area, increasing as population density rises. As the human population in the action area continues to grow, demand for industrial and commercial development is also likely to grow and increase in intensity. The effects of those new activities are likely to further reduce the conservation value of the habitat within the action area. State-led upland clean-up of contaminated areas adjacent to the river is ongoing. The NMFS is not aware of any specific future non-Federal activities within the action area that would cause greater impacts to listed species than presently occur. Industrial activities will continue within the action area, as will the ongoing CERCLA clean-up of contaminated sediments. As part of the CERCLA action and the resulting Natural Resource Damage

[2] U.S. Census Bureau, State and County Quickfacts, Multnomah County, http://quickfacts.census.gov/qfd/states/41/41051.html

Assessment, as well as the City of Portland's commitment to restore listed salmon and steelhead, habitat restoration actions will be constructed and provide benefits to rearing and migrating fish.

Conclusion

After reviewing the status of salmonids considered in this Opinion, and their designated critical habitats, the environmental baseline for the action area, the effects of the proposed action, and cumulative effects, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of the listed salmonids, and will not result in the destruction or adverse modification of designated critical habitat. These conclusions are based on the following considerations.

Juvenile rearing and migration of the ESA-listed species in this Opinion is limited by poor water and sediment quality, and degradation of physical habitat. Adult spawning is limited by poor access to quality spawning areas, and a lack of quality spawning areas. Most populations of the ESA-listed species are at relatively low abundance and are at risk for all VSP categories, including abundance, productivity, diversity and spatial structure (Good *et al*. 2005, McElhany *et al*. 2007). The Willamette River is designated critical habitat for four of the five ESA-listed salmonid species. It is rated as having 'high' conservation value, although present conditions in the action area are degraded due to industrialization and urbanization in the basin that have altered flows, degraded water and sediment quality, reduced the availability of shallow water habitat, and reduced the complexity of the channel.

The proposed action will degrade rearing conditions in the action area for approximately 4 weeks by affecting water quality, forage, space, and safe passage conditions, all of which are limiting factors for the ESA-listed species. However, over the long term (*i.e*., years), the proposed action will maintain or improve existing water and sediment quality at the Port's Terminal 4 in the Willamette River. There will be a permanent loss of approximately 14,000 square feet of beach habitat in Wheeler Bay as the result of riprap placement, but the value of this habitat will be replaced by mitigation work over the long term. No degradation of rearing conditions is likely in the Columbia River, although there may be temporary degradation of water quality if there is a spill of contaminated sediment.

A very small proportion of the total number of each ESA-listed salmonid in the Willamette River will be affected by the short-term effects of the action on rearing and migratory conditions. This is because only a small portion of each species will be migrating past the site during the in-water work window, or will be rearing in the action area during project activities. Those few fish will be exposed to additional stress caused primarily by reduced water quality, increased turbidity, and impaired passage. Any stress and resulting injury experienced by those fish is likely to be last for a few weeks and is limited to the vicinity of Slip 3 and Wheeler Bay. These adverse effects will be experienced by far too few fish to produce an observable effect on the abundance, distribution, diversity or productivity of these listed salmonids at either the population or species scale.

Further, the proposed action will not cause further degradation of freshwater rearing habitat or adverse modification of critical habitat PCEs for LCR steehead and Chinook salmon, UWR

steelhead and Chinook salmon, LCR coho salmon, and CR chum salmon. The negative effects will last for a few weeks, are an extension of the existing condition, will be offset be the creation of shallow water habitat, and will not contribute to a reduction in the conservation value of designated critical habitat in the Willamette River for the ESA-listed salmon and steelhead.

The remaining seven species are present in the Columbia River only, and these species rear in the Columbia River as the juveniles move downstream. In the event dredged sediment is spilled during transport, some of these fish will be exposed to degraded water quality. However, any stress experienced by these fish is likely to be brief (days to weeks) and limited to fish near the unloading site. The timing, frequency, intensity, and duration of these adverse effects will be experienced by far too fish to produce an observable effect on the abundance, distribution, diversity or productivity of these seven species at either the population or species scale.

Finally, for the Columbia River, the proposed action will not cause further degradation of freshwater rearing habitat or adverse modification of critical habitat PCEs. The current value of critical habitat along the transport route and the unloading site will be maintained. The negative effects will be short-term or an extension of the existing condition, and will not contribute to a reduction in the conservation value of designated critical habitat in the Columbia River for the ESA-listed salmon and steelhead.

Reinitiation of Consultation

Reinitiation of formal consultation is required and shall be requested by the Federal agency or by NMFS where discretionary Federal involvement or control over the action has been retained or is authorized by law and: (a) If the amount or extent of taking specified in the incidental take statement is exceeded; (b) if new information reveals effects of the action that may affect ESA-listed species or critical habitat in a manner or to an extent not previously considered; (c) if the identified action is subsequently modified in a manner that has an effect to the ESA-listed species or critical habitat that was not considered in the biological opinion; or (d) if a new species is listed or critical habitat is designated that may be affected by the identified action (50 CFR 402.16).

If the Port fails to provide the compensatory mitigation plan for this removal action to NMFS for approval or disapproval within 2 years of the start of operations under this Opinion, or fails to carry out the plan within 5 years after it is approved, as described in the proposed action and in the reasonable and prudent measures and terms and conditions, NMFS may assume the proposed action has been modified in a manner that has an effect to the ESA-listed species or critical habitat that was not considered in the biological opinion, and may recommend reinitiation of this consultation.

To reinitiate consultation, contact the Oregon State Habitat Office of NMFS and refer to the NMFS Number assigned to this consultation (2007/08174).

Incidental Take Statement

Section 9(a)(1) of the ESA prohibits the taking of listed species without a specific permit or exemption. Protective regulations adopted pursuant to section 4(d) extend the prohibition to threatened species. Among other things, an action that harasses, wounds, or kills an individual of a listed species or harms a species by altering habitat in a way that significantly impairs its essential behavioral patterns is a taking (50 CFR 222.102). Incidental take refers to takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(o)(2) exempts any taking that meets the terms and conditions of a written incidental take statement from the taking prohibition.

Amount or Extent of Take

Activities necessary to complete the proposed action at Terminal 4 will take place within the active channel of the Willamette River and the Columbia River when individuals of Chinook salmon, coho salmon, chum salmon, sockeye salmon, and steelhead considered in this Opinion are likely to be present. Adverse effects of the proposed action will include the temporary loss of prey items for rearing juveniles in the Willamette River, an increase in turbidity, sediment, and potential exposure to pollutants (PAHs, zinc, cadmium and lead) in the Willamette River and the Columbia River. The habitat that will be adversely affected by these effects is of moderate to poor quality and not limited at the site-specific or watershed scale. The placement of riprap in Wheeler Bay will permanently reduce the quality of shallow-water rearing habitat in the bay, and this habitat is limited at the site-specific and the watershed scales, and will be re-created in the lower Willamette River. These effects are reasonable likely to cause increased physiological stress, reduced feeding, and change in behavior, which frequently result in impaired growth, reduced lipid stores, and increased likelihood of mortality. These effects are likely to harass adults and juveniles by, and harm juveniles by increased predation and reduced resistance to disease, and reduced fitness due to low growth rates (*i.e.*, within an area extending from 500 feet upstream to 1,000 feet downstream of the terminal and the off-loading facility.

The distribution and abundance of fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area for this consultation cannot be attributed entirely to habitat conditions, nor can NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action.

The best available indicators for the extent of take are the areas of the active channel used by ESA-listed salmonids as habitat that will be disturbed by dredging activities, suspended sediment and contaminant plumes, and the bankline activities in Wheeler Bay. These features best integrate the likely take pathways associated with this action, are proportional to the anticipated amount of harm, and are the most practical and feasible indicators to measure. Thus, the predicted extent of take indicators for this consultation are: (1) The disturbance of 75,000 square feet of migration, rearing, and riparian habitat in Wheeler Bay during the summer in-water work

window; (2) a 100-meter long plume of increased suspended sediment from dredging activities measured from the edge of the area with in-water activities at 5 NTU over the background level for two consecutive monitoring intervals during the summer window; and (3) an increase in laboratory parameters (PAHs, metals) measured 100 meters from the in-water activities at concentrations greater than the acute criteria for more than three sampling intervals. Dredging-generated suspended sediment is an extent of take indicator due to the relationship between suspended sediment and contaminant concentrations.

In the accompanying Opinion, NMFS determined that this level of incidental take is not likely to result in jeopardy to the species. The increase in turbidity and the aerial extent of dredging are thresholds for reinitiating consultation. Exceeding this indicator for extent of take will trigger the reinitiation provisions of this Opinion.

Reasonable and Prudent Measures

Reasonable and prudent measures are nondiscretionary measures to avoid or minimize take that must be carried out by cooperators for the exemption in section 7(o)(2) to apply. The EPA has the continuing duty to regulate the activities covered in this incidental take statement where discretionary Federal involvement or control over the action has been retained or is authorized by law. The protective coverage of section 7(o)(2) may lapse if the EPA fails to exercise its discretion to require adherence to terms and conditions of the incidental take statement, or to exercise that discretion as necessary to retain the oversight to ensure compliance with these terms and conditions. Similarly, if any applicant fails to act in accordance with the terms and conditions of the incidental take statement, protective coverage may lapse.

Full application of conservation measures included as part of the proposed action, together with use of the reasonable and prudent measures and terms and conditions described below, are necessary and appropriate to minimize the likelihood of incidental take of listed species due to completion of the proposed action.

The EPA shall:

1. Minimize incidental take from project-related activities by applying permit conditions to the proposed action that avoid or minimize adverse effects to water quality and the ecology of aquatic systems.
2. Ensure completion of a monitoring and reporting program to confirm this incidental take statement is meeting its objective of minimizing incidental take from permitted activities.

Terms and Conditions

To be exempt from the prohibitions of section 9 of the ESA, the EPA and its cooperators, including the applicant, if any, must fully comply with conservation measures described as part of the proposed action and the following terms and conditions that implement the reasonable and prudent measures described above. Partial compliance with these terms and conditions may invalidate this take exemption, result in more take than anticipated, and lead NMFS to a different

conclusion regarding whether the proposed action will result in jeopardy or the destruction or adverse modification of critical habitats.

1. To implement reasonable and prudent measure #1, the EPA shall ensure that:

   a. Work Window. To minimize effects to juvenile listed salmonids, the Port limits dredging is limited to the summer in-water work window (July 1 through October 31).
   b. Notice to Contractors. Before beginning work, all contractors working on site are provided with a complete list of reasonable and prudent measures, and terms and conditions intended to minimize the amount and extent of take resulting from general dredging activities, in-water work, and shoreline stabilization activities.
   c. Minimize Impact Area. The Port confines dredging impacts to the minimum area necessary to complete the project.
   d. Dredging.
      i. No fallback or redistribution. All digging passes of the bucket shall be completed without any material being returned to the wetted area. Dumping of partial or full buckets of dredged material back into the river is not allowed. Dredging of holes or sumps below the maximum depth, and redistribution of sediment by dredging, dragging or other means is not allowed.
      ii. Cycling time. Clamshell cycling time shall be slowed, as necessary, to reduce turbidity and reduce sediment drift to adjacent areas.
      iii. A closed-lip or environmental bucket will be used. If the type of material precludes the use of this type of bucket, please notify NMFS.
      iv. Debris. All large anthropogenic debris shall be removed from dredged sediments and transported to an appropriate disposal site.
      v. Post-dredge sampling shall include a full suite of parameters, including metals, SVOC, PCBs, and TOC.
      vi. Materials such as booms and sorbent pads shall be available on-site, and must be used to contain and clean up petroleum products spilled or release as a result of project activities. The booms must be deployed in Slip 3 prior to and during work at the head of Slip 3.
      vii. No release of either sediment or water back into the Willamette River or Columbia River from the transport barge is allowed.
   e. Cap.
      i. All covers or caps over contaminated soil or sediment require demarcation of the base of the cap with a geofabric demarcation barrier.
      ii. Institutional controls are required to protect the integrity of the cap.
      iii. Contaminated soil or sediment shall be capped in place with a minimum of 12 inches of clean cover material over the demarcation fabric. This includes the Wheeler Bay bankline and within Slip 3.
      iv. Cap material shall be from an approved upland source.
   f. Fish Deterrent System. The fish deterrent mesh panels shall be at least 20 feet deep, and shall extend into the Willamette River to the harbor line to greater encourage fish movement past the dock at Berth 410 (as depicted in Figure 15 in

the biological assessment, as opposed to figures in the Design Analysis Report (2008). Filter fabric is the preferred material for the mesh panels. However, the mesh opening shall be no bigger than 0.25 inch.

g. Habitat Measures.

i. Cable and concrete shall not be used to anchor large wood into the bankline in Wheeler Bay.

ii. Vegetation Cover in Wheeler Bay. The Port must achieve 80% aerial coverage by established (*i.e*, not newly-planted) vegetation at year 5. Invasive plants species do not count toward the 80% cover.

iii. Institutional controls (*e.g*., covenant, easement, or some other long-term measure) must be placed on the Wheeler Bay bankline area to prevent disturbance in the future.

iv. The Port will submit its proposed compensatory mitigation plan to NMFS for approval or disapproval within 2 years of the start of operations under this Opinion, and complete all actions necessary to carry out the plan within 5 years after the date the plan is approved. As described in 40 CFR 232.3(f)(2), NMFS will consider any time lag between commencement of sediment removal and the start of compensatory mitigation activities that exceeds 2 years to be an additional temporal loss of aquatic resource function when determining whether to the approve or disapprove the proposed mitigation ratio.

h. Monitoring. The size of the dredge prism and sediment/riparian disturbance area shall be monitored (amount and areal extent). In addition, monitoring shall be conducted for turbidity, sheens or other visible contamination in the water or along the bankline, and distressed or dying fish.

i. Visual monitoring. If any of the above are observed (turbidity plume, sheens, or distressed/dying fish), then the Port must notify EPA immediately to coordinate response decisions, and must evaluate the need to alter activities. Additional quantitative monitoring may be required.

ii. Quantitative monitoring will be conducted and recorded as described below during dredging, barge unloading and sediment transfer and during cap material placement. Monitoring will occur at one upstream station and three downstream stations, as identified by EPA. Water quality monitoring for laboratory parameters via depth-specific whole water samples will occur at the downstream station having the highest turbidity reading. The monitoring stations may be reversed, depending on the tidal cycle.

iii. Quantitative monitoring frequency. Monitoring field parameters will be measured at the start of each operation at least once every hour during active in-water work. The first sample of the day will be taken 1 hour after the initiation of the activity. This frequency will continue until four consecutive hourly events indicate no exceedance of any triggers levels, and the sampling frequency will be reduced to every 4 hours. If results exceed the triggers, these same parameters will be measured again within 30 minutes of the determination of the exceedance. In addition, hourly frequency will resume if any visible decline in water quality is observed or

if an exceedance has been confirmed. If exceedances continue, then procedures outlined below will be implemented. A properly and regularly calibrated turbidimeter is required. In addition, water samples for analysis of laboratory parameters will be collected once a day in subareas with active dredging and capping operations.

iv. Parameters monitored. The following field parameters shall be monitored: turbidity, dissolved oxygen, pH, and oil/sheen. The following laboratory parameters will be monitored: total suspended solids, anthracene, benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthese, benzo(a)pyrene, indeno(1,,3-cd)pyrene, dibenzo(a,h)anthracene), benzo(g.h,i)perylene)fluoranthene, pyrene, fluorene, phenanthrene, natphthalene, acenaphthlene, acenaphthene, cadmium, lead, zinc, water velocity.

v. Monitoring depths. Sampling depths for the field and laboratory parameters shall be located at the top, middle and bottom of the water column. For water depths less than 7 feet, two samples will be collected, and for depths less than 2 feet, one sample will be collected.

vi. Representative background point. For field parameters, initial background conditions will be established prior to the start of in-water work, with a minimum of seven independent measurements at least 100 meters upstream of the location of the activity, and over the course of a 2-day period just prior to the initiation of in-water work. For laboratory parameters, depth-specific whole water samples will be taken at one upstream sampling station. The 90th percentile upper confidence limit on the mean will be used to represent initial background conditions.

vii. Compliance point for field parameters. The compliance point of the field parameters (other than turbidity) is 100 m downstream from the center of the activity. The compliance point for turbidity is 100 meters beyond the inner harbor line. Table 4-1 of the water quality monitoring and compliance conditions plan (WQMCCP) outlines triggers for field parameters that require additional controls for the in-water activity. For example, if turbidity at the compliance point is more than 3 NTUs over background (when background <50 NTU) or greater than 10% over background (where background >50 NTUs), the Port will implement additional controls to reduce turbidity. If turbidity is more than 50 NTUs over background, then the Port must cease operations until they can continue without this exceedance.

viii. Compliance point for laboratory parameters. The compliance point is 100 meters downstream of the center of the activity. The WQMCCP, Table 4-1, provides aquatic chronic and acute triggers.

ix. Reporting. Copies of monitoring data shall be made available to NMFS upon request. The Port shall notify NMFS if there are two or more consecutive exceedances of the field or laboratory parameters.

x. The Port shall monitor for injured, sick or dead ESA-listed salmonids during active in-water work. The Port shall conduct this monitoring at

least once per day and anytime other parameters are being sampled, to be conducted no sooner than 1 hour after dredge operations have begun.

h. Weather Conditions. If the weather conditions are unsuitable to monitor the dredging operations (*e.g.*, heavy fog, excessive winds, rough water), then in-water operations must cease until conditions are suitable for monitoring.

j. Transport. To prevent the blowing of sediment back into the river, the sediments shall be covered during transport on the barge if winds are predicted to be greater than 20 miles per hour during transport. As stated above, no water shall be discharged from the barge.

k. Upland Disposal Site. The upland disposal site shall be large enough to accommodate the quantity of material and water to be placed there to allow adequate settling. No discharge of water (from the upland disposal site) to waterways with ESA-listed salmonids is covered in this Opinion.

2. To implement reasonable and prudent measure #2, the EPA shall ensure that:

a. Reporting. The applicant reports all monitoring items, including turbidity measurements, size of the dredged area (amount and aerial extent), depth of sand cap (if needed) and dates of initiation and completion of work, to NMFS within 90 days of the close of any work window that had dredging-related activity within it. Any exceedance of take covered by this Opinion must be reported by the applicant to NMFS immediately. The report will include a discussion of implementation of the terms and conditions in #1, above.

b. The applicant submits monitoring reports to:

National Marine Fisheries Service
Oregon State Habitat Office
Attn: 2007/08174
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232-2778

c. The applicant posts the following notice prominently at the work site:

NOTICE: If a sick, injured or dead specimen of a threatened or endangered species is found in the project area, the finder must notify NMFS through the contact person identified in the transmittal letter for this Opinion, or through the NMFS Office of Law Enforcement at 1-800-853-1964, and follow any instructions. If the proposed action may worsen the fish's condition before NMFS can be contacted, the finder should attempt to move the fish to a suitable location near the capture site while keeping the fish in the water and reducing its stress as much as possible. Do not disturb the fish after it has been moved. If the fish is dead, or dies while being captured or moved, report the following information: (1) NMFS consultation number; (2) the date, time, and location of discovery; (3) a brief description of circumstances and any information that may show the cause of death; and (4) photographs of the fish and where it was found. The NMFS also suggests that the finder coordinate with local biologists to recover

any tags or other relevant research information. If the specimen is not needed by local biologists for tag recovery or by NMFS for analysis, the specimen should be returned to the water in which it was found, or otherwise discarded.

MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

The consultation requirements of section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions, or proposed actions, that may adversely affect EFH. Adverse effects include the direct or indirect physical, chemical, or biological alterations of the waters or substrate and loss of, or injury to, benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects to EFH may result from actions occurring within EFH or outside EFH, and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that may be taken by the action agency to conserve EFH.

The Pacific Fishery Management Council (PFMC) designated EFH for groundfish (PFMC 2005), coastal pelagic species (PFMC 1998), and Chinook salmon, coho salmon, and Puget Sound pink salmon (PFMC 1999). The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for various life-history stages of coho and Chinook salmon (PFMC 1999).

Based on information provided in the BA and the analysis of effects presented in the ESA portion of this document, NMFS concludes that proposed action will have the following adverse effect on EFH designated for coho and Chinook salmon:

> Degradation of water quality from increased turbidity and contaminant exposure for a period of a few weeks, and loss of riparian and shallow water habitat.

EFH Conservation Recommendations

The NMFS believes that the following conservation measure is necessary to avoid, mitigate, or offset the impact of the proposed action on EFH. This conservation recommendation is an identical subset of the ESA terms and conditions.

1. Dredging and in-water work: Follow terms and conditions 1a – 1k as presented in the ESA portion of this document.
2. Monitoring and reporting: Follow terms and conditions 2a, 2b, and 2c as presented in the ESA portion of this document.

Statutory Response Requirement

Federal agencies are required to provide a detailed written response to NMFS' EFH conservation recommendations within 30 days of receipt of these recommendations [50 CFR 600.920(j)(1)]. The response must include a description of measures proposed to avoid, mitigate, or offset the

adverse affects of the activity on EFH. If the response is inconsistent with the EFH conservation recommendations, the response must explain the reasons for not following the recommendations, including the scientific justification for any disagreements over the anticipated effects of the proposed action and the measures needed to avoid, minimize, mitigate, or offset such effects.

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, in your statutory reply to the EFH portion of this consultation, we ask that you clearly identify the number of conservation recommendations accepted.

Supplemental Consultation

The EPA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH conservation recommendations [50 CFR 600.920(k)].

DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

Section 515 of the Treasury and General Government Appropriations Act of 2001 (Public Law 106-554) (Data Quality Act) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the Opinion addresses these Data Quality Act (DQA) components, documents compliance with the DQA, and certifies that this Opinion has undergone pre-dissemination review.

Utility: Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users.

This ESA consultation concludes that the proposed activities at the Port of Portland Terminal 4 will not jeopardize the affected species. Therefore, the EPA can authorize this action in accordance with its authority under CERCLA. The intended users are the EPA and the Port of Portland.

Individual copies were provided to the above-listed entities. This consultation will be posted on the NMFS Northwest Region website (http://www.nwr.noaa.gov). The format and naming adheres to conventional standards for style.

Integrity: This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

Objectivity:

Information Product Category: Natural Resource Plan.

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA Regulations, 50 CFR 402.01, *et seq.*, and the MSA implementing regulations regarding EFH, 50 CFR 600.920(j).

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the Literature Cited section. The analyses in this Opinion/EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with Northwest Region ESA quality control and assurance processes.

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APPENDIX B
SUPPLEMENTAL SECTION 404(B)(1) EVALUATION

Supplemental Section 404(b)(1) Evaluation
Terminal 4 Phase I Removal Action
Port of Portland, Portland, Oregon
Contract No. 68-S7-03-04
Task Order No. 0003

Prepared for

U.S. Environmental Protection Agency
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Port of Portland, Portland, Oregon. Prepared by
Parametrix, Sumner, Washington. June 30, 2008.

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DISTRIBUTION LIST

NAME	TITLE	ORGANIZATION

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ACRONYMS

AOC	Administrative Order on Consent
ARARs	Applicable or Relevant and Appropriate Requirements
ARCS	Assessment and Remediation of Contaminated Sediments
BA	Biological Assessment
BBL	Blasland, Bouck and Lee, Inc.
CDF	confined disposal facility
CERCLA	Compensation and Liability Act of 1980
CST	column settling test
cy	cubic yards
DAR	Design Analysis Report
DDD	dichlorodiphenyldichloroethane
DDT	dichlorodiphenyltrichloroethane
EE/CA	Engineering Evaluation and Cost Analysis
EPA	U.S. Environmental Protection Agency
FWS	U.S. Fish and Wildlife Service
ISE	imminent and substantial endangerment
NMFS	U.S. National Marine Fisheries Service
NTCRA	Non-Time-Critical Removal Action
ODEQ	Oregon Department of Environmental Quality
ODFW	Oregon Department of Fish and Wildlife
PAHs	polynuclear aromatic hydrocarbons
PCBs	polychlorinated biphenyls
PEC	probable effects concentration
Port	Port of Portland
psf	pounds per square foot
RAA	Removal Action Area
RAOs	Removal Action Objectives
RAWP	Removal Action Work Plan
RI/FS	remedial investigation/feasibility study
SEA	Striplin Environmental Associates, Inc.
T4 or Site	Terminal 4 Site
TSS	total suspended sediments
USACE	U.S. Army Corps of Engineers

ACRONYMS (CONTINUED)

USEPA	U.S. Environmental Protection Agency
USGS	U.S. Geological Survey
WQMCCP	Water Quality Monitoring and Compliance Conditions Plan

1. INTRODUCTION

This evaluation was prepared in accordance with guidelines promulgated by the Environmental Protection Agency at 40 CFR 230 for evaluating discharges of dredged or fill material in the waters of the United States. Its purpose is to support decisions by the U.S. Environmental Protection Agency, Region 10, (USEPA) regarding a Non-Time-Critical Removal Action (NTCRA) at the Terminal 4 Site (T4 or Site) (USEPA 2003b), under the authority of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended. This supplemental evaluation will be included as part of the administrative record.

The Port of Portland (Port) owns the T4 uplands located between River Miles 4.1 and 4.5 on the Lower Willamette River, extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay. The remainder of submersible or submerged land within the Removal Action Area (RAA) is owned by the State of Oregon Department of State Lands. T4 is currently used as an operating marine facility with a variety of tenants and operations, including automobile importing, exporting of soda ash, import and export of dry and liquid bulk cargo, associated rail intermodal facilities, and associated petroleum storage. Historically, activities at Slip 3 included loading and unloading dry and liquid bulk cargo such as Bunker C, diesel, pencil pitch, and metal ores. Slip 1 has been used for bulk and break-bulk cargo loading and unloading operations handling liquid fertilizer, lead and zinc concentrates, cured meats, agricultural produce, flour, vegetable oils, molasses, tallow, caustic soda, and a variety of general cargoes.

An Engineering Evaluation and Cost Analysis (EE/CA) Report (BBL 2005) presented the Site conceptual model, identified Removal Action Objectives (RAOs) and Applicable or Relevant and Appropriate Requirements (ARARs), screened remedial action technologies, and evaluated and ranked removal action alternatives. Appendix Q of the EE/CA was a Draft CWA 404(b)(1) analysis memorandum specifically addressing Alternative C, the selected action. This document supplements but does not alter that initial analysis or its conditions as discussed below.

As part of the collaborative resolution process for design of the T4 Removal Action, it was determined that many of the design issues are linked to the overall harbor-wide remedial investigation/feasibility study (RI/FS) process. For this reason, the Parties agreed to revise the schedule for implementation of the T4 Removal Action to realign the project with the harbor-wide RI/FS schedule.

As a condition of the approval of the schedule realignment, USEPA is requiring the Port to implement an abatement action during the 2008 in-water work window to reduce risks present at the T4 Site (USEPA 2007). Essentially, this action results in the division of the Removal Action project into two phases. Phase I (the abatement action) is planned for the 2008 in-water work window and encompasses abatement measures that could be initiated in the near term to reduce risk and address any imminent and substantial endangerment at T4 that may exist. Phase II (including construction of the confined disposal facility [CDF]) will commence once the project is realigned with the harbor-wide RI/FS process. The Port submitted an Abatement Measures Proposal (Phase I remedy) in October 2007 (Anchor 2007a) which was accepted by EPA. A Design Analysis Report (DAR) and Remedial Action Work Plan for the Phase I work have been prepared and submitted to EPA for review and approval.

The objectives of this Phase I of the Removal Action include reducing ecological and human health risks associated with sediment contamination within the RAA pending the completion of the Removal Action selected in the Action Memorandum (USEPA 2006a). Because the Phase I Removal Action is not the complete Removal Action, and a long-term Remedial Action for the Portland Harbor Superfund Site is contemplated, this Phase I Removal Action is not intended to address all exposure pathways and environmental media within the RAA.

As described in Appendix Q of the EE/CA (Draft CWA Section 404[b][1] Analysis Memorandum), the Alternative C, including CDF disposal option, was determined to be an acceptable dredge and fill project consistent with the Clean Water Act for placement of fill in aquatic environments. The CDF would result in loss of aquatic habitat in Slip 1, but with the completion of adequate compensatory mitigation, no net loss of habitat quality and function will occur. Some temporal loss of habitat or function will result from dredging and capping areas, which will require appropriate mitigation.

A final approved mitigation plan was required by the EE/CA to be completed prior to any loss of existing habitat for the full T4 removal action. As part of the conceptual plan proposal for the mitigation project in the EE/CA, the overall objective for the mitigation project, as well as specific, quantitative performance standards for both the construction and long-term monitoring of the mitigation project must be established in development of the final, approved mitigation plan.

Compensatory mitigation plans were to be developed pursuant to the performance criteria (preliminary criteria were identified) and in consultation with EPA and resource agencies, and be submitted to and approved by EPA during the Removal Action Design.

EPA reserves the right to consider mitigation proposals that do not meet all of the performance criteria if the Port demonstrates that the proposal otherwise contributes to conservation and recovery of ESA listed species and/or other relevant conservation initiatives for the Lower Willamette River basin. These conditions have not yet been satisfied and remain outstanding. Accordingly, EPA's finding of compliance with the CWA 404 ARAR remains preliminary and conditional.

This supplemental evaluation focuses specifically on the Phase I abatement measures at this time. When considered in context with the expected implementation of the Phase II T4 Removal Action and overall Portland Harbor RI/FS process, the abatement measures for this Phase I Removal Action only partially implement the elements of Alternative C selected in the EE/CA. The Wheeler Bay shoreline stabilization is being implemented as a source control action to limit release of contaminants (PAHs, cadmium, copper, selenium, zinc, and dichlorodiphenyltrichloroethane [DDT] above screening levels for human or ecological receptors) that are present in shoreline bank soils. The proposed stabilization design calls for placing riprap between elevation +10 and +15 feet NGVD29 datum. NMFS has determined that the area is important habitat and that placement of riprap will have an adverse affect on existing habitat, and therefore is requiring mitigation. NMFS, the Port, and EPA have agreed to the following to define the mitigation required for the Phase I Removal Action:

> "The Port shall create, restore or preserve (in perpetuity) up to 14,000 square feet of shallow water habitat in the lower Willamette River or the Columbia Slough to be completed in conjunction with the Phase II Removal Action Mitigation. If the Phase II Mitigation has not been initiated within 10 years from the start date of Phase I, the Port will perform the Phase I mitigation component at that time."

The Port is also placing sand and gravel over the riprap surface of the Wheeler Bay bank stabilization and cap to create a more natural habitat. The Port recognizes that the long-term viability of sand placement over a riprap surface depends on site-specific conditions such as wave action, the shape of the shoreline, nearby river activities, and river dynamics. The Port

is placing the sand at this location because the Wheeler Bay conditions may be conducive to sand staying in place. The Port will monitor the area as a pilot project to determine whether the site-specific conditions are conducive to maintaining a sand habitat layer over the riprap at this specific Site. If monitoring demonstrates that a sandy surface can be maintained long-term, this may be considered by NMFS when determining the appropriate mitigation project for the action.

2. DESCRIPTION OF THE PROPOSED DISCHARGE

As a condition of the approval of the schedule realignment, USEPA is requiring the Port to implement an abatement action during the 2008 in-water work window to reduce risks present at the T4 Site. Essentially, this action results in the division of the Removal Action project into two phases. Phase I (the abatement action) is planned for the 2008 in-water work window and encompasses abatement measures that could be initiated in the near term to reduce risk and address any imminent and substantial endangerment at T4 that may exist. Phase II (including construction of the CDF) will commence once the project is realigned with the harbor-wide RI/FS process.

Phase I of the Removal Action includes the following components:

- Dredging and off-site disposal of sediment exhibiting the highest chemical concentration, providing a permanent solution of contaminant mass removal.
- Construction of a nearshore cap to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing discharge source to nearby areas.
- Stabilization of the Wheeler Bay bank to minimize contaminant migration to the river.
- Dredging and off-site disposal of contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo (USEPA 2006a) and in support of overall risk reduction in the RAA.

The DAR presents the design details, and the Removal Action Work Plan (RAWP) presents detailed construction activities approved by EPA for the Phase I abatement remedy.

2.1 NEED FOR DISCHARGE

Actual or threatened releases of hazardous substances from the T4 Site, if not addressed, represent an imminent and substantial endangerment to public health, welfare, or the environment. These hazardous substances have contaminated adjacent sediments in the Willamette River. The general purpose of the Phase I activities is to remove material with the highest surface sediment probable effects concentration (PEC) exceedance ratios (greater than 20 times the PEC) in the Berth 411 Plus dredging areas, isolate petroleum-contaminated sediment at the head of Slip 3, remove a potential future contaminant source to sediments along the Wheeler Bay shoreline, and eliminate a navigational impediment at Berth 410 in a manner that is consistent with USEPA's Action Memo.

After there was agreement on realigning the overall Removal Action and completing a Phase I Removal Action in 2008, the Port and USEPA management teams discussed what specific abatement measures should be scoped in Phase I, and agreed that the measures should address the following objectives:

- Proposed measures should be partially effective in abating imminent and substantial endangerment (ISE) posed to aquatic life that may have direct contact with sediments within the RAA.
- Proposed measures should be consistent with USEPA's selected Removal Action (i.e., CDF in Slip 1).

- Proposed measures should not unduly impede or disrupt the designated use of T4 for water-dependent maritime use.
- Proposed measures should be consistent with sediment management activities that will be required at T4 to continue ongoing water-dependent maritime use (e.g., maintenance dredging).

The abatement measures that meet these objectives and are part of the Phase I project include:

- Removal of material with the highest surface sediment PEC exceedance ratios (greater than 20 times the PEC) in Slip 3 and north of Berth 414. This removal work is referred to as the Berth 411 "Plus" dredging.
- Removal of sediment along Berth 410/411 to eliminate navigational impediments consistent with USEPA's Action Memo (USEPA 2006a). This removal work is referred to as the Berth 410 dredging.
- Placement of a cap at the head of Slip 3 to address petroleum-contaminated sediment.
- Stabilization of the shoreline at Wheeler Bay.

These Phase I abatement measures will meet the objectives by:

- Dredging and off-site disposal of sediments exhibiting the highest surficial chemical concentrations.
- Dredging and off-site disposal of contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo and in support of overall risk reduction in the RAA.
- Constructing a nearshore cap to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas.
- Stabilizing the bank to minimize contaminant migration to the river.

All sediments dredged from Slip 3 will be loaded onto haul barges for transporting and disposal at the Subtitle D Wasco County Landfill facility in The Dalles, Oregon. Details of the dredged material dewatering, rehandling, and transportation from the dredging site to the ultimate repository are contained in the approved RAWP. Generally, the dredged material will be hauled down the Willamette River, then up the Columbia River to the Port of The Dalles. At the Port, construction equipment will transfer the sediment to trucks or rail cars for transport to the landfill. No return-water discharge back to waters of the United States from the transfer process is authorized.

2.2 LOCATION

The T4 facility itself is within the Portland Harbor Superfund Site. The RAA is defined in the AOC as "that portion of the site adjacent to and within the Port of Portland's T4 at 11040 North Lombard, Portland, Multnomah County, Oregon, extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay." A vicinity map and site plan locating T4 are provided in Figure 1 of the DAR.

2.3 DESCRIPTION OF THE DISCHARGE SITE

The Port of Portland (Port) owns the T4 uplands located between River Miles 4.1 and 4.5 on the Lower Willamette River, extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay. The remainder of submersible or submerged land within the Removal Action Area (RAA) is owned by the State of Oregon Department of State Lands. T4 is currently used as an operating marine facility with a variety of tenants and operations, including automobile importing, exporting of soda ash, import and export of dry and liquid bulk cargo, associated rail intermodal facilities, and associated petroleum storage. Historically, activities at Slip 3 included loading and unloading dry and liquid bulk cargo such as Bunker C, diesel, pencil pitch, and metal ores. Slip 1 has been used for bulk and break-bulk cargo loading and unloading operations handling liquid fertilizer, lead and zinc concentrates, cured meats, agricultural produce, flour, vegetable oils, molasses, tallow, caustic soda, and a variety of general cargoes.

2.4 METHOD OF DISCHARGE

Discharges will occur directly (e.g., through placement of capping material and slope riprap) and indirectly (e.g., minimal release of incidental fallback from dredging, erosion of material placed for slope stabilization). No overflow from barges is allowed.

2.5 TIMING OF DISCHARGE

To minimize effects to juvenile salmonids, dredging shall be limited to the summer in-water work window (July 1 through October 31).

2.6 GENERAL CHARACTERISTICS OF MATERIAL

A number of sources of existing sediment chemistry data for T4 are available from historical investigations of sediment contamination. The Port has been investigating the nature and extent of sediment contamination at T4 since before 1988. Other organizations, including USACE, USEPA, and DEQ, have investigated the nature and extent of sediment contamination in the Willamette River and have collected sediment samples in the vicinity of T4 as part of their investigations (BBL 2004a).

Most recently, sediment chemistry data were collected as part of the T4 Early Action design. Laboratory tests show that the recently deposited sediments overlying the grey, loose-to-medium dense sands consist predominantly of very soft organic silt and clay with liquid limits ranging from about 70 percent to nearly 100 percent and moisture contents ranging from 67 percent to 106 percent. The fines content of these sediments generally ranges from 51 percent to 96 percent, with average fines content ranging from 75 percent to 85 percent. Based on consolidation and plasticity results, as well as on testing conducted in the field (including pocket penetrometer tests, torvane tests, and standard penetration resistance), it is expected that these soils are normally consolidated and have very low undrained shear strengths. The undrained strength of the very soft sediments is estimated to be on the order of about 20 to 140 pounds per square foot (psf).

The material to be dredged in Slip 3 consists of very soft to soft, slightly sandy to sandy organic silt and clay. Areas of higher density sediment may be encountered during dredging. The sediment to be dredged at Berth 414 consists of very soft to soft, clayey, fine sandy silt with occasional wood chunks. In addition, debris is anticipated to be encountered during the dredging.

2.7 QUANTITY OF MATERIAL

Specifications of material removed or placed are contained in the EPA-approved RAWP. Between 8,900 and 16,500 cubic yards (cy) of contaminated sediments will be dredged and removed from the slip. Anticipated volumes of cap and fill material are presented below by area and by material type:

- Head of Slip 3:
  - 600 cy of Base Cap Types 2 and 3.
  - 1,400 cy of Armor Type 3.
- Wheeler Bay Shoreline Stabilization:
  - 1,850 cy of exported cut material.
  - 800 cy of import select fill (beneath the armor layer as filter material).
  - 1,100 cy of Armor Type 3.
  - 600 cy of Habitat Cover.

2.8 SOURCE OF MATERIAL

Sources for capping and stabilization material will most likely be commercial upland quarries. All materials used in imported material placement will meet the requirements established in the December 2003 Technical Plans and Specifications (Ecology and the Environment 2003) for the McCormick & Baxter sediment cap located within the Willamette River.

The Construction Specifications (Appendix E) present both physical and chemical parameters for the imported materials. Base cap materials will either be fine-to-medium sand or sandy gravel/gravelly sand depending on the steepness of the area being capped. Steeper areas will require the sand and gravel material. Armor layers are varying sizes of riprap. Import material must meet specified physical and chemical properties, as outlined in the Construction Specifications (Appendix E), prior to being used. Sampling and analysis of materials before and during construction, coupled with visual inspections of import materials, will be completed to verify suitability.

2.9 PROJECTED LIFE OF DISPOSAL SITE

Not applicable. Contaminated sediments will be removed to an as-yet unidentified upland landfill. This Phase I action is considered a one-time event.

3. POTENTIAL IMPACTS ON PHYSICAL AND CHEMICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM

3.1 SUBSTRATE

The discharge is not expected to significantly alter the physical characteristics of the Site. Bottom topography will be altered by the removal of material through dredging (although this area has been periodically maintenance dredged several times in the historic past), presence of the caps (inconsequential mounds) at two locations, and resculpting and stabilization of shorelines within the terminal slip and Wheeler Bay. Long-term change within the slip is expected when the Phase II Removal Action is implemented. The function of the caps is to isolate the underlying chemically contaminated substrate, thereby resulting in improved habitat. Likewise, shoreline stabilization within Wheeler Bay has the potential to improve the habitat potential, particularly when mitigation is implemented.

3.2 SUSPENDED PARTICULATES/TURBIDITY

Turbidity will occur as a result of the proposed project, both from the dredging and the placement of cap and shoreline fill material during construction activities. A supplemental analysis was prepared and submitted to EPA on predicted turbidity, primarily for dredging (Anchor 2008c).

When subjected to a column settling test (CST), T4 sediments showed high levels of residual turbidity even after much of the suspended solids had settled out. T4 sediments appear to color the water, even though elutriate test results indicate the turbidity generated by these sediments is not associated with elevated levels of dissolved contaminants. The nature of this correlation indicates that sediment particles (measured and modeled as total suspended sediments [TSS]) drop out more quickly over time, whereas residual discoloration of the water (expressed as turbidity) may persist even at relatively low TSS concentrations. Elutriate test results indicate that the turbidity generated by these sediments is actually not associated with elevated levels of dissolved contaminants, nor is it associated with suspended solids.

Turbidities associated with capping and shoreline stabilization activities are expected to be localized to the immediate area of construction, and placement areas such as coarse, clean, upland source material (sands and gravels) will be used. Duration and intensity are expected to be brief (5 to 20 minutes).

No violation of water quality standards is anticipated during construction. EPA has prepared a 401 certification (Water Quality Monitoring and Compliance Conditions Plan) which specifies points of compliance for the various water quality parameters.

3.3 WATER QUALITY

As described in Section 3.2, significant effects to ambient water quality are not anticipated during construction. These Phase I abatement measures are expected to result in improved water quality at the Site by:

- Dredging (removing) of sediments exhibiting the highest surficial chemical concentrations from the slip.

- Dredging (removal) of other contaminated sediments in Slip 3 at Berth 410 to support water-dependent maritime use in a manner consistent with the Action Memo and in support of overall risk reduction in the RAA.
- Constructing a nearshore cap to isolate petroleum-contaminated sediments from aquatic receptors and control a potential ongoing source to nearby areas.
- Stabilizing the bank to minimize contaminant migration to the river.

3.4 CURRENT PATTERNS AND WATER CIRCULATION

Current patterns and water circulation will not be affected by this action.

3.5 NORMAL WATER FLUCTUATIONS

The action will not substantively affect normal water fluctuations.

3.6 SALINITY GRADIENTS

Not applicable.

4. POTENTIAL IMPACTS ON BIOLOGICAL CHARACTERISTICS OF THE AQUATIC ECOSYSTEM

4.1 THREATENED AND ENDANGERED SPECIES

A Biological Assessment (dated December 2007) was submitted to the U.S. Fish and Wildlife Service (FWS) and U.S. National Marine Fisheries Service (NMFS). By letter dated February 19, 2008, the FWS concurred with the determination that the action "may affect, but is not likely to adversely affect" bull trout. By Technical Memorandum, dated March 4, 2008, supplemental information was provided to NMFS regarding the Biological Assessment (BA) for Phase I of the T4 Removal Action that was submitted in December 2007. The document provided additional information on the following topics:

1. Literature regarding the use of bubble curtains for fish guidance and/or deterrent.
2. Expected contaminant concentrations in the vicinity of the dredging activity.
3. Habitat description and clarification for work to be performed at Wheeler Bay.

The Wheeler Bay shoreline stabilization is being implemented as a source control action to limit release of contaminants (PAHs, cadmium, copper, selenium, zinc, and DDT above screening levels for human or ecological receptors) that are present in shoreline bank soils. NMFS determined that the area is important habitat and that placement of riprap will have an adverse affect on existing habitat, and therefore is requiring mitigation. NMFS, the Port, and EPA have agreed to the following to define the mitigation required for the Phase I removal action:

> "The Port shall create, restore, or preserve (in perpetuity) up to 14,000 square feet of shallow water habitat in the lower Willamette River or the Columbia Slough to be completed in conjunction with the Phase II Removal Action Mitigation. If the Phase II Mitigation has not been initiated within 10 years from the start date of Phase I, the Port will perform the Phase I mitigation component at that time."

NMFS provided Conservation Measures on the Phase I Removal Action. These measures have been incorporated into the project design or required by EPA.

4.2 AQUATIC FOOD WEB

The project area has been regularly disturbed in the past by maintenance dredging and is already degraded by industrial waterway activities and the high chemical contamination of the sediment. Initially, the dredging and the placement of the caps and shoreline fills will kill (remove or smother) most benthic life within the affected areas, although mobile species will avoid the dredging and discharge. This represents a real, but insignificant loss to the aquatic food web. A similar biological community should redevelop relatively rapidly as much of the slip bottom will not be affected by the abatement actions. Presumably, if the abatement actions are effective, a real (although still insignificant) improvement to the aquatic food web should result.

4.3 WILDLIFE

Although the abatement measures would be expected to displace birds and any resident mammals during actual construction, no significant effect is expected.

5. POTENTIAL IMPACTS ON SPECIAL AQUATIC SITES

5.1 SANCTUARIES AND REFUGES

Not applicable.

5.2 WETLANDS

No effect. No vegetated wetlands occur on Site.

5.3 MUDFLATS

Not applicable.

5.4 VEGETATED SHALLOWS

Not applicable.

5.5 RIFFLE AND POOL COMPLEXES

Not applicable.

6. POTENTIAL EFFECTS OF HUMAN USE CHARACTERISTICS

6.1 MUNICIPAL AND PRIVATE WATER SUPPLIES

Presently there are no water intakes within the slip or within its immediate vicinity downstream. No effects are anticipated.

6.2 RECREATIONAL AND COMMERCIAL FISHERIES

The Willamette River is a major fisheries corridor and a well-known recreational fishery area. T4 and the river immediately offshore are not known to be a popular recreational fishing location. No commercial fishery occurs in the river. Construction is restricted to the normal summer work window (July to October) to minimize impacts to salmonids. Additionally, NMFS's Conservation Measures include a requirement for a fish deterrent system to encourage fish movement past the dock at Berth 410. All fishing activities will be displaced from the slip and immediate water area around the project area during construction.

6.3 WATER-RELATED RECREATION

The Site is a maritime industrial site and is not generally available for recreational boating. The construction activities may require recreational boaters bypassing the Site in the river to stay farther away from the shore. However, such conflicts are considered inconsequential and insignificant.

6.4 AESTHETICS

The shoreline stabilization measures may result in a "tidier" appearance; however, no significant change in aesthetics is expected.

6.5 PARKS, NATIONAL AND HISTORIC MONUMENTS, NATIONAL SEASHORES, WILDERNESS AREAS, RESEARCH SITES, AND SIMILAR PRESERVES

Not applicable.

7. EVALUATION AND TESTING OF DISCHARGE MATERIAL

7.1 GENERAL EVALUATION OF DREDGED OR FILL MATERIAL

See Section 2.6. The sediments to be removed are contaminated and are regarded as unsuitable for open-water disposal. The T4 project file contains the record of past and recent characterization study reports. Contaminants at the RAA include polynuclear aromatic hydrocarbons (PAHs) (fluoranthene, pyrene, benzo(a)anthracene, chrysene, and anthracene); metals (mercury, cadmium, lead, and zinc); pesticides (DDT and dichlorodiphenyldichloroethane [DDD]), and polychlorinated biphenyls (PCBs). Many of these contaminants are known or suspected human carcinogens. In addition, pencil pitch (coal tar), a source of contamination in sediments, contains chemicals that are known or are suspected carcinogens in humans through skin contact, inhalation, or ingestion. The contaminated sediments represent a potential continuing source of releases to the river and have the potential to impact human health and/or ecological receptors. While the sediments removed represent a significant removal of the worst of the contaminated mass, the removal does not result in a "clean" waterway.

Materials to be used for capping and shoreline stabilization work will most likely be commercial upland quarries (see Section 2.8). Given the coarse nature of the material, the environmental risks are judged to be very low.

7.2 EVALUATION OF CHEMICAL-BIOLOGICAL INTERACTIVE EFFECTS

7.2.1 Exclusion of the Material from Testing

See Section 7.1. The dredged material has been tested. Imported material must meet specified physical and chemical properties, as outlined in the Construction Specifications (Appendix E) prior to being used. Sampling and analysis of materials before and during construction, coupled with visual inspections of import materials, will be completed to verify suitability.

7.2.2 Water Column Effects

Dredging and actual discharges within and outside of the slip will result in measurable turbidity. The condition is expected to be of limited duration and scale owing to the short construction schedule. No significant water column effects are anticipated.

7.2.3 Effects on Benthos

See Section 4.2. Benthos in the immediate area of the construction will be removed or smothered. Species that are more mobile will tend to avoid the area during the construction. Any benthic loss is considered unavoidable but not significant for this action.

7.3 COMPARISON OF EXCAVATION AND DISCHARGE SITES

7.3.1 Total Sediment Chemical Analysis

See Sections 7.1 and 7.2.1.

7.3.2 Biological Community Structure Analysis

Not applicable.

7.4 PHYSICAL TESTS AND EVALUATIONS

See Sections 2.6 and 7.2.1.

8. PROPOSED AND ALTERNATIVE ACTIONS TO MINIMIZE ADVERSE EFFECTS

All appropriate management actions (e.g., actions concerning material to be discharged or controlling the material after discharge) have been included in the proposed action. Specific pre-, during, and post-construction monitoring will occur as described in the DAR or RAWP approved by EPA for this action.

9. ANALYSIS OF PRACTICABLE ALTERNATIVES

The abatement measures required through this Phase I Removal Action are considered to be a water-dependent use. The various reports contained in the T4 project file, and especially the EE/CA provide a complete and acceptable description of alternatives considered for remediation at T4. The EE/CA alternatives analysis determined that no practicable alternatives exist that result in less environmental damage and which also meet the objectives of the T4 removal action purpose and need. Phase I encompasses abatement measures consistent with the selected alternative in the EE/CA and needs to be initiated in the near term to reduce risk and address any imminent and substantial endangerment at T4 that may exist. All appropriate management actions (e.g., actions concerning material to be discharged or controlling the material after discharge) have been included in the action proposed.

10. FACTUAL DETERMINATIONS

10.1 PHYSICAL SUBSTRATE DETERMINATIONS

The dredging will remove highly contaminated sediments (but not all contaminated sediments) from waters of the United States and in doing so will temporarily alter bathymetry in the slip. As the slip is an active port industrial facility, similar action and associated effects have occurred repeatedly in the past. In time (2 to 4 years), accreted sediments will fill in the dredged area. The caps placed will raise the bottom elevation measurably (~1 foot) but not significantly. If the cap remains stable, the new surface will be physically similar to present, as accretion is expected to deposit new material onto the new caps. To the extent that shoreline stabilization measures intrude into the river, the newly placed riprap material will be covered to some extent (dusting to several centimeters) by deposited sediments.

10.2 WATER CIRCULATION, FLUCTUATION, AND SALINITY DETERMINATIONS

No measurable effect on these parameters is expected. The river is not saline.

10.3 SUSPENDED PARTICULATES/TURBIDITY DETERMINATIONS

Sediments will be resuspended by activities associated with this Phase I Removal Action. Turbidities resulting from the dredging will cause measurable turbidities (water discoloration) outside of the slip and required designation of a case-specific point of compliance. This turbidity does not represent a significant release of suspended sediment or of associated particle-associated chemicals of concern.

10.4 CONTAMINANTS DETERMINATIONS

The abatement measures will reduce, but not eliminate, risk to the human and aquatic environment.

10.5 AQUATIC ECOSYSTEM AND ORGANISM DETERMINATIONS

The dredging activities will have temporary and minor adverse impacts on the aquatic ecosystem and organisms at the dredging site. Cap placement and shoreline stabilization (to the extent of intrusion in the river) will bury benthic and other sedentary aquatic organisms present at those locations—also a temporary and minor adverse effect. Recolonization of these disturbed organisms is anticipated within several weeks to several months following construction. The area is already a distressed habitat, and the Phase I Removal Action is unlikely to cause substantial long-term change or improvement in habitat function.

10.6 PROPOSED DISPOSAL SITE MIXING ZONE DETERMINATIONS

The State of Oregon Water Quality Standards do not allow for use of defined mixing zone determinations for dredging and many other aquatic construction activities. However, EPA has determined that this work constitutes "…essential dredging, construction or other legitimate activities…" under Oregon's water quality law and regulations and applicable water quality standards (340-041-0036). EPA has prepared a Water Quality Monitoring and Compliance Conditions Plan (WQMCCP) that defines appropriate points of compliance. EPA expects that short-term exceedances of water quality standards, if any, will be outweighed by

the long-term benefit of completing the Phase I Removal Action; however, all water quality standards will be met at the following points of compliance:

> "For this project, the outer boundary of the water area a distance of 100 meters from the approximate center of the Removal Action activity is defined as the point of compliance for all field parameters other than turbidity. The compliance point for turbidity is 100 meters beyond the inner harbor line."

The zone of compliance is defined as the entire water area within the point of compliance.

10.7 DETERMINATION OF CUMULATIVE EFFECTS ON THE AQUATIC ECOSYSTEM

Cumulative impacts are defined as the changes in the aquatic ecosystem that are attributable to the collective effect of a number of individual discharges of dredged or fill material into waters of the United States. Although the impact of a particular discharge may constitute a minor change in itself, the cumulative effect of numerous discharges in an area can result in a major impairment of the water resources and interfere with the productivity and water quality of the existing ecosystem. This action, together with past and reasonably foreseeable future actions, will not result in significant detrimental cumulative impacts on the aquatic ecosystem. This action, including removal of contaminated sediments and required compensatory mitigation, together with future Phase II remediation of contaminated sediment in Portland Harbor, are expected to result in a cumulatively positive effect.

10.8 DETERMINATION OF SECONDARY EFFECTS ON THE AQUATIC ECOSYSTEM

The Phase I Removal Action (the abatement measures) will reduce risk and address any imminent and substantial endangerment at T4 that may exist. The action does not eliminate risk to the human and aquatic environment, and it will not directly cause other actions to occur that would affect the aquatic environment. Current secondary effects on the aquatic environment from the T4 Site remain substantially unchanged.

11. REVIEW OF CONDITIONS FOR COMPLIANCE

11.1 AVAILABILITY OF PRACTICABLE ALTERNATIVES

No practicable alternatives that result in less environmental damage and which meet the objectives of the T4 removal action purpose and need and this abatement action are judged to exist. All appropriate management actions (e.g., actions concerning material to be discharged or controlling the material after discharge) have been included in the action proposed.

11.2 COMPLIANCE WITH PERTINENT LEGISLATION

11.2.1 State Water Quality Standards and Federal Toxic Effluent Standards (Section 307 of the Clean Water Act)

See Section 10.6.

11.2.2 Endangered Species Act of 1973

By letter dated February 19, 2008, the FWS concurred with the determination that the action "may affect, but is not likely to adversely affect" bull trout. NMFS provided Conservation Measures on the Phase I Removal Action and required mitigation for the Wheeler Bay stabilization work (see Section 4.1). These measures and mitigation requirements have been incorporated into the project design or required by EPA.

11.2.3 Marine Sanctuaries (Marine Protection, Research, and Sanctuaries Act of 1972)

Not applicable.

11.3 POTENTIAL FOR SIGNIFICANT DEGRADATION OF WATERS OF THE UNITED STATES AS A RESULT OF THE DISCHARGE OF POLLUTED MATERIAL

Due to the methods of construction employed, measures to minimize water quality effects, and site conditions (i.e., size), the potential for long-term degradation of the waters of the United States as a result of the discharges evaluated here is considered unlikely. Short-term water quality effects during actual construction are anticipated and are expected to be only minor and localized.

11.4 STEPS TO MINIMIZE POTENTIAL ADVERSE IMPACTS ON THE AQUATIC ECOSYSTEM

All practicable and necessary steps have been included.

12. FINDINGS

The proposed discharges associated with the T4 Phase I Removal Action are found to comply with the requirements of the Section 404(b)(1) Guidelines with the completion of the condition for mitigation. EPA, in consultation with NMFS, will ensure that the mitigation agreed to for this Phase I Removal Action is completed. This document supplements the existing preliminary 404(b) (1) evaluation for the T4 remediation. Mitigation conditions for this larger action (Phase II) also have not yet been satisfied and remain outstanding. Accordingly, EPA's finding of compliance with the CWA 404 ARAR remains preliminary and conditional.

Reviewed and Approved by:

Sediment Management Program Office of Ecosystems, Tribal and Public Affairs	Date

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APPENDIX C
ACTION MEMORANDUM

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue
Seattle, Washington 98101

ACTION MEMORANDUM

DATE:

SUBJECT: Action Memorandum for a Removal Action at the Port of Portland Terminal 4 site within the Portland Harbor Superfund Site, Portland, Multnomah County, Oregon

FROM: Sean Sheldrake
Remedial Project Manager

TO: Daniel D. Opalski, Director
Office of Environmental Cleanup

THRU: Chris D. Field, Unit Manager
Emergency Response Unit, Office of Environmental Cleanup

Sylvia Kawabata, Unit Manager
Site Assessment and Cleanup Unit 2, Office of Environmental Cleanup

Lori Houck Cora, Assistant Regional Counsel
Office of Regional Counsel

Site ID: CERCLIS – OR987172509

I. PURPOSE

The purpose of this Action Memorandum is to document the U.S. Environmental Protection Agency's (EPA) approval of the removal action described herein for the Port of Portland Terminal 4 site located within the Portland Harbor Superfund Site, Portland, Multnomah County, Oregon (the "site"). A removal action will be completed at the Terminal 4 site and will be conducted by the Port of Portland (the Port) pursuant to an Administrative Order on Consent (CERCLA 10-2004-0009). On October 2, 2003, EPA signed the Administrative Order on Consent (AOC) agreed to by the Port of Portland (USEPA 2003). A Statement of Work (SOW) was attached to the AOC and incorporated into it. The AOC requires the Port to conduct an Engineering Evaluation and Cost Analysis (EE/CA) for a non-time critical removal

action (NTCRA) at Terminal 4. Terminal 4 is within the boundaries of the initial study area for the Portland Harbor Superfund Site.

The Draft EE/CA was reviewed and approved by EPA. The EE/CA was finalized in May 2005 and initially put forth for a 30-day public comment period. Subsequent to the initial 30-day public comment period, the EPA granted an extension of 60 days for public review, ending on September 7, 2005.

By approval of this memorandum, EPA Region 10 determines that: 1) the conditions at the site may present an imminent and substantial endangerment to public health, or welfare, or the environment; and 2) the site conditions meet the criteria of the National Contingency Plan (NCP), 40 CFR Section 300.415, for a removal action. The removal action is required for immediate reduction of the risk to the public and the environment from uncontrolled hazardous substances at the Terminal 4 site. An administrative record has been prepared for this removal action. No obligation of funds is necessary as this action will be conducted by the Port of Portland under a CERCLA order.

II. SITE CONDITIONS AND BACKGROUND

A. Site Description

The EPA identification number for the Site is: CERCLIS – OR987172509. The Terminal 4 site is located at 11040 North Lombard in Portland, Oregon and is within the boundaries of the initial study area of the Portland Harbor Superfund Site. The Portland Harbor Superfund Site was listed on the National Priorities List (NPL), pursuant to Section 105 of CERCLA, 42 U.S.C. § 9605, on December 1, 2000. The Port of Portland was notified of its potential responsibility for response costs. The Port of Portland is one of ten parties that signed an administrative order on consent for Remedial Investigation/Feasibility Study (RI/FS) activities with EPA in September 2001.

The Port of Portland, a port district of the State of Oregon, owns the Terminal 4 uplands between River Miles 4.1 and 4.5 on the Lower Willamette River. The Port also owns a portion of the submersible and submerged lands in Slip 1 and Slip 3 located within the Removal Action Area (defined below). The remainder of the submersible or submerged land is owned by the State of Oregon and managed by the State of Oregon Department of State Lands (DSL). The location of the Terminal 4 site is shown on Figures 1 and 2.

The Removal Action Area is defined in the AOC as "that portion of the site adjacent to and within the Port of Portland's Terminal 4 at 11040 North Lombard, Portland, Multnomah County, Oregon, extending west from the ordinary high water line on the northeast bank of the Lower Willamette River to the edge of the navigation channel, and extending south from the

downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay." The boundaries of the Removal Action Area are shown on Figure 3.

B. Site Background

Terminal 4 is currently used as an operating marine facility with a variety of tenants and tenant operations, including importation of automobiles, exportation of soda ash, import and export of dry and liquid bulk cargo, associated rail intermodal facilities, and associated petroleum storage facilities. Adjacent property owners include Schnitzer Steel, Northwest Pipe and Casing, and the Burgard Industrial Park. The location of the site is shown on Figures 1 and 2.

There is a long tenant history at Terminal 4. Past tenant operations primarily involved the movement of bulk commodities such as grains and mineral concentrates. Operations at Terminal 4 have also included the storage and use of petroleum products such as diesel fuel, bunker C oil, and gasoline, which were typically stored in underground storage tanks (USTs) and above ground storage tanks (ASTs) at the St. John Tank Farm and at various discrete business locations. Many of these tanks have since been removed. Pipelines to move bulk liquids and to fuel locomotives and other equipment have been in use at the site. A fumigation facility was also operated at Terminal 4. In addition, pencil pitch, a coal tar distillate, was handled at Terminal 4 from approximately 1978 to 1998. Historically, Slip 1 has been used for bulk and break-bulk cargo loading and unloading operations, and Slip 3 has been used for loading and unloading dry and liquid bulk cargo such as Bunker C, diesel, pencil pitch and metal ores.

Investigations conducted by the Port of Portland as part of the Engineering Evaluation/Cost Analysis activities indicated that based on their differences in chemical, physical, and operational characteristics, five subareas within the Removal Action Area have been identified, which include:

- Berth 401
- Slip 1
- Wheeler Bay
- Slip 3
- North of Berth 401

Each of these subareas has site-specific chemical conditions, physical characteristics, or operations and logistical concerns which require different approaches for site remediation. These conditions were considered during screening of remedial technologies and selection of the preferred alternative.

1. Removal Site Evaluation

Past operations and waste disposal practices at the Terminal 4 site are considered to be the primary sources of the most significant contaminants found at the site. These past releases from the Terminal 4 site are the primary source of contaminants in the river sediments that are subject to this removal action. The Port of Portland has conducted investigations in upland areas of the site to evaluate whether there is an ongoing source of contamination to the in-water area and investigations are also being conducted as part of the Portland Harbor Superfund Site to evaluate contaminants in river sediments other than those addressed in this removal action.

Hazardous substances found in the Removal Action Area to date include: polynuclear aromatic hydrocarbons (PAHs), metals (mercury, cadmium, chromium, lead and zinc), pesticides (DDT, DDD, DDE), phthalates and polychlorinated biphenyls (PCBs). Many of the contaminants detected in sediments at the site are known or suspected human carcinogens. In addition, pencil pitch (coal tar), a main source of contamination in sediments is a suspected carcinogen that can harm humans through skin contact, inhalation, or ingestion. The contaminated sediments represent a potential continuing source to the river which have the potential to impact human health and/or ecological receptors. The EPA has determined that the presence of the contaminated sediments constitute actual and/or threatened "releases" as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22).

The EE/CA at Terminal 4 was initiated based on the presence of these organic chemicals and metals in sediments at concentrations that exceed risk-based sediment quality guidelines (SQGs), demonstrated toxicity of sediments to benthic macroinvertebrates, and presence of persistent, bioaccumulative, and toxic (PBT) compounds in sediments. SQGs used for the site include Threshold Effects Concentrations (TECs) and Probable Effects Concentrations (PECs) (MacDonald et al, 2000). The TEC is a low effects guideline that represents concentrations below which toxicity effects are unlikely to be observed in freshwater benthic invertebrates. The PEC is a probable effects guideline that represents concentrations above which toxicity effects are likely to be observed in freshwater benthic invertebrates. Chemicals in sediments exceeding SQGs include metals (copper, cadmium, lead, mercury, and zinc), PAHs, PCBs, DDT, DDD, and phthalates.

Persistent, bioaccumulative, and toxic (PBT) compounds including PCBs, DDD/DDE/DDT, and phthalates were also detected in some fish and crayfish samples collected from the Removal Action Area for the Harbor-wide RI/FS in addition to sediments. However, the relative risk from these compounds was not evaluated for the EE/CA because standard sediment quality guidelines are not available for assessing risks from bioaccumulation.

TEC exceedances are numerous and widespread throughout the Removal Action Area. PEC exceedances, representing the highest chemical concentrations, are significantly less but

have been identified in most of the subareas in one or more locations. PEC exceedance ratios (contaminant concentration divided by the PEC), summarized by sediment type, include:

Surface sediment: PAHs, DDT, and PCBs detected in Slip 1, with PEC exceedance ratios of less than 2. Lead and PAHs detected in Wheeler Bay with PEC exceedance ratios less than 2. Lead and zinc detected in Slip 3 with maximum PEC exceedance ratios of 5. PAHs detected in Slip 3 with a maximum PEC exceedance ratio of 26.

Under-Pier Sediment: Cadmium, lead, and zinc detected in Slip 1 and Slip 3 with PEC exceedance ratios between 1 and 15. PAHs detected in Slip 3 with a maximum PEC exceedance ratio of 18.

Subsurface Sediment: Lead, zinc, and DDD detected in Slip 1 with a maximum PEC exceedance ratio of 2. Lead, mercury, and PAHs detected in Wheeler Bay, with maximum PEC exceedance ratios of 24, 1 and 4, respectively. Mercury, PAHs, DDD, and PCBs detected in Slip 3 with maximum PEC exceedance ratios of 3.

The presence of these chemicals at concentrations in sediment exceeding probable effects guidelines supports the EPA-required removal action. See Section III for discussion of potential exposure and risk to site receptors.

In accordance with the AOC, the removal action focuses on in-water sediments extending west from the ordinary high water line to the edge of the navigation channel in the Willamette River and south from the downstream end of Berth 414 to the end of Berth 401. Other contaminated media, including surface water, groundwater, and soils, are being considered in other regulatory programs, which include the uplands investigation at Terminal 4 under oversight from the Oregon Department of Environmental Quality (DEQ) and the RI/FS for the Portland Harbor Superfund Site under the oversight of EPA.

2. Physical Location

The Port of Portland, a port district of the State of Oregon, owns the Terminal 4 uplands between River Miles 4.1 and 4.5 on the Lower Willamette River. The Port also owns a portion of the submersible and submerged lands in Slip 1 and Slip 3 located with the Removal Action Area. The remainder of the submersible or submerged land is owned and managed by the State of Oregon, by the Department of State Lands. The entire Terminal 4 site is approximately 150 acres in size and is currently used as an operating marine facility with a variety of tenants and tenant operations. Land use within the vicinity of the site is primarily heavy industrial, commercial, and recreational (river). Adjacent property owners include Schnitzer Steel, Northwest Pipe and Casing, and Burgard Industrial Park. The location of the site is shown on Figures 1 and 2.

All of the work will be completed in near-shore sediments. The Removal Action Area is defined as "that portion of the site adjacent to and within the Port of Portland's Terminal 4 at 11040 North Lombard, Portland, Multnomah County, Oregon, extending west from the ordinary high water line on the northeast bank of the lower Willamette River to the edge of the navigation channel, and extending south from the downstream end of Berth 414 to the downstream end of Berth 401, including Slip 1, Slip 3, and Wheeler Bay." The Removal Action Area is shown on Figure 3.

3. Site Characteristics

Terminal 4 is currently used as an operating marine facility with a variety of tenants and tenant operations, including importation of automobiles, exportation of soda ash, import and export of dry and liquid bulk cargo, associated rail inter-modal facilities, and associated petroleum storage facilities. Past tenant operations at Terminal 4 involved the movement of bulk commodities such as grains and mineral concentrates. Operations at Terminal 4 have also included the storage and use of petroleum products such as diesel fuel, bunker C oil, and gasoline, which were typically stored in USTs and ASTs at the St. John Tank Farm and at various discrete business locations. Many of these tanks have since been removed. Pipelines to move bulk liquids and to fuel locomotives and other equipment have been located at the site. A fumigation facility was also operated at Terminal 4. In addition, pencil pitch, a coal tar distillate, was handled at Terminal 4 from 1978 to 1998.

Past operations and waste disposal practices at the Terminal 4 site are considered to be the primary sources of the most significant contaminants found at the site. These past releases from the Terminal 4 site are the primary source of contaminants in the river sediments that are subject to this removal action. See discussion above regarding contaminants detected, concentrations, sediment quality guidelines, and site conditions and Section III for exposure and associated risk.

4. Release or threatened release into the environment of a hazardous substance, or pollutant, or contaminant

The portion of the Terminal 4 site that will be addressed by the removal action primarily consists of contaminated river sediments. The contaminants of concern are certain PAHs, metals, PCBs, pesticides (DDD/DDE/DDT), and phthalates. Many of the contaminants found at the site are "hazardous substances" as defined by Section 101(14) of CERCLA, 42 U.S.C. § 9601(14) that may present an imminent and substantial danger to public health or welfare under Section 104(a)(1) of CERCLA, 42 U.S.C. § 9604(a)(1). Concentrations and analysis of contaminants in the river sediments are described in the EE/CA (BBL, 2005) and in the Site Characterization Report (BBL, 2004). The primary sources of these contaminants are from upland commercial facilities and uses that released the substances into the river. Based on

current upland source control efforts, it is believed that significant upland sources have been controlled or will be by the time the removal action is completed.

The presence of hazardous substances at the site, or the past, present, or potential migration of hazardous substances currently located at or emanating from the site, constitute actual and/or threatened "releases" as defined in Section 101(22) of CERCLA, 42 U.S.C. § 9601(22). See Section III for discussion of potential exposure and risk to site receptors.

5. NPL status

The Terminal 4 site is located within the boundaries of the initial study area of the Portland Harbor Superfund Site, which was listed on the NPL on December 1, 2000.

6. Maps, pictures, and other graphic representations

Relevant figures and tables are attached to this memorandum.

C. Other Actions

1. Previous actions

Limited previous sediment remediation or removal actions have been completed in the aquatic portions of the Terminal 4 site. Approximately 35,000 cubic yards of pencil-pitch contaminated sediments were removed from Slip 3 in December 1994 through January 1995 under a federal Clean Water Act Consent Decree. Confirmation sediment sampling indicated significant PAH and metal contamination remained. Slip 3 is the location of a number of documented and undocumented releases of pencil pitch (a suspected human carcinogen).

RI/FS activities have been completed for upland portions of the Terminal 4 site above the ordinary high water line under the Oregon DEQ's voluntary cleanup program (VCP). In 1993, an interim groundwater remediation system was activated along the eastern edge of Slip 3 to capture nonaqueous-phase liquid (NAPL) and contaminated groundwater from the upland area before it discharged to the river. Additional investigation and waste control/recovery activities have been completed since that time. Upland source control evaluations at Terminal 4 have indicated one area, east of Slip 3, where light nonaqueous-phase liquid (LNAPL) is present in the subsurface as a result of upland waste petroleum releases. In response to the presence of LNAPL, the Port completed a bank excavation and absorptive backfill remedial action in the area in 2004, which has mitigated the potential for LNAPL and dissolved-phase petroleum hydrocarbon seepage.

2. Current actions

The upland source control work is ongoing under state authorities and has included some recovery and disposal of subsurface contamination in some portions of the site. Potential sources of post-removal recontamination have been considered during the EE/CA evaluation of alternatives. These include: potential upstream sources (resuspension of sediments, stormwater discharges, industrial discharges and over-water activities), groundwater discharges, direct runoff and bank erosion, existing structures and operations, and material handling and spills. A combination of sampling, historical data evaluation, and modeling will be used for future evaluations of the removal action.

In addition, the CERCLA RI/FS for the Portland Harbor Superfund Site has included a number of sediment cores and surface samples collected near and within the Terminal 4 site boundaries. The RI/FS will evaluate the threats posed by other media on the site and post-removal sediment concentrations to determine whether additional cleanup is required for long-term protectiveness.

D. State and Local Authorities; Tribal Consultation

1. State and local actions to date

RI/FS and remedial actions have been conducted on the upland portions of the site under the oversight of the Oregon DEQ. The upland RI, risk assessment, and FS have been completed and a Record of Decision (ROD) was issued in April 2003. Remedial actions include removal of NAPL and contaminated groundwater through extraction wells, removal of contaminated soil at the Slip 3 riverbank, and continued monitoring. See the discussion above regarding in-water actions at the site.

The Oregon DEQ have participated in reviewing and commenting on documents associated with the Terminal 4 removal action and will continue to provide support to EPA as the project moves forward.

2. Potential for continued State/local response

The removal action at the Terminal 4 site will be conducted under CERCLA authority, with the state being given the opportunity to provide timely comments on project design documents and work plans. Coordination efforts with state and local authorities will continue throughout the project.

3. Tribal Consultation

EPA coordinated with six tribal governments on this action through the technical coordination team established for the Portland Harbor site. Additionally, EPA consulted with tribes that requested government to government consultation to solicit their input on the proposed cleanup alternative. EPA will continue to coordinate, allow opportunities for review and comment, and consult, as appropriate as the project proceeds.

III. THREATS TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT, AND STATUTORY AND REGULATORY AUTHORITIES

A detailed risk assessment has not been conducted for the Terminal 4 site, however, a baseline risk assessment is being performed through the RI/FS for the Portland Harbor Superfund Site. A pathway analysis was conducted for this early action to expedite the removal of contaminated sediments through pathway elimination.

A. Threats to Public Health or Welfare

A detailed human health risk analysis is not necessary to allow selection of the preferred alternative, due primarily to the aggressive nature of the technologies proposed for the Removal Action, and the interim status of the Removal Action relative to the Harbor-wide ROD. The risk from direct exposure to sediments for humans will be assessed in the Portland Harbor RI/FS and any residual risk remaining from Terminal 4 will be evaluated using that assessment. However, a pathway analysis was completed to identify potential exposure pathways and potential contaminant sources, and to develop a geochemical conceptual model. These are shown on Figures 4 and 5.

Chemicals of potential concern for risk at the site include certain metals, PAHs, pesticides, phthalates, and PCBs. These chemical groups have been found to be present at elevated concentrations based on results of sediment sampling at Terminal 4. These chemicals are not the only analytes of potential concern at the site, but they are among the most important in terms of risk-based decision making and are good indicators of contaminant distribution at the site. Many of these compounds are known or suspected human carcinogens and known to bioaccumulate. In addition, pencil pitch, a main source of contamination in sediments, is a suspected carcinogen that can harm humans through skin contact, inhalation, or ingestion.

For human receptors, direct exposure results from activities that involve contact with sediments. Such activities include workers involved with operations or maintenance at Terminal 4, or fisherman that may contact sediments while retrieving traps or nets that have contacted contaminated sediment. In addition, potential exposure pathways for human health risks include ingestion of contaminated fish and dermal exposure to contaminated sediment at low tide. In particular areas, contaminated sediment is open and exposed in the Willamette River and on the

river bank, more so at low water levels. Trespassers on this and adjacent industrial property, transients camping nearby, recreational boaters, and workers all may be exposed by contact to site contaminants, especially during low water when more of the sediment is exposed.

Indirect exposure results from contact with contaminants that have been transferred from sediments to another exposure medium. Indirect exposure pathways may include ingestion of food that has become contaminated through contact with sediment contaminants. Humans that ingest fish or invertebrates taken from contaminated sediment areas may experience indirect exposure if contaminants have accumulated in tissues.

Persistent, bioaccumulative, and toxic (PBT) compounds including PCBs, DDD/DDE/DDT, and phthalates were detected in sediments, and were also detected in some fish and crayfish samples collected from the Removal Action Area for the Harbor-wide RI/FS.

Based on the concentrations detected in sediments at the site and the potential direct and indirect exposure pathways identified, EPA has determined that a removal action is required to mitigate impacts to public health, or welfare, or the environment.

B. Threats to the Environment

There is an imminent and substantial endangerment to the environment in part through the actual or potential exposure of the river water, river sediment, surface soils and standing surface water to hazardous substances and pollutants or contaminants. Actual or potential exposure to contaminated sediments exists for fish, shellfish, and other aquatic biota, such as benthic organisms, and wildlife, such as pisciverous birds. Actual or potential exposure to site contaminants by aquatic species, although not quantified, would be expected to become part of the ecological food chain as wildlife consume such species.

For aquatic invertebrates and fish, external contact with sediment, including porewater, can be a significant risk for metals and organic compounds. Direct exposure pathways include contact between receptors' external surfaces and contaminated bed sediment; ingestion of contaminated sediment by receptors, either incidentally during drinking or eating or as part of the feeding process (e.g., filter feeders); and contact between the receptor and re-suspended sediment (e.g., ventilation of gill surfaces).

The Site Characterization Report (BBL, 2004) identified organic chemicals and metals that were detected in surface sediments of the Removal Action Area. The Site Characterization Report also identified the chemicals for which concentrations exceeded generally accepted sediment quality guidelines, such as TECs and PECs (MacDonald et al, 2000). The TEC is a low effects guideline that represents concentrations below which toxicity effects are unlikely to be observed in freshwater benthic invertebrates. The PEC is a probable effects guideline that represents concentrations above which toxicity effects are likely to be observed in freshwater

benthic invertebrates. TEC exceedances are numerous and widespread throughout the Removal Action Area. PEC exceedances, representing the highest chemical concentrations, have been identified in most of the subareas in one or more locations, including metals (copper, cadmium, lead, mercury, and zinc), PAHs, PCBs, DDT/DDD, and phthalates.

Persistent, bioaccumulative, and toxic compounds including PCBs, DDD/DDE/DDT, and phthalates were detected in sediments, and were also detected in some fish and crayfish samples collected from the Removal Action Area for the Harbor-wide RI/FS. The relative risk from these compounds to aquatic species that are exposed to them was not evaluated for the EE/CA because standard sediment quality guidelines are not available for assessing risks from bioaccumulation.

Data that directly addresses ecological stress attributable to chemical contamination of sediments was gathered as part of sediment toxicity tests conducted for the Terminal 4 Slip 3 RI/FS. Sediments from 16 locations within and near Slip 3 were collected. Samples from the outer half of Slip 3 (riverward) did not fail any toxicity tests. However, six of nine samples from the inland half of Slip 3 were toxic to *Chironomus tentans* and/or *Hyallela azteca* in standard laboratory toxicity tests. Additionally, data from the Portland Harbor RI/FS show potentially elevated concentrations of some Terminal 4 analytes, including PCBs, DDT, DDD, and DDE in crayfish and sculpin gathered from Slip 1 and Slip 3.

Contact with contaminated sediment could pose a risk to waterfowl that may use, rest, or feed in the area. Other animals may also be exposed if using this water for drinking. Uptake to aquatic species is likely but not quantified. The Willamette River is a transitory area for a number of ESA-listed fish species, including five salmonid species listed as threatened under the Endangered Species Act. Coastal cutthroat trout, steelhead, and chum and chinook salmon are also all considered sensitive species by ODFW. Pacific lamprey and river lamprey are recognized as species of concern at the federal level by the U.S. Fish and Wildlife Service (USFWS). Western toad, Cope's giant salamander, tailed frog, northern red-legged frog, northwestern pond turtle, and painted turtle are all considered sensitive species by ODFW. In addition, northwestern pond turtle, tailed frog, and red-legged frog are listed as species of concern by USFWS. Aleutian Canada geese and the American peregrine falcon are protected as state endangered species (ODFW). Nine wetland plants that occur in the Willamette Valley and may occur in the Portland Harbor Superfund Site are all species of concern by USFWS.

Based on the concentrations detected in sediments at the site (above TEC/PEC criteria) and known or potential ecological pathways identified, EPA has determined that a removal action is required to mitigate potential impacts to the environment.

IV. ENDANGERMENT DETERMINATION

Actual or threatened releases of hazardous substances from this site may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. PROPOSED ACTIONS AND ESTIMATED COSTS

A. Proposed Actions

This non-time-critical removal action at the Terminal 4 site will be implemented by the Port of Portland pursuant to an Administrative Order on Consent dated October 2, 2003. The removal action objectives (RAOs) established for the site are to: (1) reduce ecological and human health risks associated with sediment contamination within the Removal Action Area to acceptable levels, and (2) reduce likelihood of recontamination of sediments with the Removal Action Area.

These RAOs were further defined for evaluation of the alternatives to aid in understanding and achieving the RAOs. Reductions in human and ecological risks were further defined as reduction in contact for human health risks and attenuation of exposure pathways for ecological receptors. Reduction of the likelihood of recontamination within the Removal Action Area includes removal or capping of sediments as well as evaluation of potential ongoing sources.

As discussed in the EE/CA, all of the alternatives evaluated include monitored natural recovery, dredging, capping, and disposal components. The level to which these technologies would be employed was the basis for developing the different alternatives (see Section 2 below for description of other alternatives).

1. Proposed action description

The preferred alternative (Alternative C in the EE/CA) includes a combination of capping, monitored natural recovery (MNR), and dredging to achieve the objectives of the removal action. One or more of these technologies will be implemented in each of the subareas of the site dependent on nature and extent of contamination, associated risk and exposure, potential for transport, and engineering and operational considerations.

a. Preferred Alternative

The preferred alternative includes a dredge emphasis with confined disposal facility (CDF) disposal. The highest risk material (prevalent PEC exceedances) was selected for

dredging and incorporation into the CDF, and the lowest risk material was selected for MNR (generally at or below TECs). Capping will be used in areas with moderate levels of contaminants of concern where immobilization could limit risk to receptors or where it was deemed impractical to dredge, and port uses would not affect the integrity of a cap. See Figure 6 for configuration of the technologies in the various subareas of the Removal Action Area.

An at-grade CDF will be constructed in Slip 1 that would contain approximately 15.3 acres of contaminated sediments dredged from areas included in this remediation and potentially others in the Port or Harbor-wide cleanup actions. Dredging, capping, and MNR efforts will be implemented in affected areas to include Slip 1, Slip 3, Wheeler Bay, North of Berth 401 and Berth 401 itself.

Alternative C will meet the substantive requirements of the ARARs to the extent practicable and offers greater overall protection of human health and the environment than do the other alternatives, because:

- The most highly contaminated sediment will be contained in a CDF designed and constructed to be protective of human health and the environment.
- Handling and transport of the contaminated sediments are minimized and kept within the Terminal 4 site.
- The construction activities associated with implementation of the Preferred Alternative are essentially confined to the Terminal 4 site, with little impact to the local community.
- The short-term risk of recontamination during implementation is minimized because dredged sediment is moved over the shortest distance and because the contaminated sediment will be isolated from the Willamette River.
- The long-term risk of recontamination of Terminal 4 is reduced because Slip 1 is eliminated.

b. Details of Preferred Alternative

(i). Details of the preferred alternative in each subarea.

Slip 1 – Full At-Grade Confined Disposal Facility

An at-grade CDF will be constructed in Slip 1 and sediment dredged in Slip 3 will be disposed of in the Slip 1 CDF. A total of approximately 115,000 cubic yards of contaminated sediment will be disposed in the CDF (105,000 cubic yards from Slip 3 and 10,000 cubic yards

from beneath the CDF containment berm to provide a structural foundation). The CDF has excess capacity available for other dredged sediment from the Portland Harbor Superfund Site, should the CDF be selected as an appropriate disposal site through a separate removal or remedial action decision and provided the material is compatible with Terminal 4-specific waste acceptance criteria. Waste acceptance criteria will be developed during design. By constructing the CDF to an at-grade surface, the newly gained land can be used for water dependent commercial purposes. An earthen containment berm will be constructed at the mouth of Slip 1 to serve as an isolation/retaining structure for the dredged sediment. The Port would acquire State of Oregon property for the purpose of constructing the CDF. The Department of State Land (DSL) has indicated a willingness to sell its portion of the land to the Port.

Slip 3 – Combination of Dredging, Capping, and Monitored Natural Recovery

The Removal Action in Slip 3 consists of a combination of dredging, capping, and a relatively small area of MNR (i.e., the under-pier area at Berth 410 below the finger pier portion). The area at Pier 5 will be capped, while the area between Pier 4 and Pier 5 will be dredged. Dredging will be performed in front of Pier 4 to remove contamination. Capping is impractical due to the need to maintain ship access to the actively used Berths 410 and 411. The nearshore slopes under Pier 4 at Berth 411 will be capped. Dredging under this pier is impractical due to the presence of riprap. Some dredging, but primarily capping, is used at a relatively small slope area at the head of Slip 3 below the existing pinch pile bulkhead. Dredging in this area would decrease the stability of the slope. Kinder Morgan's operations would be shut down during dredging of Slip 3, but for less time than the other alternatives. Dredged sediments from Slip 3 are disposed of in the Slip 1 CDF. Approximately 105,000 cubic yards of contaminated sediment will be dredged and disposed in the CDF.

Wheeler Bay – Monitored Natural Recovery and Capping

The depth of detected sediment contamination in Wheeler Bay is varied, extending from the surface to beyond 22 feet below the sediment surface. Since contaminant concentrations identified in most of Wheeler Bay are low, MNR is used for the majority of Wheeler Bay. A portion of the slope is capped as shown on Figure 6 because of higher PAH concentrations in one sample location.

North of Berth 414 – Monitored Natural Recovery

Similar to Wheeler Bay, low contaminant concentrations were found in the North of Berth 414 subarea up to 22 feet below the sediment surface. Therefore, MNR is used north of Berth 414.

Berth 401 – Monitored Natural Recovery and Capping

MNR is used for the majority of the Berth 401 area because of low contaminant concentrations. A relatively small area in the northeast corner of the Berth 401 area would be capped because of marginal PCB concentrations in one sample location.

(ii). Institutional Controls and/or Other EPA Considerations

The overall protectiveness of the alternative will be further enhanced by implementation of institutional controls for areas where contaminated sediment is contained in place with caps, where contamination resides at depth in MNR areas, and at the CDF. The primary removal action objective for the institutional controls for caps and the CDF will be to restrict and/or limit uses on or immediately adjacent to caps and the CDF to prevent accidental releases or unauthorized disturbances of contaminated sediment and ensure the long-term integrity of the containment. For MNR areas, the primary removal action objective for the institutional controls will be to restrict and/or limit uses of the MNR areas to prevent accidental releases or unauthorized disturbance of contaminated sediment that is at depth in those areas. Any future use or activities that may disturb contaminated sediment must be authorized and the sediment handled properly. For capping, proposed control mechanisms may include identification of the capped areas as no commercial vessel anchoring zones. These areas would be identified on U.S. Coast Guard navigational maps. In addition, the capped and MNR areas would be identified on Port maps/plans to ensure that the integrity is not impacted during future potential construction. Commercial activities by the Port and third parties may need to be limited above capped and MNR areas as well to ensure prop scour does not compromise the cap's integrity or disturb higher levels of contaminated sediment at depth in MNR areas. Proposed institutional controls for the CDF include the following: (1) notification to current tenants adjacent to the CDF of the CDF and any appropriate precautions they should take during its construction and/or completion; (2) specific lease language for future tenants who would occupy the land above the CDF notifying them of the CDF and restricting their construction activities based on the presence of the CDF; (3) including the CDF on Port plans/maps of the area with notation on limitations on use; (4) an easement, or if an easement is not possible, some other form of land use restriction that runs with the land that restricts activity below a specific elevation; and (5) registration of the CDF and associated appurtenances with the "call before you dig" utility location program. During design, further analysis of the most effective and implementable controls will be analyzed and implemented.

(iii). Issues Evaluated For Protectiveness. The Port, in consultation with EPA, considered the following issues in evaluating the protectiveness of the CDF over the long term:

- **Containment before, during and after an earthquake**. The evaluations support that the CDF can be designed and constructed to meet the structural strength and stability requirements for the Portland area. Because Portland is in a seismically active area, the impact of seismic events on structures needs special consideration. Preliminary analyses indicate that liquefaction occurs within the foundation soils below the berm and within the dredged fill, under seismic design events of operating level event (OLE) (72-year return) and contingency level event (CLE) (475-year return). For the OLE, the deformations should not immediately affect Port operations. More substantial liquefaction and resulting deformations of the berm are expected under the CLE. However, it is not expected that the berm deformation would lead to the release of contaminated sediment for either event. The CDF would have to be inspected following seismic events and any damage to the CDF berm or CDF cap would be repaired as soon as practicable.

- **Flood event impacts.** Concerns regarding the erosion potential of high velocity Willamette River flows and the potential impacts on the CDF stability and integrity were assessed. It was determined that while some sections of the channel may experience velocities faster and slower than the average, velocities above the average are typically located in the deeper parts of the mid-channel sections and not along the banks affecting the CDF. It was noted that propeller wash from tugboats and other boating activities have the potential to generate much higher velocities than flooding events, albeit for short durations. To address potential impacts to the CDF from flood events and boating velocities, the preliminary specifications of the CDF berm were designed to appropriate standards. The CDF berm will include placing clean sandy gravel fill with training terraces consisting of quarry spall rip-rap extending from the toe of the berm to the cap and along both the river and land sides of the berm. These are standard construction practices that have been successfully used along major river channels in the Northwest. The final berm design will consider the need for adequate toe protection for the alluvial materials on the channel bank and along the channel bottom, as well as over-excavation and installation of select fill and bank protection (rip rap) to protect the berm from undercutting by potential streambed scour and resulting toe scour. The final design will also consider long-term degradation (addressed through operations and maintenance); general scouring and potential for localized areas of scour (i.e., propeller wash); and estimates of the total depth of potential channel bed scour necessary to "key in" rip-rap to provide sufficient toe protection. Therefore, the erosion concerns regarding the slope face of the CDF berm will be addressed by covering the berm with erosion resistant rip-rap. During the design, the erosion potential will be evaluated and the rip-rap size selected according to standard design criteria. Potential short-term impacts of flooding and overtopping the berm during construction will be addressed by specifying construction techniques and by staging of the CDF berm construction. These details will be evaluated during final CDF design. The CDF would have to be inspected following significant flooding as soon as practicable.

- **Impacts from the CDF to the Willamette River's flood stage**. An assessment of potential impacts to the Willamette River demonstrated that no rise in the base flood elevations would result from the CDF and the action would comply with FEMA regulations. An assessment of the flood storage was also conducted. Although a portion of the CDF will be located above the non-storm winter stage and some flood storage will be lost from filling Slip 1, this volume of flood storage has an insignificant effect in reducing flood hazard. As a result, no noticeable increase in peak discharge is predicted and the loss of flood storage from the CDF would not have a noticeable impact downstream.

- **Long-term effects on the Willamette River from groundwater passing through the CDF and entering the river**. Preliminary fate and transport analyses show that water quality would meet the criteria for existing long-term water quality standards. As part of the design, EPA will require long-term monitoring to ensure that contaminants are not reaching the river in excess of pre-determined criteria. Acceptance criteria developed during the design process will ensure that only wastes with low leachability potential appropriate for a particular location within the CDF will be accepted.

- **Short-term effects to the Willamette River when sediment is being placed into the CDF.** The CDF may be filled with sediment delivered in slurry form if hydraulic or hydraulic cutterhead dredging is used, or it may be filled using barges and delivered to the CDF by hydraulic transport or double handling over the berm if mechanical dredging is used in Slip 3. Numerous re-suspension containment techniques, including controlled placement of the sediment and various containment structures (such as silt curtains and turbidity curtains), are available for minimizing water quality impacts to the extent practicable. Water quality monitoring criteria will be established for the CDF construction period to minimize water quality impacts to the maximum extent practicable.

- **Time required for sediments placed in the CDF to settle**. Because of the relatively high sand content of the Terminal 4 sediments to be placed in the CDF, consolidation will occur relatively quickly and is not expected to cause construction delays. Additional sediment or other material may be filled into the CDF over several construction seasons. It is expected that the settlement of these materials will develop during or shortly after placement. The design, construction, and scheduling of the final cap placement will take into account the consolidation of the fill and will include measures to ensure uniform settlement, representing little impact to the structural integrity of the cap over the sediment filled in the CDF.

- **Design components of the CDF**. As part of the CDF design process and follow on documents, the following will be outlined: Steps involved for post construction certification, final closure plan, temporary closure plan, and monitoring requirements.

(iv). EPA Directed Modifications as a Result of Public Comment

As a result of public comments received (see Section VIII Community Relations), EPA has identified additions and/or modifications to the Preferred Alternative which will be required to be implemented in the Removal Action design documents for EPA review and approval. These include:

CDF Sediment Disposal/Acceptance Criteria. Through the preliminary design process, significant care was taken to ensure that the methods of construction proposed would ensure effective containment of contaminants of concern in the CDF and below the cap. Models were tested to evaluate required cap thickness, dispersion of sediments, and integrity of the CDF during a variety of expected and extreme conditions. The design was modified in response to this evaluation. This program includes post-remediation monitoring of the CDF and capped areas to ensure that design criteria are maintained.

No sediment will be allowed into the facility which fails hazardous waste testing procedures (TCLP specifically). Materials that are generally leachable will not be accepted. Community review and comment will be solicited during the screening criteria development process for the CDF during design. No sediment will be accepted into the CDF other than the Terminal 4 materials without separate public review and comment on future proposed cleanup plans. The following sediment acceptance criteria will be used to determine suitability of any sediments proposed for placement in the saturated zone of the Terminal 4 CDF.

1. Only sediments from the Portland Harbor Superfund Site are eligible for placement in the saturated zone of the CDF.
2. No sediments that may be designated as characteristic hazardous waste or contain free-phase oil would be eligible for placement without treatment to control potential for release and migration of these substances.
3. Sediments must be of acceptable geotechnical character (to be defined during design) such that they do not impact the long-term performance of the CDF.
4. Sediments must undergo appropriate testing including bulk chemistry tests and pancake column leachate test (PCLTs) to document source characteristics acceptable for the CDF. Maximum chemical concentrations measured in representative PCLTs of the sediments must be protective (to be defined during design) of surface water quality criteria.

During the design of the CDF, the Port will be required to submit a detailed evaluation of the criteria for acceptance of sediment material into the CDF including methods for verification that sediment passes all criteria. The evaluation shall include proposed criteria (chemical and

physical), type and frequency of testing (i.e. analytical, leachability, etc.), detailed modeling results, and contingency factors. If sediment from another type of dredging project is proposed to be placed in the CDF, appropriate federal and state permits or approvals would be necessary.

CDF Geotechnical Considerations. The geotechnical seismic analysis shall be a component of design that establishes required construction materials, construction methods, and geometric aspects of the CDF containment berm to be appropriately protective of human health and the environment during an earthquake. Required design-level geotechnical seismic analysis for the Terminal 4 site and CDF containment berm stability are as follows:

1. Detailed characterization of seismic sources (known regional faults) in the vicinity of the Terminal 4 site for development of a site-specific seismic hazard analysis.
2. Development of input ground motions from seismic sources considering site-specific geotechnical considerations.
3. Evaluation of liquefaction potential for CDF containment berm, foundations soils, dredged material, and surrounding site soils potentially contributing to instability of the CDF during the design-level earthquake. This includes evaluation of liquefaction-inducted deformations and lateral spreading.
4. Evaluation of slope stability and deformation, as appropriate, for critical cross-sections(s) including both pseudo-static and post-earthquake conditions.
5. Development of a contingency plan for post-earthquake inspection and repair.

MNR Contingency. MNR is proposed for certain portions of the Removal Action Area including along the Willamette River harbor line (Berth 401 and North of Berth 414) and Wheeler Bay. At these locations, MNR was determined to be highly probable within 5 years after removal action completion and during the projected timeframe for attenuation the removal would be protective. The areas selected for MNR exhibit generally low contaminant concentrations and the physical and chemical conditions are suitable for natural recovery processes to reduce the risk posed by surface contamination in sediment. EPA will require the Port to verify the progress and success of MNR through periodic monitoring consisting of sediment analysis to verify that sediment concentrations are decreasing over time. If after 5 years of post-removal action monitoring, concentrations are not consistent with RAOs for this removal or RAOs or remediation goals in a CERCLA ROD for the Portland Harbor Superfund Site, additional response actions will be evaluated and may be required by EPA, such as capping. The evaluation of MNR will be based, in part, on risk-based criteria and/or cleanup goals established by EPA through the harbor-wide RI/FS process for the Portland Harbor Superfund Site. MNR areas will also be subject to institutional controls, to be finalized during design, which will meet the objectives stated in the "**Institutional Controls and/or Other EPA Considerations**" Section above.

Mitigation. More specific mitigation goals and requirements are discussed in detail in the ARARs Section below.

2. Alternative Actions described in EE/CA

The EE/CA included the proposed action described above (identified as Alternative C in the EE/CA), and Alternatives A, B, and D. The No Action Alternative and Alternatives A, B, and D are described below.

- No Action Alternative: Provided for comparison purposes only, no activities would be implemented under this alternative and it does not meet the RAOs.
- Alternative A – MNR Emphasis: This alternative includes a small amount of dredging in Slip 3, but primarily MNR and capping.
- Alternative B – Cap Emphasis: This alternative includes a small amount of dredging in Slip 3, but primarily MNR and capping. This alternative is similar to Alternative A, but has a greater reliance on capping in some areas.
- Alternative D – Dredge Emphasis with Landfill Disposal – This alternative in similar to Alternative C, but involves landfill disposal of sediments instead of use of a CDF in Slip 1. This alternative differs from Alternatives A and B in that involves dredging in Slip 1 and a greater amount of dredging in Slip 3.

Alternatives A, B, C, and D all have MNR, capping, and dredging as components of the Removal Action, but vary in the degree to which they apply the technologies deemed feasible for Terminal 4. For instance, the estimated volume of dredged sediment ranges from 105,000 cubic yards under Alternatives A and B, which emphasize MNR and capping, to 204,000 cy under Alternative D, which emphasizes dredging as a principal component. Only Alternative C includes onsite disposal of the dredged material in a CDF.

Through an evaluation of effectiveness, implementability, and costs, the proposed action (Alternative C) was selected as the preferred alternative. Alternatives A, B, C, and D are all found to be effective and implementable and all are considered to meet the RAOs. The estimated costs (total net present value) of the alternatives are $23,303,000 for Alternative A, $24,627,000 for Alternative B, $30,555,000 for Alternative C, and $26,431,000 for Alternative D. The CDF in Alternative C offers excess capacity that could be used for the disposal of contaminated sediments from other sites within the Portland Harbor Superfund Site, as well as for the placement of suitable sediments or fill. The Port valued the excess capacity at $10,000,000. Incorporating the estimated value of the excess capacity of the CDF, the net estimated cost of Alternative C is approximately $20,555,000.

3. Contribution to remedial performance

The Terminal 4 site is located within the initial study area of the Portland Harbor Superfund Site and is being investigated as part of the in-water Harbor-wide RI/FS. The Portland Harbor Superfund Site was listed on the NPL on December 1, 2000 and a Record of Decision is expected after the design of the Terminal 4 non-time-critical removal action. Due to the number of years remaining to select and implement a remedy Harbor-wide, this removal action is designed to immediately remove a large volume of contaminated sediments within the Terminal 4 site, reduce the risk of further migration of contaminants to adjacent sites, and reduce exposure to receptors to concentrations of chemicals that likely would require response action under any future remedial alternative.

Each of the Removal Action alternatives evaluated are expected to result in substantially cleaner sediments and reduce risk to the environment and human health. The Preferred Alternative is expected to provide an overall net benefit to the Portland Harbor Superfund Site by providing the opportunity to isolate and consolidate contaminated dredged materials on-site. In addition, a CDF with excess capacity may facilitate more expedited sediment cleanup in Portland Harbor by providing additional disposal options for future cleanup decisions. It is expected that establishing an in-water disposal site within the Portland Harbor Superfund Site would reduce the overall environmental impacts and potential public safety implications associated with transport of materials to offsite disposal facilities. Having one or more disposal options for the Portland Harbor Superfund Site also helps control the costs of disposal because it creates a more competitive market for disposal. This, in turn, makes dredging and removal of contaminated sediment a more cost effective remedy and encourages the consolidation of the contaminated sediments into a limited number of locations, which may reduce the area within the Willamette River where contaminated sediments would be contained in place.

This Action Memorandum only documents the EPA decision for the Terminal 4 Early Action. This decision is limited to MNR, capping, dredging, and disposal of sediments within the CDF which come from dredging within Terminal 4 to achieve the removal action objectives. Placement of additional material from any cleanup action in the excess capacity of the CDF will require additional EPA CERCLA decisions. Placement of dredged material as fill from another type of project will require appropriate federal and state permits or approvals. If future CERCLA decisions do not select the CDF as a disposal option, and/or if the Port does not secure federal or state approvals for filling Slip 1, the EE/CA and this Action Memorandum may require modification and amendment, respectively, to consider whether changes to the designed confinement facility in Slip 1 of the Terminal 4 dredged materials needs to be modified and/or the dredged materials removed to another disposal location.

4. Description of alternative technologies

Candidate technologies for sediment remediation were identified and screened prior to developing alternatives for further engineering analysis. General categories of remedial technologies considered at the screening stage included: capping, sediment excavation/removal, construction containment, and sediment transport, treatment, and disposal. Each of these candidate technologies were evaluated based on effectiveness, implementability, and cost. Technologies were eliminated from further consideration due to low expected technical feasibility or effectiveness. Technologies that were not cost-effective relative to other equally-protective options were also not retained.

5. Engineering Evaluation/Cost Analysis (EE/CA)

The Port of Portland prepared the EE/CA, which documents the development and evaluation of removal action alternatives, and discusses the rationale for the recommended alternative. The EE/CA was finalized in May 2005, and a copy of the Executive Summary of the EE/CA is provided in Attachment A. A 90-day public comment period on the EE/CA was held, and EPA prepared a response to public comments (Attachment B).

6. Applicable or relevant and appropriate requirements (ARARs)

For on-site activities, all state and federal ARARs will be complied with to the extent practicable. Preliminarily identified ARARs for the selected removal action are listed in Attachment C.

The Port prepared a Biological Assessment that evaluates the potential effects on threatened and endangered species from this removal action. The Biological Assessment is included in the EE/CA as Appendix P and consultation with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service, was initiated.

A Clean Water Act 401 water quality certification will be issued for this project defining chemical and other monitoring requirements as well as limitations, best management practices, and reporting procedures for assuring compliance with state water quality standards. The point of compliance for monitoring parameters during dredging and construction likely will allow for a specific area where relevant standards may not be met. At this time it is our understanding that Oregon's water quality standards may not allow for mixing zones for dredging. EPA will coordinate with the State of Oregon on this issue. Any allowed mixing zone will protect beneficial uses of the river; however, it is not practicable to meet all water quality standards immediately adjacent to the dredge, or where cap material may be placed. Water quality impacts from the dredging, capping and construction of the CDF will be minimized to the maximum extent practicable.

As described in Appendix Q of the EE/CA (Draft CWA Section 404(b)(1) Analysis Memorandum), the Alternative C, including CDF disposal option, is an acceptable dredge and fill project consistent with the Clean Water Act for placement of fill in aquatic environments. The CDF would result in loss of aquatic habitat in Slip 1, but with adequate compensatory mitigation, no net loss of habitat quality and function will occur. Likewise, some temporal loss of habitat or function will result from dredging and capping areas which will require appropriate mitigation.

The CDF would result in loss of aquatic habitat in Slip 1, but with adequate compensatory mitigation, no net loss of habitat quality and function will occur. The preliminary evaluation indicates that construction of the CDF in Slip 1 would result in the loss of 15.3 acres of total aquatic area, including approximately 3.1 acres of shallow water (i.e., <20 feet deep), 11.5 acres of deepwater, 0.2 acres of vegetated shallows or wetlands, 3.5 acres of inundated piling areas, and 3,317 linear feet of shoreline which is comprised of various structures, unclassified fill, seawalls, and riprap. Temporal loss would occur when approximately 8.7 acres of cap are placed and 9.2 acres are dredged. Capped areas range from shallow water to deep water (though capped areas are primarily shallow water), while dredged areas are primarily in deeper water. A final approved mitigation plan is required prior to any loss of existing habitat. The assessment of habitat acreage and function lost and appropriate compensatory mitigation will be coordinated with the Tribes, as well as state and federal resource agencies, including through the ESA consultation process with NMFS. As part of the conceptual plan proposal for the mitigation project in the EE/CA, the overall objective for the mitigation project as well as specific, quantitative performance standards for both the construction and long term monitoring of the mitigation project will be established in development of the final, approved mitigation plan. However, some basic, general criteria are provided herein to address Lower Willamette River watershed issues:

1) All compensatory mitigation must be consistent to the maximum extent practicable with any established mitigation strategies or conservation initiatives supported by state and federal resource agencies for the Lower Willamette River basin
2) Preference will be given to compensatory mitigation plans that are consistent with habitat function.
3) All compensatory mitigation plans will include an assessment of how they contribute toward the conservation and recovery of ESA listed species.
4) Mitigation plans must include consideration for connectivity to existing habitat.
5) The potential success of the mitigation projects will be specifically factored into habitat plans.
6) All compensatory mitigation plans will include measurable performance objectives, management, monitoring and reporting requirements, responsibilities, and schedules.
7) Native species only will be utilized in any plantings to the maximum extent practicable.
8) Mitigation plans should include facility design and site plans for any development/redevelopment that occurs as a result of a fill. The facility and site plans must

ensure that the facility and site characteristics and functions do not create adverse impacts to water, sediment, and habitat quality during construction and operation.
9) Performance criteria will be developed that quantitatively relate to the above criteria. Potential performance criteria that will be used or considered include, but are not limited to: specific depth and acre size at specific depths (to be monitored over time), utilization surveys to verify the project objective is being met (e.g. diver surveys for juvenile salmonid use of the area), photopoint monitoring over time to ensure that percent coverage standards for flora, and maximum coverage ceilings for invasive species.

Compensatory mitigation plans will be developed pursuant to these performance criteria and in consultation with EPA and resource agencies, and be submitted to and approved by EPA during the Removal Action Design. EPA may consider mitigation proposals that do not meet all of the performance criteria if the Port demonstrates that the proposal otherwise contributes to conservation and recovery of ESA listed species and/or other relevant conservation initiatives for the Lower Willamette River basin.

Off-site activities will comply with all applicable local, state, and federal laws, including the Off-Site Disposal Rule (40 CFR 300.440).

7. Project schedule

The Terminal 4 Removal Action is an early action within the Portland Harbor Superfund Site. The construction sequencing for the Terminal 4 Removal Action was designed to be phased in order to maximize effectiveness and minimize other impacts. The anticipated schedule is dependent on the means of sediment transportation, which will be established in the design documents. The preliminary schedule is as follows:

For Barge transport:

- Year 1: Stage 1 berm construction and simultaneous capping in Wheeler Bay and at Berth 401. Miscellaneous other work such as demolition of piers and warehouses.
- Year 2: Dredging in Slip 3. Possibly placement of intermediate CDF cap.
- Year 3: Stage 2 berm construction and capping in Slip 3.

For pipeline transport:

- Year 1: Stage 1 berm construction and simultaneous capping in Wheeler Bay and at Berth 401. Miscellaneous other work such as demolition of piers.
- Year 2: Stage 2 berm construction, dredging in Slip 3 following completion of berm, and possibly placement of intermediate CDF cap.

- Year 3: Capping in Slip 3.
- Filling of the CDF will continue after construction year 3.

The estimated time to complete sediment remediation is 3 years. A monitoring program will be required which will include post-removal monitoring for monitored natural attenuation on an annual basis for the first five years. If after five years of post-removal action monitoring, concentrations are not consistent with the remedial action objectives, additional removal actions will be evaluated. Monitoring for capping and the CDF is proposed for years 1, 2, 5, 7, 10, 15, 20, 25 and 30.

B. Estimated Costs

The removal action is being implemented by the Port of Portland. The projected costs to implement this non-time-critical removal action are estimated at $30.6 million (see Appendix O of the EE/CA). However, due to projected value of the excess capacity of the CDF ($10 million), the net cost to implement the action is $20.6 million. Estimated costs for the other alternatives ranged from $23.3 million to $26.4 million.

VI. EXPECTED CHANGE IN THE SITUATION SHOULD ACTION BE DELAYED OR NOT TAKEN

If the action is delayed or not taken, contamination will continue to adversely affect the environment at levels exceeding probable effect concentrations. Delayed action will increase environmental risks through prolonged exposure to contaminants present in the sediments.

VII. OUTSTANDING POLICY ISSUES

There are no outstanding policy issues at this site.

VIII. COMMUNITY RELATIONS

In July 2004, the Port initiated public outreach regarding the development of the Removal Action alternatives. Mechanisms used to solicit effective involvement of community members included project open houses, meetings with neighborhood associations, environmental groups, and community groups, project representation at community events, a project website for sharing information and deliverables with interested parties and project meetings at which community associations, government elected officials and staff, port stakeholders, government agencies, tribes, and rail roads are invited. On several occasions, EPA joined the Port of Portland project team when they made presentations at more than 20 neighborhood association and community group meetings. The Port also hosted a workshop and site tour in 2004 and hosted an open house at the Linnton Community Center during the comment period. In all, the Port has participated in and/or hosted 21 meetings and events attended by more than 275 people. An

effort has been made to meet with the groups more than once to provide updated project information.

The Administrative Record was prepared for the EE/CA and for this Action Memorandum. The Administrative Record is available at EPA, the Portland Central Library, St. Johns Branch Library, and the Northwest Branch Library.

The EE/CA for the Terminal 4 removal action was available for public review and comment from June 6, 2005 to September 7, 2005. Notice of a 30-day comment period was published in The Oregonian on June 6, 2005, and two notices of extension were published on June 20 and July 29, 2005. In addition, a postcard providing notice of the comment period start, followed by a May 2005 Fact Sheet summarizing the proposed EE/CA alternatives were mailed to over 900 addressees on the Portland Harbor project mailing list. The Administrative Record is available at EPA, the Portland Central Library, St. Johns Branch Library, and the Northwest Branch Library.

A public meeting was held on June 23, 2005 at the St. Johns Community Center to provide project information and accept spoken comments for the project record. EPA received 89 comment letters or spoken comments during the public comment period. EPA responded to all comment letters (see "Responsiveness Summary", dated March 7, 2006, in Attachment B).

In addition to the formal public comment opportunity, EPA provided routine monthly updates to the Portland Harbor Community Advisory Group (CAG) between May 2004 and July 2005. In addition, EPA met with the CAG Evaluation Committee to discuss the Terminal 4 EE/CA in July and December 2004.

IX. ENFORCEMENT

This removal action will be implemented by the Port of Portland, pursuant to an Administrative Order on Consent (CERCLA No. 10-2004-0009). The order describes the environmental work to be performed for the removal action. The work to be performed by the Port of Portland includes preparation and submittal of project design and removal action documents, implementation of the removal action, submittal of a Removal Action Completion Report, and submittal of a Long-Term Monitoring and Reporting Plan to ensure that the removal action objectives are achieved at the site.

X. RECOMMENDATION

This decision document represents the selected removal action for the Port of Portland Terminal 4 site, located within the boundaries of the Portland Harbor Superfund Site, Portland, Oregon, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the site.

Conditions at the site meet the NCP Section 300.415(b)(2) criteria for a removal and I recommend your approval of the proposed removal action. None of the removal project costs come from the Regional Removal allowance. Your approval or disapproval should be indicated below.

Approve:_____ Date:_____

Disapprove:_____ Date:_____

List of Figures, Tables, and Attachments

Figures

Figure 1	Vicinity Map (Figure 1-1 from the EE/CA)
Figure 2	Terminal 4 Aerial Photograph (Figure 1-2 from the EE/CA)
Figure 3	Removal Action Area Plan (Figure 7-1 from the EE/CA)
Figure 4	Potential Exposure Pathways
Figure 5	Geochemical Conceptual Model
Figure 6	Selected Alternative, Dredge Emphasis with CDF Disposal (Section 7.3.4 from the EE/CA)

Attachments

Attachment A	Executive Summary for the Engineering Evaluation/Cost Analysis, Terminal 4 Early Action
Attachment B	Responsiveness Summary for Public Comments on the Engineering Evaluation/Cost Analysis, Terminal 4 Removal Action
Attachment C	ARARs

APPENDIX D
USEPA DOCUMENTATION OF REQUIRED MITIGATION ACREAGE

From:	Sheldrake.Sean@epamail.epa.gov
To:	Madalinski, Kelly
Cc:	Elizabeth Appy; Genevieve.Angle; Ken Fellows; Hollis, Michelle
Subject:	Re: Follow-up on the T4 Phase I Removal Action Mitigation Scope
Date:	Tuesday, December 07, 2010 7:38:15 PM
Attachments:	T4 Ph I Description of Mitigation Sites and Concept_11-08-10.pdf 05033201-RP-YR1-007-MWP FIG 3.pdf

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Kelly,

EPA has reviewed the Port conceptual mitigation project scope, and has the following general comments.

BACKGROUND:

The original requirement per BiOp: 0.33 acres x 1.5 = 0.50 acres, with the caveat that if the sand stays in place, there may be an adjustment to the mitigation project (BiOp does not indicate the acreage).

In 2009 there was erosion upslope of the armor layer, and the Port repaired the erosion in fall 2010 by increasing, on 0.15 acres, the armor layer thickness and steepness to bring it up to a higher elevation, over the same footprint as before. No sand was placed. Therefore, 0.15 acres requires mitigation.

The Port indicates sand has stayed over the 0.18 acres of 0.33 acres that was not repaired, and say that is self mitigating, leaves 0.15 acres x 1.5 = 0.23 acres to mitigate.

PROPOSAL FOR MITIGATION SITE

EPA and NMFS proposes to reduce the mitigation ratio to 1.0 due to sand retention at Wheeler Bay.

Original area where sand stayed: 0.18 x 1.0 = 0.18 acres
Repaired area: 0.15 x 1.5 = 0.23 acres

Total = 0.39 acres

This mitigation area is proposed assuming that "substantial enhancement" is completed as mitigation, not just preservation of an existing site with good habitat already, or just removing a bit of debris or similar.

Please revise the Port's submittals to conform to the above requirements and clearly indicate with some detail and photographs (if appropriate) the nature of the proposed mitigation (substantial enhancement or preservation) within 30 days.

Thank you.

S

Sean Sheldrake, RPM, Unit Diving Officer
USEPA, Region 10
Environmental Cleanup Office
1200 Sixth Avenue, Suite 900, ECL-110
Seattle WA 98101-3140
sheldrake.sean@epa.gov
Phone: 206/553-1220

APPENDIX E
USEPA LETTER TO THE PORT OF PORTLAND DATED FEBRUARY 7, 2012, AND THE PORT'S RESPONSE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
1200 Sixth Avenue, Suite 900
Seattle, WA 98101-3140

OFFICE OF
ENVIRONMENTAL CLEANUP

February 7, 2012

Mr. Kelly Madalinski
7200 N.E. Airport Way
Portland, OR 97218

Sent via email only

Mr. Kelly Madalinski
7200 N.E. Airport Way
Portland, OR 97218

RE: Port of Portland, Terminal 4 Phase I Removal Action Mitigation – September 30, 2011 Updated Mitigation Conceptual Plan Memorandum

Dear Kelly:

EPA has reviewed the Port of Portland's December 16, 2011 responses to EPA's November 8, 2011 review of the Terminal 4 Phase I Removal Action Updated Mitigation Conceptual Plan (prepared by Anchor QEA, LLC for the Port of Portland, September 30, 2011). The Port's December 16, 2011 submittal addresses most of the comments raised in EPA's November 8th letter. Specific responses to each comment are shown in the attached comment response table. The Port's responses are acceptable contingent on the Port incorporating EPA's responses and requirements found in the attached table and in this letter into the future deliverables as appropriate; a response to these comments is due within 30 days. There remain a number of outstanding questions and issues about the proposed mitigation project which in large measure stem from the fact that the Alder Creek Conservation Bank is not approved nor constructed. We anticipate our questions and issues will be resolved as additional information becomes available from Wildlands and the Port's Mitigation Work Plan. EPA's primary outstanding questions and issues are summarized below.

Authorization of a Mitigation Bank and Conservation Bank

During the Section 404 permitting process, the US Army Corps of Engineers can agree to the use of a mitigation bank to compensate for the unavoidable loss that will be caused by the permitted dredge and fill activity because it also has an active role in approving the mitigation bank and in enforcing the bank instrument's performance standards and financial assurance requirements. The regulating agency thus has a legal relationship with both the party creating the impact (through the 404 permit) and the party providing the mitigation bank. The party creating the impact also has a legal relationship with both the regulating agency and with the mitigation bank proponent. In summary, the Corps has a complete triangle of contractual and regulatory relationships.

Conservation banks are suitable mitigation vehicles for impacts to listed species under the Endangered Species Act (ESA) because the US Fish and Wildlife Service and/or the National Marine Fisheries Service have approved the bank and have a legal relationship with both the party responsible for the

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impact and the party responsible for the conservation bank. Please note, EPA generally does not have the review and comment role on approval of conservation banks as it has with mitigation bank approval.

Under the current proposal, in which the Port would use the Alder Creek Conservation Bank as mitigation for Terminal 4 Phase I Removal Action impacts, neither EPA nor the Corps will have the triangle relationship with Wildlands and the Port that would exist in a 404 permit situation. Wildlands representatives have indicated that there are cases where EPA has approved the use of one of their conservation banks for mitigation under 40 CFR 230. EPA has just received (through its contractor CDM Smith) some example materials of Corps approval of conservation banks for 404 mitigation and we have not yet had a chance to review them. Likewise, we will need to discuss whether and how the Administrative Order on Consent would need to be modified to provide the necessary assurances that, if the conservation bank fails, the Port will meet its mitigation obligation.

No matter what, however, regulatory approval of the Alder Creek site as a mitigation bank is an important step that would need to be completed before EPA could approve the use of the site as mitigation for Terminal 4 Phase I Removal Action impacts.

Compensatory Mitigation vs. ESA Conservation goals

The fundamental objective of compensatory mitigation is to offset environmental losses resulting from unavoidable impacts to waters of the United States (40 CFR 230.93). Compensatory mitigation is intended to compensate for the aquatic resource functions that are lost as a result of the activity and compensatory mitigation must be commensurate with the amount and type of impact that is associated with a particular activity (40 CFR 230.93). This standard is slightly different from the standards applied to offsetting measures under ESA.

Measures to offset adverse impacts to species under ESA are focused on species recovery rather than replacement of lost functions. This means that the conservation measures under ESA do not need to directly offset impacts, but rather may provide benefits to species recovery that are commensurate. To use a rather extreme example, an action that may affect a small area of juvenile rearing habitat could be offset by activities to reduce predation of juveniles rather than replacement of rearing habitat.

While this type of “out-of-kind” mitigation is common under ESA, it is not the preferred type of compensatory mitigation for Section 404 impacts. In general, in-kind mitigation is preferable to out-of-kind mitigation because it is most likely to compensate for the functions and services lost at the impact site (40 CFR 230.93(e)). In addition, offsetting measures under ESA do not address loss of habitat for non-listed species or other ecosystem functions that may not be directly related to species recovery.

It seems clear that the Alder Creek Conservation Bank would offset the adverse effects to listed species that occurred as a result of the Terminal 4 Phase I Removal Action; assuming that it can meet associated requirements for timing of construction, monitoring, financial assurances, long-term protection, and compliance with performance standards. However, the Port and Wildlands will need to show EPA how the project will meet any other compensatory mitigation habitat and function requirements for the Terminal 4 Phase I Removal Action impacts.

For EPA to approve the use of the Alder Creek Conservation Bank as compensatory mitigation, at a minimum, we will need to review the various components that would ordinarily be approved by an interagency committee in authorizing a mitigation bank. Pursuant to 40 CFR 230.94, these components include:

- Mitigation objectives

- Factors considered during site selection
- Site protection instrument
- Baseline information about the mitigation site
- Rationale for the determination of credits
- Mitigation work plan
- Maintenance plan
- Performance standards
- Monitoring requirements
- Long-term management plan
- Adaptive management plan
- Financial assurances

EPA needs to be satisfied that the unavoidable loss of habitat that resulted from the Terminal 4 Phase 1 Removal Action is fully compensated for and that long-term maintenance is in place and financially assured to guarantee the habitat functions of the mitigation is maintained in perpetuity. Attachments 1 and 2 to the Port's December 16, 2011 comment response were particularly helpful in pulling together in one place the description of habitats and functions that were impacted. Please be sure to include that information in the Mitigation Work Plan. In order for the Alder Creek site to be considered suitable compensatory mitigation for the Terminal 4 Phase I Removal Action it will need to replace the habitat types and functions that were impacted.

Performance Standards

The establishment of performance standards that can be used to assess whether the project is achieving its objectives is a key component of compensatory mitigation. Performance standards should relate to the objectives of the compensatory mitigation project, so that the project can be objectively evaluated to determine if it is developing into the desired resource type, providing the expected functions, and attaining any other applicable metrics such as acres (40 CFR 230.95).

Performance standards must be based on attributes that are objective and verifiable. EPA will develop draft performance standards that any mitigation proposal for the Terminal 4 Phase I Removal Action must meet and will provide these under separate cover. These standards will include, at a minimum, standards related to biotic factors such as coverage of native plant species by time, coverage of invasive plant species, and use of the site by appropriate fish and invertebrates, and abiotic factors such as appropriate hydrology, substrate formations/elevations, and substrate soils/nutrients. EPA will expect the Port to incorporate these standards into the Mitigation Work Plan.

Schedule Risks

EPA has reviewed the issue of what must be completed by 2015 with NMFS, and the agencies agree that construction of a mitigation site, including installation of plant materials, must have occurred by 2015. However, EPA would like to emphasize that there will be monitoring requirements and performance standards that will need to be met over the long-term per 40 CFR 230 and that these requirements will extend beyond 2015.

EPA remains concerned with the risks inherent in the plan to use credits from a bank that is not yet authorized or constructed. We appreciate that the Alder Creek project construction is planned for 2012 and that this provides essentially two years of contingency; meaning that construction could occur as late

as 2014 and still meet the Port's mitigation requirements. However, EPA requests the Port to prepare a contingency plan no later than September 2013 in the event that the Alder Creek site is not under construction by that time (summer of 2013). This would allow adequate time to review an alternate plan and construct an alternate mitigation project by 2015. This contingency plan should be capable of being implemented no later than fall of 2014 if the Alder Creek site is not under construction by that time. A provision for the contingency plan should be incorporated into the Mitigation Work Plan.

Next Steps

On December 5, 2011, EPA approved a revised schedule for the submission of a Mitigation Work Plan in recognition of the fact that many of the key components necessary from Wildlands would not be available until approximately April 1, 2012. Under this revised schedule, the Port is to forward the draft Habitat Development Plan for the Alder Creek project to EPA on or about April 1, 2012. This is expected to be the same draft plan that Wildlands submits to NMFS and other Portland Harbor Trustees. Within 45 days of NMFS/Portland Harbor Trustees approval of the Habitat Development Plan, the Port is to submit the Mitigation Work Plan to EPA.

The Mitigation Work Plan would need to include all of the components that would ordinarily be approved by an interagency committee in authorizing a mitigation bank under 40 CFR 230.94. In addition, the Port should include information, such as is found in Attachments 1 and 2 to your December 16, 2011 submittal that detail the impacts incurred at Wheeler Bay. The Mitigation Work Plan will need to document how the Alder Creek site would provide compensatory mitigation for Section 404 impacts. While the documentation that will be available from Wildlands will be a valuable component of the Mitigation Work Plan, the Mitigation Work Plan should also include this more project specific information relevant to the Terminal 4 Phase I Removal Action impacts.

Wildlands expects to begin construction on the Alder Creek site in the summer of 2012, but could start as late as the summer of 2014 and still meet the Port's need to have a constructed mitigation site by 2015. However, if the Alder Creek site is not under construction by the summer of 2013 or the Alder Creek site has been determined to not be suitable mitigation for Terminal 4 Phase I Removal Action impacts, EPA requests that the Port prepare a contingency/alternate mitigation plan for submission to EPA by September 2013.

This schedule will be revisited periodically as dates become more certain.

Please let me know if you have any questions or concerns at (206) 553-1220 or via email at Sheldrake.sean@epa.gov.

Sincerely,

Sean Sheldrake, RPM

Enclosure

Cc:

Kristine Koch, EPA *via email only*
Chip Humphrey, EPA
Tom Gainer, DEQ
Lance Peterson, CDM

USEPA Review of Port Responses - Port of Portland, Terminal 4 Phase I Removal Action
September 30, 2011 Updated Mitigation Conceptual Plan Memorandum

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
General Comments			
1	In general, EPA supports Wildlands proposed restoration project at the Alder Creek site. The project will create much needed shallow water off-channel habitat in the Lower Willamette River. This habitat will benefit fish and wildlife including salmonid species listed as threatened under the Endangered Species Act. In addition, it appears that the proposed restoration plan will meet the Port's mitigation requirements. However, EPA would like to caution the Port that the proposed Wildlands restoration project has not been completed. As a result, EPA will need assurances that should the Wildlands project fall through for any reason or should the project not be completed in the required timeframe, the Port will still be required to provide compensatory mitigation by October 2015 in accordance with the agreed upon schedule.	The Port of Portland (Port) agrees with the U.S. Environmental Protection Agency (USEPA) that the proposed purchase of mitigation acres from Wildlands will meet the Port's mitigation requirements and is pleased that USEPA supports the proposal. The Port is aware of the risks associated with the Wildlands project not moving forward and has taken those risks under consideration. Based on all the effort expended to date by Wildlands to move this project forward, the Port believes there is minimal risk that this project will not be completed. However, if it is not completed, the Port understands that it is still obligated to complete its mitigation requirement in accordance with the agreed upon schedule.	Response is acceptable with the following qualifying text. EPA would like to emphasize that while the use of the Alder Creek site as mitigation for the Terminal 4 Phase I Removal Action is promising, EPA has not yet approved its use for the Terminal 4 Phase I Removal Action. Additional details still need to be provided for review and EPA approval. Please refer to EPA's letter transmitting this table with respect to schedule risks and appropriate contingency planning.
Specific Comments			
1	The Wildlands Alder Creek project is not yet an official mitigation bank with an approved mitigation bank instrument and does not appear ready or able to sell mitigation credits to the Port at this time. Wildlands must still successfully maneuver through many steps before the mitigation bank would be considered complete. Mitigation banks must have an approved mitigation plan and other assurances in place before credits can be provided to purchasers (CFR 230.93(b)(2)). Credit release schedules are tied to performance milestones and banks must have a mitigation bank instrument approved by the	The Alder Creek project has been set up as a conservation bank. The National Oceanic and Atmospheric Administration (NOAA) approached Wildlands about adding the Alder Creek site as a conservation bank under the Umbrella Banking Agreement for the Columbia Basin. The conservation bank program is administered by NOAA/National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS) and is consistent with recovery plans and local/regional conservation planning efforts. In addition, the conservation bank provisions are consistent with the General Compensatory Mitigation Requirements identified in 40 Code of Federal	Response is acceptable for the stage of the process we are in for developing a mitigation plan for the Phase I T4 Removal Action. However, EPA does not agree with the Port's general statement that conservation banks are consistent with mitigation banks. The process for approving a conservation bank is different from approval of mitigation banks. But more importantly, the purpose, goals, and standards for a conservation bank for threatened or endangered species is not necessarily going to equate to the purpose, goals, and standards for a mitigation bank. As we learn more specifics about the Wildlands'

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
1 (cont.)	U.S. Army Corps of Engineers (USACE)District Engineer before credits can be sold (CFR 230.93 (d)(6)(iii)(B)). The Port should include a copy of the Alder Creek mitigation bank instrument and credit release schedule in the Mitigation Work Plan so that EPA can evaluate the Port's proposal to use mitigation bank credits for the Phase I Removal Action project	Regulation (CFR), Part 230, §332.3 of the Final Mitigation Rule. The focus of the program is on recovery of listed species and the protection of habitat for those species. This focus on local/regional conservation planning and recovery of listed species and their habitat is consistent with the general mitigation project requirements that USEPA previously identified for the Terminal 4 Early Action project in the Action Memorandum (Action Memo; USEPA 2006), as well as information contained in the Terminal 4 Phase I Removal Action 404(b)(1) Evaluation (USEPA 2008). The Action Memo states that "All compensatory mitigation must be consistent to the maximum extent practicable with any established mitigation strategies or conservation initiatives supported by state and federal resource agencies for the Lower Willamette River basin." The Action Memo and the Terminal 4 Phase I Removal Action 404(b)(1) Evaluation further state that "USEPA may consider mitigation proposals that do not meet all of the performance criteria if the Port demonstrates that the proposal otherwise contributes to conservation and recovery of Endangered Species Act (ESA) listed species and/or other relevant conservation initiatives for the Lower Willamette River basin." As such, purchasing mitigation acres from an approved conservation bank with a focus on ESA-listed species and their habitat is appropriate and consistent with past and current requirements. In addition, Wildlands has been working with the Portland Harbor Trustees on establishing the site as a restoration site for settling Natural Resource Damage (NRD) liability. Through this approach, the area served by the site will be mainly the Portland Harbor Superfund Site. The credit evaluation is being done using the Habitat Equivalency Analysis (HEA) method which was developed by NOAA for use in NRD assessments to scale compensation for habitat damage resulting from oil spills and other contaminant-related impacts. In addition, the USACE has also used the method to scale compensation for habitat impacts resulting from	project and the Port's Mitigation Work Plan, we will need to judge whether the Alder Creek project will be sufficient as compensatory mitigation for the T4 project. See our letter for the conservation bank development documents EPA will need to review in order to make that decision. The Port and Wildlands will need to show how documents generated for the conservation bank approval are comparable to those required for mitigation bank approval if they are named differently. Also, the legal relationship as between EPA and the Port and/or Wildlands is not the same as if the Corps were approving a mitigation bank. Please refer to EPA's letter transmitting this table for more information on the issues related to the use of a conservation bank for compensatory mitigation under 40 CFR 230. The Mitigation Work Plan to be prepared by the Port will need to address mitigation consistent with the 404(b)(1) guidelines and Subpart J in particular. While we expect that the documents prepared by Wildlands will form the core of the Mitigation Work Plan, please be mindful of the fact that this additional perspective will need to be included and may mean that adjustments to Wildlands plans may be required to meet 404 needs.

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
1 (cont.)		large projects. The HEA method is based on replacing lost ecological services (functions and values) resulting from an impact rather than replacing lost acreage of similar habitat. This method is consistent with the 2008 Compensatory Mitigation Rule, as well as the Action Memo, which states that "Preference will be given to compensatory mitigation plans that are consistent with habitat function." The conservation bank development has been modeled after the mitigation bank process and will result in the preparation of similar documents. As stated previously, the conservation bank elements are consistent with USACE and USEPA's compensatory mitigation requirements identified in the Final Mitigation Rule. Wildlands is preparing a Conservation Bank Document, which will be used, in part, as the basis for the submittal for the Mitigation Work Plan. This document will contain the following pieces: • Habitat Development Plan, including Performance Standards • Long-term Management Plan • Service Area • Title Report and Legal Parcel Map • Credit Evaluation • Conservation Easement Form • Property Assessment and Acknowledgment • Phase 1 and 2 Environmental Site Assessments • Sales Agreement/Credit Receipt form • Financial Assurances • Other Environmental Documentation, including the • Cultural Resources Report and Biological Assessment As discussed at the conference call meeting on December 5, 2011, this document is expected to be available on April 1, 2012. As part of the Mitigation Work Plan submittal, the Port will provide a cover memorandum that details how the Alder Creek	

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
1 (cont.)		restoration project complies with the mitigation requirement for the T4 Phase I Removal Action project. As such, this cover memorandum along with components of the Conservation Bank Document will be the Mitigation Work Plan submittal.	
2	The costs associated with compensatory mitigation may be significant. The Interagency Review Team (IRT) has made a preliminary estimate that the Alder Creek site will be able to produce 28 acres of mitigation area that translates into 630 discounted service acres-years (dsays). Therefore, at this estimated rate of 22.5 dsays/acre, the Port of Portland would need to purchase over 8.7 dsays to comply with the requirement for 0.39 acres of mitigation. The Port will need to carefully describe the costs associated with this purchase in the planned Mitigation Work Plan and demonstrate the ability to finance a purchase of this magnitude	The Port agrees that the cost associated for settling its compensatory mitigation requirements is significant. The Port is committed to following through with the purchase of 0.39 acre of mitigation. Pursuant to the Administrative Settlement Agreement and Order on Consent (AOC) for Removal Action, the Port must demonstrate financial assurance for the obligations under the AOC each year. The most recent financial assurance demonstration was provided on October 28, 2011, thus, demonstrating the Port's ability to finance such a project.	Response is acceptable with the following qualifying text. Please note that the AOC financial assurance did not include the mitigation requirement. We also acknowledge that some work assured by the AOC provision has been accomplished. A revised financial assurance requirement may be necessary once the mitigation plan is more fully developed and close to approval. Please incorporate financial assurance information into the Mitigation Work Plan.
3	The October 2011 *Restoration Work Plan for the Alder Creek Mill Site*, prepared by URS and presented in Attachment D of the PPA, describes a Phase II Environmental Site Assessment (ESA) completed at the Alder Creek site which identified the presence of polychlorinated biphenyls (PCBs), semi-volatile organic compounds (SVOCs), total petroleum hydrocarbons (TPH) and metals at the site. The PPA specifies that the material with significant or visible contamination will be taken off site for disposal at a permitted landfill, that lightly contaminated soil and wood waste will be managed upland through a Solid Waste Letter of Authorization and that followup porewater and sediment sampling will be performed following excavation of the habitat area. However, unanticipated environmental conditions may	Comment noted. The Port is aware of the risk of developing a mitigation project in an industrial area like Portland Harbor. Uncovering unanticipated environmental conditions as the uplands are disturbed is a risk that can exist in most locations in Portland Harbor and is not unique to the Alder Creek site. In fact, this is a risk that the Port would encounter in any of the sites it considered to satisfy its mitigation requirements. Wildlands has experience dealing with unanticipated conditions. For example, Wildlands constructed a restoration project along Hylebos Creek near Commencement Bay in Tacoma, Washington, and found an unexpected area of chemical contamination. Due to their extensive coordination with the agencies prior to construction, Wildlands was able to address the issue and move construction forward without substantial delays.	Response is acceptable with the following qualifying text. Please refer to EPA's letter transmitting this table with respect to schedule risks and appropriate contingency planning.

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
3 (cont.)	delay implementation of the restoration project and completion of compensatory mitigation in the required time frame.		
4	The Alder Creek project proposes to remove a levee along the river front to facilitate inundation of much of the site. The Portland Harbor Natural Resource Trustee Council notes that the removal of this levee would require coordination with the Sauvie Island Drainage District. EPA will need assurances that the Port will still be able to meet the previously approved schedule regardless of any obstacles that Wildlands may encounter with their plan to complete construction in 2012.	Again, as noted in the previous response, the Port is aware that there are challenges with implementing a project that excavates upland industrial area and creates new aquatic habitat. This is not a challenge that is unique to the Alder Creek site. Wildlands is experienced at developing aquatic restoration areas out of industrial uplands and has spent a great deal of effort evaluating the feasibility of this project. To date, there has been no identified obstacle that would make this project infeasible. The levee that is proposed for removal as part of the Alder Creek project is actually a private berm that is not managed by the Sauvie Island Drainage and Irrigation District (SIDID) or the USACE. Wildlands has discussed the removal of this berm with both the SIDID and the USACE, and neither agency has any issues with its removal.	Response is acceptable with the following qualifying text. Please refer to EPA's letter transmitting this table with respect to schedule risks and appropriate contingency planning.
5	Although the Conceptual Mitigation Plan appears to satisfy the compensatory mitigation requirements, the Conceptual Mitigation Plan does not describe the linkage between the T4 mitigation requirements and the proposed restoration project. In addition, the Conceptual Mitigation Plan does not describe the necessary performance standards. The Mitigation Work Plan will need to document that the restoration plan will meet the compensatory mitigation requirements. In particular, the Port will need to demonstrate that the mix of habitat types, functions, and values produced at Alder Creek include those that are required for mitigation by the Phase I Removal Action project.	The Mitigation Work Plan will document that the Alder Creek project will meet the compensatory mitigation requirements. In particular, the documentation will demonstrate that the mix of habitat types, functions, and values produced at Alder Creek include those that are required for mitigation for the Terminal 4 Phase I Removal Action project. The specifics are provided in Attachment 1 to this response as requested by USEPA and CDM during the December 5, 2011 conference call. In addition, the performance standards are currently being developed by Wildlands in conjunction with the Portland Harbor Trustees and their expert panel (which includes representatives from NOAA), and are expected to be completed by April 1, 2012.	Response is acceptable with the following qualifying text. EPA appreciates the summary provided in Attachment 1. Please be sure to include this same information in the Mitigation Work Plan for the project along with the detailed description of the habitat types and functions to be provided at the Alder Creek site. However, as the Port is aware, unless the necessary instruments and legal agreements with Wildlands are in place, and the expected habitat functions are achieved, EPA will not be able to finally approve that the Port's plan has been implemented. In order for the Alder Creek site to be considered suitable compensatory mitigation for the Phase I Removal Action it will need to replace the habitat types and functions that were impacted. EPA will provide its expectation for performance standards under separate cover. The Port should incorporate these performance standards into the

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
5 (cont.)			Mitigation Work Plan. Please note that Wildlands would also need to include these same performance standards if the Port is to use the Alder Creek site as mitigation for the Terminal 4 Phase I Removal Action impacts.
Additional Specific Comments			
1	The Draft Mitigation Work Plan must demonstrate how the Wildlands Alder Creek project will be consistent with the proposed action that the Biological Opinion is based upon and how it will meet the terms and conditions.	The Mitigation Work Plan will demonstrate how the Alder Creek project is consistent with the "Habitat Improvements" section of the proposed action in the 2008 Biological Opinion (BiOp), as well as how the proposed project will offset impacts that occurred as part of the Terminal 4 Phase I Removal Action, as detailed in the BiOp. The specifics are provided in Attachment 2 to this response as requested by USEPA and CDM during the December 5, 2011 conference call.	Response is acceptable with the following qualifying text. EPA appreciates the summary provided in Attachment 2. It is understood that Wildlands has or will be preparing a long-term monitoring plan and providing permanent site protection and financial assurances. However, until EPA has the opportunity to review these materials, we will be unable to concur with the Port's conclusion that the Alder Creek site provides compensatory mitigation in compliance with 40 CFR 230. In addition, the long term monitoring plan, provisions for permanent site protection, and financial assurances should be included in the Mitigation Work Plan.
2	In accordance with the agreed upon schedule, the compensatory mitigation must be completed by 2015. It is clear that the intent was for the mitigation action to be constructed and well established (not newly planted) by 2015. The Port must demonstrate how the Wildlands Alder Creek project will meet this expectation that the mitigation plan be "carried out" by 2015.	This is a new interpretation of the schedule. The BiOp does not clearly state this interpretation, and for the last 2 years the Port and USEPA have been defining the 5-year clause as 5 years until completing construction of the mitigation project. USEPA and NMFS have never before indicated that the first 5 years of monitoring was included in that timeframe. In addition, the USEPA-approved schedule assumes completing construction of the mitigation project by 2015. In any event, the Alder Creek site is anticipated to be constructed in 2012 and no later than 2014, which is well ahead of the 2015 requirement date.	Response is acceptable with the following qualifying text. EPA has reviewed this issue with NMFS and the agencies agree that construction, including installation of plant materials, may occur by 2015. However, there will be monitoring requirements and performance standards that will need to be met over the long-term per 40CFR 230. Please refer to EPA's letter transmitting this table with respect to schedule risks and appropriate contingency planning.
3	The Biological Opinion included several other terms and conditions related to habitat mitigation at the Wheeler Bay site including the condition that aerial coverage of established (not newly planted) vegetation achieve 80 percent by year 5. The first five years of a mitigation project involve a fairly intensive	The Wheeler Bay aerial coverage vegetation goals for Year 5 apply to the vegetation that was planted as part of the bioengineered portion of the shoreline stabilization action. This is not part of the compensatory mitigation requirement. Although the Port proposed this as compensatory mitigation in the Draft Mitigation Work Plan in September 2010, it was rejected. As such, this term	Please see response to Port Response to Additional Specific Comment No. 2, above.

Comment No.	USEPA Comment	Port Response	Review of 12/16/2011 Response
3 (cont.)	amount of work including planting, replanting to replace vegetation that did not survive, monitoring, and maintenance to promote survival and control invasive species. The Biological Opinion clearly indicates that the time frame for the mitigation activities is to include this first 5 year period. Construction and initial planting in year 5 would not be an acceptable proposal. The Port will need to demonstrate how the Wildlands Alder Creek project will be able to meet this expectation of an established mitigation site by 2015.	and condition does not apply to the compensatory mitigation, although it is likely that a similar performance standard for vegetation will be included as part of the mitigation performance standards. Please also see the response to Additional Specific Comment No. 2, above. The Port disagrees that the BiOp clearly indicates that the timeframe for compensatory mitigation activities is to include this first 5-year period of monitoring.	
4	The compensatory mitigation for the Phase 1 Removal Action must be functional by 2015. The Port will need to demonstrate how that goal will be achieved given the current schedule and inherent risks associated with the Wildlands proposal.	Please see responses to Additional Specific Comments No. 2 and No. 3, above.	Please see response to Port Response to Additional Specific Comment No. 2, above.
5	The September 30th memorandum does not appear to address EPA's June 25, 2011, comments which requested a clear correlation between the impacts (elevations and habitat types impacted) and the proposed mitigation (elevations, mitigation measures proposed). The mitigation acreage required is presented as 0.39 acres and the memorandum does not enumerate the elevations or habitat types affected to arrive at that figure. The Mitigation Work Plan will need to include a detailed description of the habitat types, elevations, and acreages affected and the calculations used to arrive at the compensatory mitigation acreage. The Mitigation Work Plan will need to demonstrate a direct correlation between the habitat types affected and those to be provided by the Wildlands Alder Creek project.	Please see response to Specific Comment No. 5, above, and Attachment 1.	Response is acceptable with the following qualifying text. EPA appreciates the summary provided in Attachment 1. Please be sure to include this same information in the Mitigation Work Plan for the project along with the detailed description of the habitat types and functions to be provided at the Alder Creek site.

Kenny Hanour

From: Madalinski, Kelly <Kelly.Madalinski@portofportland.com>
Sent: Wednesday, March 07, 2012 7:03 AM
To: 'Sean Sheldrake'
Cc: PetersonLE@cdm.com; Elizabeth Appy; cora.lori@epa.gov; Hamilton, Jessica; Genevieve.Angle@noaa.gov; 'Julie Mentzer'; 'Mark Heintz'
Subject: FW: T4 Responses to EPA Comments on the September 30, 2011 Updated Mitigation Conceptual Plan Memorandum
Attachments: Mitigation 2 7 12.pdf; Response to EPA Comments_Mitigation Conceptual Plan_ 12-16-11.pdf

Sean,

The purpose of this message is to follow up on the conference call we had on February 21, 2012. Thank you for the discussion clarifying the February 7, 2012 letter commenting on the Port's response to EPA comments on the September 30, 2011 Updated Mitigation Conceptual Plan Memorandum. The outcomes from the meeting are summarized below:

- The Port will include Clean Water Act (CWA) Section 404 information in the Mitigation Work Plan. Specifically, the Port will provide information on how the proposed project at Alder Creek will meet Section 404 requirements as outlined in the 2008 Supplemental 404(b)(1) Evaluation for the Terminal 4 Phase I Removal Action.
- NMFS is working with Wildlands to create performance standards for the Alder Creek project. The Port understands that EPA is coordinating with NMFS on these performance standards with the goal of having performance standards consistent with both the Endangered Species Act (ESA) and CWA Section 404.
- The Port and EPA agreed that per the approved schedule, the mitigation construction does not need to be finalized until 2015 (i.e., fall of 2015, given current allowable work windows).
- Jessica (Port) and Mark (Wildlands) will follow up with Lori separately to work through the legal issues identified during the call.

With these understandings, the Port has no further responses to the February 7, 2012 letter and will incorporate the comment responses into future deliverables, where necessary.

Please feel free to contact me with any questions.

Regards,
Kelly

****Please note my new mobile # contact: 503-349-7526****

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-----Original Message-----
From: Sean Sheldrake [mailto:Sheldrake.Sean@epamail.epa.gov]
Sent: Tuesday, February 07, 2012 11:20 AM
To: Madalinski, Kelly; Genevieve.Angle@noaa.gov; Hamilton, Jessica; Jessica (Jessica.Hamilton; jmentzer@wildlandsinc.com; eappy@anchorenv.com
Cc: ted_buerger@fws.gov; cyril.alex@deq.state.or.us; cora.lori@epa.gov; Elizabeth Allen; fuentes.rene@epa.gov; Genevieve.Angle@noaa.gov; jeremy_buck@fws.gov; peterson.jennifer@deq.state.or.us; ANDERSON.Jim@deq.state.or.us; Peterson, Lance; Lori Cora; POULSEN.Mike@deq.state.or.us; Nancy.Munn@noaa.gov; Mark Ader; Chip Humphrey; Kristine Koch; Sean Sheldrake; Richard Muza; aebbets@stratusconsulting.com; audiehuber@ctuir.com; Brandy.Humphreys@grandronde.org; cunninghame@gorge.net; colin@ridolfi.com; dallen@stratusconsulting.com; erin.madden@gmail.com; jdw@jdw-law.net; Jennifer Peers; jweis@hk-law.com; Michael Karnosh; matt@jdw-law.net; rose@yakama.com; tomd@ctsi.nsn.us; reopn@mindspring.com; rick.j.kepler@state.or.us; Robert.Neely@noaa.gov; shephard.burt@epa.gov; Dan Phalen; gainer.tom@deq.state.or.us; Alanna Conley
Subject: T4 Responses to EPA Comments on the September 30, 2011 Updated Mitigation Conceptual Plan Memorandum

Kelly,

Please see the attached letter in response to your December 16th transmittal.

Let me know if you have any questions or concerns.

Thank you.

S
(See attached file: Mitigation 2 7 12.pdf)
Sean Sheldrake, RPM, Unit Diving Officer
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Region 10 Dive Team: http://www.epa.gov/region10/dive
EPA Divers only:
http://204.47.216.153:9876/r10/infopage/cleanup.nsf/webpage/DSBtechdirector
Portland Harbor Cleanup: http://www.epa.gov/region10/portlandharbor
Green Cleanups:
http://yosemite.epa.gov/R10/extaff.nsf/programs/greencleanups
Green Cleanups (EPA only):
http://204.47.216.153:9876/r10/infopage/cleanup.nsf/webpage/greener
+cleanups
Health and Safety (EPA only):
http://204.47.216.153:9876/r10/infopage/cleanup.nsf/webpage/H&Secl
Deliveries: Parking Garage mailroom (1st floor)
Visitors: Check-in @ PERC / Service Center on 12th floor:
http://yosemite.epa.gov/r10/extaff.nsf/Homepage/Visiting+Seattle

From: Rana Wilson [mailto:rwilson@anchorqea.com]

Sent: Friday, December 16, 2011 4:16 PM
To: Sean Sheldrake
Cc: Kelly.Madalinski@portofportland.com; Genevieve.Angle@noaa.gov; Peterson, Lance; Hamilton, Jessica (Jessica.Hamilton@portofportland.com); jmentzer@wildlandsinc.com; Elizabeth Appy; Mike Schiewe; Lori Russo
Subject: Responses to EPA Comments on the September 30, 2011 Updated Mitigation Conceptual Plan Memorandum

Sean,

Attached is the Port's responses to EPA comments on the September 30th Updated Mitigation Conceptual Plan Memo, per the agreed upon schedule. If you have any questions during your review, please do not hesitate to call either Elizabeth Appy at Anchor QEA or Kelly Madalinksi at the Port.

Thank you,

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(See attached file: Response to EPA Comments_Mitigation Conceptual Plan_12-16-11.pdf)

APPENDIX F
HABITAT DEVELOPMENT PLAN

ALDER CREEK RESTORATION PROJECT

MULTNOMAH COUNTY, OREGON

HABITAT DEVELOPMENT PLAN

Prepared by:
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May 2013

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List of Acronyms and Explanations

ACM	Active Channel Margins
AWW	active work window
BMP	best management practices
LCR	Lower Columbia River
DPS	Distinct Population Segment
DSL	Oregon Department of State Lands
ESA	Federal Endangered Species Act
ESCP	Erosion and Sediment Control Plan
ESU	evolutionarily significant unit
GLO	General Land Office
GPS	global positioning system
Harbor	Portland Harbor
LCR	Lower Columbia River
LWD	large woody debris
MUA	multiple use agriculture
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRD	Natural Resources Damages
ODFW	Oregon Department of Fish and Wildlife
OHWL	Ordinary High Water Line
OLWL	Ordinary Low Water Line
Overall Property	64-acre property owned by Portland Harbor Holdings II, LLC

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Owner	Portland Harbor Holdings II, LLC
OWRD	Oregon Waters Resource Department
Plan	Habitat Development Plan
Project	Alder Creek Restoration Project
Restoration Site	52.3-acre Alder Creek Restoration Project
Restoration Project	52.3-acre Alder Creek Restoration Project
Reviewing Parties	Any agency or party with approval authority over the Project
RTK	real time kinematic
SIDIC	Sauvie Island Drainage Improvement Company
Sponsor	Portland Harbor Holdings II, LLC
Target Salmonids	Upper Willamette River (UWR) spring-run Chinook salmon (*Onchorhynchus tshawytscha),* Lower Columbia River (LCR) Chinook salmon, LCR steelhead (*Onchorhynchus mykiss*), UWR steelhead, and LCR coho salmon (*O. kisutch*)
Target Species	Target Salmonids, Pacific lamprey (*Lampetra tridentate),* bald eagle (*Haliaeetus leucocephalus),* osprey (*Pandion haliaetus),* river otter (*Lutra canadensis),* mink (*Mustela vison)*
Trustees	Portland Harbor Natural Resource Trustee Council
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWR	Upper Willamette River
Wetland Delineation Study Area	Area studied for the wetland delineation which includes the overall property, the DSL lease area, and the portion of the work area within State Lands for a total of 69.23 acres.

Section 1 Introduction

The Alder Creek Restoration Project ("Project" or "Restoration Project") is an aquatic, riparian, and upland forest restoration and enhancement project being developed in coordination with the Portland Harbor Natural Resource Trustee Council ("Trustees"). The habitat values provided by this Project will be used to offset Natural Resource Damages (NRD) resulting from more than a century of industrial use along the Willamette River in Portland, Oregon (Figure 1). This Project will assist with the implementation of the Preferred Alternative of the National Oceanic and Atmospheric Administration (NOAA) Draft Portland Harbor Programmatic EIS and Restoration Plan (NOAA 2012). This Preferred Alternative, the Integrated Habitat Restoration Planning Alternative, calls for the restoration of certain types of habitats that support a range of species and associated natural resource services. Under this alternative, projects such as this Restoration Project that provide benefits to a number of potentially injured species have greater ecological value compared to projects that benefit only one species.

Portland Harbor Holdings II, LLC ("Owner" and "Sponsor") owns approximately 64 acres ("Overall Property") located on the southern tip of Sauvie Island in Multnomah County, Oregon (Figure 1). The Restoration Project will be located on a 52.3-acre unencumbered portion of this Overall Property ("Restoration Site") (Figure 2). The Project is located at the divergence of the Willamette River and Multnomah Channel, near River Mile 3, approximately 10 miles north of downtown Portland, within the northern extent of the Portland Harbor Study Area (NOAA 2012) (Figure 3). The Sponsor proposes this Project primarily for the benefit of salmonid species of the lower Willamette River, but also to provide habitat and benefits to all native fish occurring within the lower Willamette River, as well as numerous avian and terrestrial species occurring in the vicinity of the Restoration Project.

The Project will be developed under guidance from the Trustees primarily for the federally threatened Upper Willamette River (UWR) spring-run Chinook salmon (*Onchorhynchus tshawytscha)* evolutionarily significant unit (ESU), the federally threatened Lower Columbia River (LCR) Chinook salmon ESU, the federally threatened LCR steelhead (*Onchorhynchus mykiss*) distinct population segment (DPS), the federally threatened UWR steelhead DPS, and LCR coho salmon (*O. kisutch*) ESU, hereafter referred to as "Target Salmonids". Once complete, this Project will also benefit a diverse array of aquatic and terrestrial species that reside either permanently or temporarily within the Willamette and Columbia Rivers of the Pacific Northwest.

This Habitat Development Plan ("Plan") describes the habitat design for the 52.3-acre Restoration Project, which includes approximately 32 waterfront acres south (waterward) of the Sauvie Island Drainage Improvement Company (SIDIC) levee and approximately 20 acres north (landward) of the SIDIC levee (Figure 2). The Project design includes dismantling the sawmill complex and then restoring the site to a mosaic of side channel, active channel margin ("ACM") (including mud flat, beach, emergent marsh, and riparian scrub-shrub), riparian forest, and upland forest habitats (Figure 4).

Section 2 Goals

The main purpose of the Project is to restore, enhance, and protect aquatic, riparian, and upland forest habitats to benefit the Target Salmonids, as well as providing benefits to other aquatic, avian, and terrestrial species. This Project will create, enhance, and protect a mosaic of habitats that will enhance fish and wildlife resources in the Lower Willamette River, an area that has experienced significant degradation of habitat including channelization, off-channel habitat removal, floodplain removal, silt loading, and water temperature increases. The most limiting or scarce habitat types within the Lower Willamette River include refuge from mainstem Willamette River flows, shallow water, and beach habitats with or without large wood assemblages, and undulating natural shorelines (NOAA 2012).

This Restoration Project has been designed so that its implementation will restore and improve habitats that:

- Move towards normative hydrology;
- Restore floodplain function, including off-channel habitat for multiple species;
- Re-establish floodplain and riparian plant communities;
- Improve aquatic and riparian habitat conditions;
- Improve river margin habitat (increase complexity in river margins); and
- Restore habitat that provides ecological value in the landscape perspective (connectivity, patch size, shape, and distance between different patches of habitat).

Implementation of the Project design will result in a complex ecosystem that transitions from the submerged tidal waters of the Willamette River and the Multnomah Channel up in elevation to an upland forest. Along this elevational transition will be a complex mosaic of habitats including beach, mudflat, marsh, side channels, scrub-shrub, riparian, and upland forest habitats (Figure 4).

The target habitat types for this Restoration Project include side channel habitat and the river's active channel margin (ACM). Side channel habitat is an important type of off-channel habitat. Side-channel habitat is defined as "flowing water bodies with clearly identifiable upstream and downstream connections to the main channel". ACM is defined as "that portion of the river's edge that is located at the interface of unwetted shoreline and shallow water, and occurs from the ordinary high water line (OHWL) mark to the ordinary low water line (OLWL). In addition, shorelines and riparian zones, especially those adjoining off-channel habitat and contiguous upland habitats, are targeted habitat priorities because of their ability to support fish and wildlife and their ecological connection to aquatic habitats.

Project construction is proposed to be completed within one construction season, and all in-water construction work is scheduled to occur within the designated in-water work window in order to minimize potential impacts to the protected resources onsite. Following construction, the Restoration Project will be protected with an in-perpetuity conservation easement and managed with funds from a non-wasting endowment fund. The specific goals of the Project include restoration and enhancement of the habitats onsite by conducting the following tasks:

- Industrial Sawmill Removal

  - Remove the sawmill infrastructure and materials from the floodplain including buildings, roads, pads, wood by-products, and equipment (Figure 2);

- Invasive Species Control and Native Re-vegetation
  - Manage invasive species by removal and re-vegetation with native species;
- Side Channel Habitat Restoration
  - Restore off-channel habitat in the form of side channels by excavating material from the waterward side of the SIDIC levee **(**Figure 4**)**;
- ACM Habitat Restoration
  - Restore ACM habitats adjacent to the restored side channel habitat, the Willamette River, and the Multnomah Channel in the form of frequently inundated mudflat, beach, marsh, and riparian scrub-shrub habitat **(**Figure 4**)**;
- Habitat Complexity Improvement
  - Provide in-water habitat structure and complexity by installing large woody debris where possible and appropriate;
- Hydrologic Reconnection
  - Reconnect restored and enhanced aquatic habitats by excavating two connections to the Willamette River and one connection to Multnomah Channel (Figure 4);
- Riparian Forest Restoration
  - Create shading and food source production for salmonids by establishing a natural gradient of riparian scrub-shrub and forest adjacent to restored emergent marsh, adjacent to the created side channels (Figure 4);
- Upland Forest Creation
  - Establish upland forest habitat by depositing excavated material north (landward) of the SIDIC levee and planting this area with native trees and shrubs (Figure 4);
- Removal of In-water Structures
  - Where feasible and appropriate, remove overwater structures and pilings from within the Multnomah Channel and Willamette River in order to connect side channel habitat to these water bodies (Figure 2).;
- In-perpetuity Protection
  - Provide in-perpetuity protection through the establishment of a conservation easement; and
- Long-term Management
  - Provide in-perpetuity stewardship through the implementation of a Long-term Management Plan, the management of which will be funded by a non-wasting endowment.

At project completion, the Project will consist of approximately 2.11 acres of restored side channel habitat, 20.86 acres of habitat within the active channel margin (which includes 3.47 acres of mudflat and beach habitat, 5.65 acres of emergent marsh, and 11.74 acres of riparian scrub-shrub and forest habitat),

8.92 acres of riparian forest within the floodplain, and 20.38 acres of forest outside of the floodplain (Table 1).

Table 1. Proposed Restoration Habitat Types		
Habitat Type	Active Channel Margin	Acres
Side Channel (off-channel habitat)	No	2.11
Mudflat or Beach	Yes	3.47
Vegetated Marsh	Yes	5.65
Scrub-shrub riparian below the OHWL	Yes	11.74
Riparian forest within the historic floodplain	No	8.92
Upland forest	No	20.38
		Total ACM = 20.86
		Total Project Acreage (including ACM) = 52.27

The restored habitats within the Project will be held to measureable performance standards, monitoring requirements and management standards, all of which are described in this Plan. To verify that the Restoration Project has achieved performance standards, activities such as regular site visits, habitat maintenance, adaptive management, effectiveness monitoring (including hydrology, vegetation, and physical monitoring), and annual reports will be required to maintain and track Project effectiveness and function in-perpetuity. Over the long-term, the restored habitats are expected to continually provide the enhanced and restored habitat functions without significant human intervention.

Section 3 Existing Conditions

3.1 LOCATION

The Overall Property consists of 64 acres located within the Willamette Basin, on the southernmost tip of Sauvie Island at the divergence of the Willamette River and Multnomah Channel in Multnomah County, Oregon (Figure 1). The Restoration Project, which will be developed on 52.3 acres of the Overall Property, is located in the northernmost reach of the Portland Harbor Superfund Site (Figure 3). The Overall Property is bisected by the Sauvie Island Drainage Improvement Company's (SIDIC) levee and a north-south oriented underground utility easement, both of which are excluded from the Restoration Project (Figure 2). The southeastern portion of the Project (waterward of the SIDIC levee and within the floodplain of the Willamette River) is approximately 32 acres and is bordered by the SIDIC Levee on the north, mostly undeveloped private property to the northeast, the Willamette River on the east, and the Multnomah Channel on the southwest. The northwestern portion of the Project (landward of the SIDIC levee and outside of the active floodplain) is approximately 20 acres and is bordered on the northeast by private rural-residential property, on the east by the utility easement, on the south by the SIDIC Levee, and by the ESCO Landfill to the northwest (Figure 2).

The Project is located within Township 2N, Range 1W, Sections 27, 28, and 34 of the Linnton and Sauvie Island, Oregon 7.5-minute U.S. Geological Survey quadrangle maps, Willamette Meridian, identified by tax lot numbers 700 and 800 (Figure 6).

3.2 TOPOGRAPHY

The Project is physically separated into two areas by the SIDIC levee: the southeastern portion of the Restoration Site is located on the waterside of the SIDIC levee, and the northwestern portion of the Restoration Site is located on the landward side of the SIDIC levee. The southeastern portion of the Restoration Site ranges in elevation from about 8 to 30 feet NAVD 88 in flat-lying areas to 65 feet NAVD 88 in the woodchip stockpile area. The area which currently houses the sawmill and associated infrastructure is generally flat while the wood by-product storage area has varying topography, and the shoreline is a combination of gently sloping beaches and artificially created steep banks. A berm consisting mainly of wood by-product and earthen material was created in 1996 to protect the sawmill complex from flooding and is still present around the perimeter of the southeastern portion of the Restoration Site. The northeastern portion of the Restoration Site is generally flat as well, but gently slopes towards the northeast. The SIDIC levee is approximately 36 feet NAVD 88 at its highest (Figure 7).

3.3 PRESENT AND HISTORICAL LAND USE

As described in the Cultural Resources Survey prepared by Willamette Cultural Resources Associates (WCRA 2011), land alterations on the Overall Property (including the Restoration Site) date back before the General Land Office (GLO) map from 1854, which shows a structure on the southeastern tip of the Restoration Site, which has been identified as the Menzies house, surrounded by cultivated land. A U.S. Army Corps of Engineers (USACE) map produced in the 1880s shows a dam extending across Multnomah Channel connecting to the southern boundary of the Restoration Site and shore protection works are indicated. An aerial photograph from 1929 shows the first indication that the Restoration Site was used extensively for placement of dredge material. The 1947 United States Coast and Geodetic Survey planimetric map depicts dolphins, numerous "old" pilings, a wreck, riprap, and a rock jetty off the shore of the Restoration Site. According to the Alder Creek Lumber Mill owners, the lumber mill was built in the 1960s and began operating shortly thereafter.

The natural landscape on the Restoration Site has been significantly modified as a result of the lumber mill activities. Modifications to the shoreline on the Restoration Site include the placement of fill, riprap, pilings, and overwater structures. Recent aerial photos show log rafts directly off-shore of the Restoration Site all along Multnomah Channel. Numerous buildings and operational areas (including wood by-product processing areas) cover almost the entire southeastern portion of the property (Figure 2). The northwestern portion of the property consists of a few structures and a large, flat log storage area associated with the lumber mill activities.

The Restoration Site and surrounding properties are subject to Multnomah County zoning ordinances. The property is designated as Multiple Use Agriculture (MUA) 20 under the Multnomah County Code. While lumber mills are not listed in the permissible uses section of the MUA-20 zone, the existing lumber mill on the property is a lawfully established non-conforming use as previously determined by Multnomah County. Given the purpose and operation of the Project as a conservation area for habitat restoration, enhancement, and protection, the proposed use is consistent with the current zoning regulations.

The majority of the Restoration Site is mostly devoid of vegetation; however, the portions adjacent to Multnomah Channel and the Willamette River are dominated by Himalayan blackberry (*Rubus discolor*), and there are small areas of native riparian tree and shrub species (including willow, cottonwood, and alder). Currently, only portions of the outer shoreline of the Restoration Site below the ordinary high water line (OHWL) are accessible to fish during normal daily tides.

3.4 BUFFERS [ADJACENT LAND USES]

The Project contains several features which act as buffers for the conservation values. Open water (i.e., the Willamette River and Multnomah Channel) is located to the south, southeast, and southwest. The northeastern portion of the Project is bordered by a line of mature trees, beyond which is mostly open space associated with a private residence. Beyond a line of mature trees on the northwest is the ESCO Landfill.

3.5 HYDROLOGY

The Project is located in an historic floodplain where the Willamette River and Multnomah Channel diverge around the southern tip of Sauvie Island and flow north to converge with the Columbia River which then flows north and west to the Pacific Ocean.

Several modifications to the natural environment have affected the hydrology on the Restoration Site. The Restoration Site has been used for dredge material placement since at least 1929. The SIDIC levee, built in the 1940s, resulted in the physical separation of the southeastern portion of the Restoration Site from the northwestern portion (Figure 2). Following the construction of the SIDIC levee, the southeastern portion of the Restoration Site was located adjacent to the Willamette River and hydrologically disconnected from the rest of Sauvie Island. The Multnomah Channel, a distributary channel, splits off from the mainstem Willamette River and flows north/northwest around the western side of Sauvie Island for approximately 21.5 miles before flowing into the Columbia River. The mainstem Willamette River flows north along the east side of Sauvie Island and then converges with the Columbia River approximately 2.6 miles downstream of the Restoration Site. The southeastern portion of the Restoration Site was further removed from natural hydrology in 1996 with the construction of a berm around the perimeter of the Restoration Site to protect the sawmill complex from high floodwaters.

The northwestern portion of the Restoration Site, which is located north and landward of the SIDIC levee, is no longer directly connected to either Multnomah Channel or the Willamette River. The area was developed as a log storage yard associated with the lumber sawmill. The development of the log yard included the creation of long linear strips compacted for log storage flanked by shallow drainages created specifically for the purpose of draining water away from the stored logs. The log storage area generally slopes gently to the northeast towards a large existing wetland area (Figures 7 and 8).

The climate in Multnomah County is a temperate marine climate typical of northwest Oregon influenced by winds from the Pacific Ocean. This area is characterized by mild, wet winters and moderately warm, dry summers. Freezing temperatures are experienced at times during the winter months. The average mean temperature for January is 41.3 ˚F while the average mean temperature in August is 68.4 ˚F. The annual precipitation on the Project is approximately 43 inches. The majority of the rainfall occurs between October and April (NRCS 2000).

Currently, the Restoration Project area contains approximately 1.76 acres of low to moderate functioning wetlands (Figure 8). The majority of these wetlands are mainly fed by direct precipitation. The highly degraded nature of the existing wetlands is due to the historic land uses and alterations on the Restoration Site. The Project's shoreline along Multnomah Channel and the Willamette River varies from gradually sloped, sandy beaches to artificially steepened Banks. The tidal fluctuation during periods of low river levels can be as much as three feet, rising and falling twice daily (Greenworks, P.C., et al, 2001). The tidal influence is almost entirely muted during high river levels. The portion of the Restoration Site which is waterward of the SIDIC levee occasionally flooded when river levels are high (flood stage) which prompted the previous landowner to construct an earthen berm around the perimeter of the property to provide flood protection for the lumber mill. Existing wetlands on the northeastern portion of the Restoration Site (located landward of the SIDIC levee) are only connected to other waters of the United States by surface flow towards the northwest corner during large or sustained precipitation events when surface flows are substantial.

3.6 SOILS

The Project is underlain by Quaternary Alluvium which is a surficial mantle of shallow, silty soils. These native soils have been overlain by artificial fill which consists of wood debris and emplaced dredge material. The Soil Survey of Multnomah County (Soil Survey Staff 2009) indicates that the study area contains two dominant soil mapping units, Sauvie silt loam and Sauvie silt loam (protected), with a minor inclusion of Moag silty clay loam in the northwest portion of the Restoration Site (Figure 9). The soil types are listed below in rough order of extent in the study area:

- Sauvie silt loam,
- Sauvie silt loam, protected
- Moag silty clay loam, protected.

Sauvie silt loam and Sauvie silt loam, protected, 0 to 3 percent slopes. Sauvie soil series consists of deep, poorly drained soils that formed mainly in alluvium on floodplains along the lower Columbia River and its tributaries. The soils are saturated from about December through June and are subject to freshwater overflow during high tides unless diked and artificially drained. These soils are poorly drained with the restrictive layer 80 inches deep or more. When diked and drained, the soils are used for improved hay and pasture, small grain, and truck crops. Areas that are not diked have native vegetation or are used for hay, pasture, and commercial waterfowl areas. The native vegetation supported by these soils includes red alder, ash, willow, cottonwood, grasses, and tussocks.

Moag silty clay loam, protected, 0 to 2 percent slopes. This soil type consists of very deep, very poorly drained soils formed on broad, nearly level, undulating floodplains of the Columbia River with the parent material consisting of alluvium with volcanic ash. The soils are saturated throughout the year and subject to freshwater overflow during high tides and spring floods unless diked and artificially drained. These soils are very poorly drained with a restrictive layer occurring at more than 80 inches deep. These soils are used for hay, pasture, and truck crops. Other uses include recreation and wildlife habitat. Where this soil is not cultivated, the vegetation is black cottonwood, willow, rose, and common snowberry with sedges, cattails, and grasses.

A Geotechnical report was prepared for the Overall Property in July 2011 (updated February 2013). As part of the geotechnical investigations, 8 borings were drilled: three within the SIDIC levee easement and 5 within the sawmill facility outside of the levee. Boring depths ranged from 30 to 71.5 feet below the existing ground surface. Soils encountered in the borings generally consisted of fill material and alluvium. The fill material was loose to medium density gray silty sand with gravel and discontinuous pockets of wood debris. Wood debris was encountered in all eight borings and varied from 5.5 to 10 feet thick with alluvial material occurring beneath the fill materials. The alluvial deposits consisted of very soft brown and gray silt with sand and trace clay to medium dense gray sand with silt. Deposits were weakly stratified and occasionally contained fine woody debris.

3.7 EXISTING HABITATS/VEGETATION

Currently, the Project consists of a lumber mill and associated structures waterward of the SIDIC levee and a log yard and associated structures landward of the SIDIC levee. The majority of the Restoration Site is either unvegetated or sparsely vegetated with mainly non-native species. There are areas of riprap and

bank stabilization along Multnomah Channel, including two small areas on either side of the Olympic Pipeline utility easement (which has been excluded from the Restoration Site). During the wetland delineation performed by URS Corporation (URS), a total of 2.071 acres of wetlands and 10.303 acres of waterways were identified within the wetland delineation study area. Approximately 1.76 acres of wetlands and 7.80 acres of waterways were identified within the 52.3-acre Restoration Site (Figure 8). This wetland delineation was verified by the DSL on June 12, 2012 and is pending verification by the USACE.

Natural habitats on the Project site have been significantly altered as a result of the historic and recent land uses including levee construction, lumber mill operations, wood by-product placement, dredge material deposition, bank armoring, and earthen berm construction. The existing wetlands on the Project are degraded from the historic and recent land uses on the Restoration Site and most are isolated from riverine influences as a result of manmade levees and berms. The dominant habitat type existing on the Restoration Site is developed habitat; however, patches of forest, ruderal, and active channel margin habitats also occur on the Restoration Site (Figure 10).

3.7.1 Developed

This habitat type is the most abundant on the Restoration Site (Figure 10). The developed areas include the area south and east of the levee which consists of the lumber mill, associated structures, and the wood chip sorting area. This area also includes a boat ramp/road. The developed area north of the levee consists of the developed areas of the log yard and associated structures. These areas are mostly devoid of vegetation. Where vegetation does exist, it is sparse and mostly non-native.

3.7.2 Ruderal

The second most abundant habitat type on the Restoration Site is ruderal habitat (Figure 10). This habitat type is dominated by non-native, invasive, and/or weedy species which are generally quick to colonize areas after disturbance. The ruderal habitat areas on the Restoration Site include the vegetated areas of the log storage yard, the vegetated areas around the sawmill complex, and the earthen berm which is vegetated almost entirely with Himalayan blackberry.

3.7.3 Forested

The Restoration Site contains a small amount of forested habitat (Figure 10). There is a small patch of forested habitat in the northwest portion of the Restoration Site. This habitat, which is outside of the floodplain and adjacent to the access road, consists of native trees with an understory dominated by non-native plant species (Figure 2). This habitat type is dominated by black cottonwood (*Populus trichocarpa*), dogwood (*Cornus sp*), Himalayan blackberry (*Rubus discolor*), common snowberry (*Symphoricarpos albus*), and Pacific blackberry (*Rubus ursinus*). There are also patches of forested habitat along the eastern edge of the Restoration Site adjacent to the Willamette River. Some of these forested areas contain mature, tall, riparian trees while other areas contain low-growing woody tree and shrub species. Both of these forested areas have an understory that contains mostly non-native plant species.

3.7.4 Active Channel Margin

The ACM is found between the OHWL and the OLWL and occurs on the outer edge of the Restoration Site along the Willamette River and Multnomah Channel (Figure 10). The existing ACM on the Project consists of a combination of non-native and invasive herbaceous vegetation, native herbaceous vegetation, woody species (both non-native and native), mudflat, beach, and open water. Approximately 1.26 acres of unvegetated beach occurs along the perimeter of the Restoration Site, mostly on the eastern edge. As high waters recede, large woody debris, as well as various other debris (e.g., trash, small woody debris, etc.), tends to accumulate here.

3.7.5 Wetlands and Other Waters of the United States

As a result of the wetland delineation performed by URS Corporation in 2012, a total of 2.071 acres of wetlands and 10.303 acres of waterways were identified within the wetland delineation study area (Figure 8). In addition to the waterways identified in the wetland delineation, an additional 1.96 acres of state-owned lands within the Multnomah Channel and Willamette River have been identified for a total of 12.262 acres. According to the concurrence letter from DSL dated June 12, 2012, DSL is asserting jurisdiction over 1.655 acres of wetlands and 10.298 acres of waters within the study area. It is expected that the Corps will make a preliminary determination that all wetlands (2.071 acres) and waters (12.262 acres) within the wetland delineation study area will be considered jurisdictional by the Corps.Out of the wetlands and waterways identified, a total of 1.76 acres of wetlands and 7.80 acres of waterways (i.e., Willamette River, Multnomah Channel, and a drainage ditch) were identified on the Restoration Site.

The majority of the existing wetlands on the Restoration Site have been substantially affected by previous activities including dredge material placement, road and levee construction, and sawmill operations. The majority of the wetlands on the waterside of the levee are located on fill material within the sawmill facilities or the wood byproduct processing area. There are linear wetlands which are excavated drainage features located at the base of the SIDIC levee. During high water events, some of these features have a surface connection to the Willamette River or Multnomah Channel; however, the majority of the existing wetlands are isolated from high flows because of their elevation (e.g., perched on fill material) and due to the perimeter berm which was constructed in 1996. Within the area of the Restoration Site landward (i.e. northwest) of the SIDIC levee, the majority of the wetlands are linear features which were used to drain the log storage area. These linear features slope gently to the north and into additional wetlands (Figure 8).

3.8 WILDLIFE

A search of the USFWS and Oregon Department of Fish and Wildlife ("ODFW") databases of federally and state listed plant and wildlife species occurring within Multnomah County identified the following species with potential to occur within the vicinity of the Project.

Bald eagle (*Haliaeetus leucocephalus*), Bradshaw's desert-parsley (*Lomatium bradshawii*), bull trout (*Salvelinus confluentus*), Columbia River chum salmon, Columbian white-tailed deer (*Odocoileus virginianus leucurus*), Kincaid's lupine (*Lupinus sulphureus kincaidii*), LCR Chinook, LCR coho, LCR steelhead, Nelson's checker-mallow (*Sidalcea nelsoniana*), northern spotted owl (*Strix occidentalis*

caurina), UWR Chinook, UWR steelhead, water Howelia (*Howellia aquatilis*), and Willamette daisy (*Erigeron decumbens* var. *decumbens*).

In addition to the state and federal listed species mentioned above, there are numerous federal candidate species and species of concern identified by USFWS as having the potential to occur within Multnomah County. These species will be evaluated to determine which of them have potential to occur on the Project. A special-status plant survey was conducted in spring of 2012 to determine which special-status species occur or have potential to occur on the Project site (Attachment A).

The main purpose of the Project is to create habitat for and contribute to the recovery of the Target Salmonids. The restoration activities on the Project will improve designated critical habitat of 5 listed andromous salmonid species (critical habitat has been proposed, but has not yet been designated for LCR coho) from the NMFS Willamette/Lower Columbia recovery domain (Figure 13). The Willamette/Lower Columbia domain includes the tidal lower Columbia River below Bonneville Dam and all of the Willamette River from its headwaters downstream to the mouth on the Columbia River. The Project will focus on habitat for all the special-status salmonids of the lower Columbia River and the Willamette River, including the following five ESUs and critical habitats for the species listed above with the exception of LCR coho salmon for which critical habitat has not yet been designated:

- LCR Chinook salmon (*O. tshawytscha*);
- UWR Chinook salmon;
- LCR coho salmon (*O. kisutch*);
- LCR steelhead (*Oncorhycus mykiss*); and
- UWR steelhead.

In addition to the listed salmon and steelhead species above, the Project is also expected to provide habitat for Pacific lamprey (*Lampetra tridentate*) and coastal cutthroat trout (*Oncorhynchus clarki* ssp.) as well as the numerous other fish, avian, and terrestrial species occurring on and within the vicinity of the Project. Specifically, in addition to the Target Salmonids, the Portland Harbor Wildlife Advisory Group has also identified the following species as injured species targeted for restoration within Portland Harbor: bald eagle, mink (*Mustela vison*), osprey (*Pandion haliaetus)*, and river otter (*Lutra canadensis*) as well as Pacific lamprey (These species together with the Target Salmonids are referred to collectively as "Target Species").

3.8.1 Target Salmonids

Habitat loss and modification are major factors in the decline of salmonid populations. Salmonid populations rely on the availability of diverse habitats with connections among those habitats. The lifecycle of salmonids involves adult salmonids that matured in the ocean returning to their home streams to spawn. Following spawning activities, embryos incubate and eventually fry emerge but they remain near the nest or "redd" until the egg sack is nearly or completely absorbed. Once the egg sack is absorbed, the juveniles swim into the stream to begin to feed. They continue to feed and grow eventually migrating as smolts to the estuary to acclimate to saltwater. The estuary environment provides critical feeding opportunities in preparation for their migration to the ocean. The freshwater habitat needs of salmonids are diverse and include:

- Cool, clean water

- Appropriate water depth, quantity, and flow velocities
- Upland and riparian vegetation to stabilize soil and provide shade
- Overhanging vegetation for refuge from flow and predators
- Clean gravel for spawning and egg-rearing
- Large woody debris to provide refuge from flow and predators
- Adequate food
- Varied channel forms

CHINOOK SALMON (*ONCORHYNCHUS TSHAWYTSCHA*)

Chinook salmon are the largest of any salmon species and have life-histories that can be divided into ocean-type and stream-type, depending on when adults return to fresh water, season in which spawning occurs, and duration of smolts in natal streams. Most ocean-type Chinook return to their natal streams as mature adult spawners in either the summer or fall and spawn in the fall. Ocean-type smolts out-migrate during spring and early-summer to marine habitat from freshwater rearing habitat as sub-yearling. Most stream-type Chinook return to their natal streams as immature adult spawners in spring, traveling higher into the watershed than fall or summer-run Chinook, and hold in deep pools until they spawn in the fall. Stream-type smolts out-migrate during spring and early-summer to marine habitat from freshwater rearing habitat as yearlings. Spring-run Chinook salmon only occur in a few tributaries (Myers et al., 1998).

From April through November, sub-yearling ocean-type juvenile Chinook salmon inhabit the estuaries and inter-tidal areas of the Pacific Coast. These estuarine areas with fresh and salt water wetlands and aquatic/riparian vegetation provide habitats that are crucial to juvenile Chinook salmon survival. Water quality within these areas is also crucial to their survival. Increases in siltation, changes in water temperature, and loss of riparian vegetation all have negative impacts on water quality. Riparian vegetation also provides habitat for juvenile Chinook (Myers et al., 1998).

LOWER COLUMBIA RIVER ESU CHINOOK SALMON

The LCR Chinook salmon ESU was listed as threatened by NMFS on March 24, 1999. The range of the LCR Chinook salmon includes the Columbia River and its tributaries including the Willamette River to Willamette Falls. Factors limiting recovery for LCR Chinook salmon include reduced access to spawning/rearing habitat in tributaries, hatchery impacts, loss of habitat diversity and channel stability in tributaries, excessive sediment in spawning gravel, elevated water temperatures in tributaries, and harvest impacts (NMFS 2005, NMFS 2006). Critical habitat was designated for this species within the Columbia River on August 12, 2005, and includes the Restoration Site as well as the entire Lower Willamette River.

Adult and juvenile Chinook salmon use the Columbia River and the lower Willamette River for spawning, rearing, and migration. Adult fall Chinook salmon enter the Columbia River from August to late November, peaking early October through mid-November. Adult spring Chinook salmon enter the Columbia River from mid-January through late June, peaking mid-March through late May. Juvenile downstream migration peaks mid-March through late July. Juvenile Chinook rear in the Columbia and lower Willamette Rivers throughout the year. The Restoration Project will benefit LCR Chinook by providing refugia from high flows and important juvenile rearing habitat.

UPPER WILLAMETTE RIVER CHINOOK SALMON

The UWR Chinook salmon ESU was listed as threatened by NMFS on March 24, 1999, and a second time on June 28, 2005 (70 FR 37160). NMFS completed a five-year review on this ESU on August 15, 2011, and concluded that this ESU should remain listed as threatened (76 FR 50448). Critical habitat was designated for this species within the Willamette River on August 12, 2005.

The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon, as well as seven artificial propagation programs.

Adult and juvenile Chinook salmon use the lower Willamette River primarily for migration. Adult presence of UWR Chinook within the lower Willamette River would generally be found from mid-January through late June, peaking mid-March through late May. Juvenile downstream migration peaks mid-March through late July. The Restoration Project will benefit UWR Chinook by providing refugia from high flows and important rearing habitat.

COHO SALMON (*ONCHORYNCHUS KISUCH*)

LOWER COLUMBIA RIVER COHO SALMON

The LCR ESU of coho salmon is listed as threatened (70 FR 37160). Critical habitat for this ESU is under development. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon, as well as twenty-five artificial propagation programs (Weitkamp et al., 1995). Adult LCR coho salmon can be found migrating to their natal streams from June through February and spawning from September through March (Weitkamp et al., 1995). Coho generally spawn in the tributaries and headwater streams of large rivers, preferably in areas with low water velocity and small-sized gravel. Coho die soon after spawning. The eggs hatch in about one month, and the juvenile coho emerge from the gravel in about two to five weeks. The young coho usually remain in fresh water for one year, moving in and out of side-channels, sloughs, beaver ponds, and tributary streams, seeking food and shelter from the high winter currents (Weitkamp et al., 1995). Though they may begin their migration downstream from April through August, most will migrate downstream approximately one year after emerging from the gravel (Weitkamp et al., 1995). The juvenile coho will generally spend two days to one month in the Columbia River estuary, feeding and adapting to salt water before entering the open ocean. Coho generally spend two years in the ocean, returning to natal streams to spawn in their third year of life. A small percentage of the coho, usually less than five percent of the population, will return early after only one year in the ocean and are known as “Jack salmon” (Weitkamp et al., 1995).

Spawning adults and out-migrating smolts of coho salmon from this ESU use the mainstem Columbia River and Willamette River for rearing and migration (URS, 2012). Out-migrating coho smolts likely use the Restoration Project for migration and rearing in suitable nearshore habitats. The Restoration Project will benefit adults and juvenile coho by providing increased off-channel habitat, increased prey availability, and habitat improvements.

STEELHEAD (*ONCHORYNCHUS MYKISS*)

LOWER COLUMBIA RIVER STEELHEAD

The LCR steelhead DPS was listed as threatened by NMFS on March 19, 1998, and reaffirmed on January 5, 2006. NOAA Fisheries issued results of a five-year review on Aug. 15, 2011, and concluded that this species should remain listed as threatened (76 FR 50448).

The DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive), as well as 10 artificial propagation programs. Excluded are steelhead populations in the upper Willamette River Basin above Willamette Falls, Oregon, and from the Little and Big White Salmon Rivers, Washington. Adult LCR steelhead enter the Willamette River from January to June, peaking from mid-January to late April. Juvenile steelhead rear in the Willamette River throughout the year. Juvenile downstream migration peaks from March to mid-August. The Restoration Project will benefit adults and juvenile LCR steelhead. Adults and juveniles will benefit from increased off-channel habitat, increased prey availability, and habitat improvements during out-migration.

UPPER WILLAMETTE RIVER STEELHEAD

The UWR steelhead ESU was listed as threatened by NMFS on March 25, 1999. NOAA Fisheries issued results of a five-year review on Aug. 15, 2011, and concluded that this species should remain listed as threatened (76 FR 50448). Critical habitat was designated for this species within the Willamette River on August 12, 2005. The DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive).

Adult and juvenile steelhead use the lower Willamette River primarily for migration. Adult and juvenile presence of UWR steelhead within the lower Willamette River would generally be found within the same timeframe as LCR steelhead (Section 3.5.3). The Restoration Project will provide benefits to UWR Chinook from increased off-channel habitat which provides refugia from high flows, increased prey availability, and habitat improvements,.

3.8.2 Other Target Species

BALD EAGLE (*HALIAEETUS LEUCOCEPHALUS*)

Bald eagles primarily nest in forested areas within 2 miles of fish-bearing water bodies including rivers, lakes and estuaries (DeGraaf et al. 1980; Peterson 1986). Bald eagles require the presence of large, mature trees, such as Sitka spruce, Douglas-fir, and black cottonwood to use for nesting and perching, and access to shallow-water areas for foraging. Nest trees are characterized by having large trunk forks or multiple forks of the trunk and are typically surrounded by a buffer of additional trees. Bald eagles are sensitive to human disturbance and protection from human disturbance is important for nesting, successful hunting, and feeding of young (Marshall et al. 2006).

Along the lower Columbia River, studies have reported that bald eagles forage mostly on fish (predominately large-scale sucker, American shad, and carp) which accounted for 71 percent of prey remains found at nest sites and 90 percent of direct foraging observations (Watson et al. 1991). Eagles also occasionally prey on smaller birds. Scavenging opportunities by eagles on the lower Columbia are rare and were not reported in previous studies; however, pirating of prey items from other species such as osprey and gulls is fairly common.

Eagles nesting along the lower Columbia and Willamette Rivers are year-round residents and even though their range may expand somewhat after the breeding season, they do not migrate. Migrating eagles from other areas also overwinter in the lower Columbia River.

Currently the Restoration Site supports only a very narrow band of native trees along the shoreline of the Willamette River. Due to the moderate size of the existing trees and their proximity to ongoing wood by-product processing operations, bald eagles are not expected to nest onsite. In 2012, an active bald eagle's nest was identified across Multnomah Channel in forested property owned by PGE. Portions of the Restoration Site are within a visual line-of-sight from the nest.

Following construction, the Project will include a variety of habitats, including riparian and upland forest. The forest areas will be planted with native tree species in order to establish forested habitat adjacent to the created aquatic habitat and existing waterways. The forest habitat is expected to provide habitat for a variety of bird species, including bald eagle nesting habitat (once the planted trees reach maturity). In the interim, the Restoration Site will benefit bald eagles by removing a sawmill and wood by-product processing operation and providing additional shallow water habitat as well as providing long-term benefits for salmonids in the Lower Willamette River system. In the created marsh/mudflat habitat, installed large woody debris will provide a habitat complexity element for migratory birds (including bald eagles and osprey). Perch sites in the form of tree snags may also be installed on the Restoration Site.

OSPREY (*PANDION HALIAETUS*)

Osprey prefer to nest in forested regions due to their preference for large live tress and snags located within 2 miles of a large waterbody (Henny et al. 1978; Vana-Miller 1987). Due to the conversion of forest land for development and agricultural use, osprey have adapted to man-made structures such as channel markers and utility poles for nest sites (Marshall et al. 2006). Lack of nesting opportunities (large trees and nest platforms) appear to be the primary limiting habitat feature for osprey in the Lower Willamette, as suitable open water and foraging opportunity exists.

Osprey along the Willamette River feed on fish which include large-scale sucker and northern pike minnow (Henny et al. 2003). Osprey in the area spend about 6 months on their wintering grounds in Mexico and Central America and return to their breeding grounds along the Willamette River by mid-March to early April of each year (Henny et al. 2003).

Currently the Restoration Site supports only minimal nesting opportunities for osprey in some of the moderately sized trees along the Willamette River. The developed portion of the Restoration Site (which is the majority of the Restoration Site) provides little to no habitat for osprey due to the lack of suitable foraging and nesting areas.

Following construction, the Project will include a variety of habitats beneficial to osprey, including riparian forest and upland forest. The forest areas will be planted with native tree species in order to establish forested habitat adjacent to the created aquatic habitat and the existing waterways. The forest habitat is expected to provide habitat for a variety of bird species, including osprey nesting habitat (once

the trees reach maturity). In the interim, the removal of the sawmill and wood by-product processing operations and the creation of shallow water habitat on the Restoration Site will provide direct benefits to osprey, while the long-term benefits to salmonids within the Lower Willamette River system will provide an indirect benefit to species dependent on salmonids for food source, including osprey. Once construction is complete, the existing trees on the Restoration Site will be more suitable as nesting habitat for osprey since the Restoration Site will no longer support a sawmill or wood by-product processing operation. In the created marsh/mudflat habitat, installed large woody debris will provide a habitat complexity element for migratory birds (including bald eagles and osprey). Perch sites in the form of tree snags may also be installed on the Restoration Site.

MINK (*NEOVISON VISON*)

Mink are semi-aquatic mammals primarily found around streams, riverbanks, lake shores, and fresh and saltwater marshes. Mink are associated with brushy or vegetative cover next to aquatic habitats, especially in wet areas with irregular or diverse shorelines. Mink activity occurs close to open water and prey availability is the primary factor influencing mink movement and habitat use through the year (Allen 1986).

Mink prey includes fish, crayfish, waterfowl and other water-associated mammals. Upland prey includes rabbits and rodents (Gerell 1967; Allen 1986; Verts and Carraway 1998). Bank slopes are an important factor affecting access and movement of mink into and out of the water, with steep slopes making it difficult for mink to access aquatic prey. In-stream habitat structures such as logs and logjams are important foraging areas for mink (Verts and Carraway 1998). Connectivity between habitats is also important for mink, providing access between various foraging locations and den sites. Ideal habitat in the Willamette River would consist of a nearly continuous, structurally complex corridor along the river bank that provided overhead cover (woody vegetation and debris), permitting mink to travel between upstream and downstream foraging areas, tributaries, and upland habitat. Although mink are considered non-migratory, they have been found to travel distances up to 7.5 miles between forage locations and den sites (Whitaker and Hamilton 119). Mink will use upland habitat if sufficient cover and prey are available (DeGraaf and Yamasaki 2001). Home ranges for both sexes tend to parallel the configuration of a body of water or wetland basin. Mink move back and forth to forage in a core area, which is located adjacent to the den site (Allen 1986). Gerell (1970) reported that mink had daily activity core areas that did not exceed more than 300m of shoreline. Based on this information, it is assumed that any wetland or wetland-associated habitat in the lower Willamette River has the potential to support mink or provide a corridor for mink passage.

Currently, the Restoration Site provides only limited habitat for mink in the narrow band of habitat around the perimeter of the Restoration Site. In many areas, the perimeter of the Restoration Site has steep slopes which would limit access and movement of mink into and out of the water making it difficult for mink to access aquatic prey. A small portion of the Restoration Site along the Multnomah Channel supports marsh habitat while a portion of the shoreline along the Willamette River supports a narrow band of riparian vegetation; however, these habitats are directly adjacent to the sawmill and wood by-product processing areas on the Restoration Site. The alterations made to the Restoration Site over the years have resulted in a conversion of natural habitats to industrial uses and fragmentation of habitats with limited connectivity and accessibility.

Following construction, the Project will support created channels, marsh/mudflat, riparian scrub-shrub and forest, and upland forest, all of which will be adjacent to the existing waterways (i.e., Multnomah Channel and the Willamette River). The continuous habitat which will be created or enhanced on the

Restoration Site will provide mink direct access to the aquatic environment and direct access to upland areas. The marsh, riparian scrub-shrub, and riparian forest habitats which will be directly adjacent to the created channels will provide native vegetative cover. The upland forest areas will be planted with native tree and shrub species to provide an area with increased cover. Debris piles may be constructed throughout the upland forest area to provide cover until the trees and shrubs mature to a point that they can also provide sufficient cover. The Restoration Site is expected to provide linked foraging and den site locations and has the potential to provide a corridor for mink passage.

RIVER OTTER (*LONTRA CANADENSIS*)

The river otter is highly adaptable to a wide variety of aquatic habitats. Habitat requirements include connectivity between habitats with a preference for complex overhanging vegetative cover along shorelines and access to open water. These areas are used for loafing, consuming captured prey, and interacting socially. River otters primarily prey on fish and crayfish in the Columbia River Basin; however, they may also consume crabs, mussels, amphibians, waterfowl, small mammals and insects (Toweill and Tabor 1982; Melquist and Dronkert 1987; Melquist et al. 2003). Although river otter home ranges encompass a much larger area compared to mink, the habitat need not be as continuous because otter use the river itself as a travel corridor. Otter home range and habitat use are largely dependent on prey availability and shelter. Off-channel aquatic habitat is used extensively in spring and summer months by adult females when the kits first begin to accompany their mother on foraging excursions (Reid et al. 1994).

There is limited habitat available for the river otter along the lower Willamette River between RM 0 and 15, including the Restoration Site. This is primarily due to the absence of shoreline vegetation, complex woody debris structure, and the lack of breeding and denning areas.

Currently, river otter habitat at the Restoration Site is constrained to a narrow strip around the outer perimeter of the Restoration Site, which provides limited near shore ACM functions during seasonal high water. The shoreline along the Willamette River supports a narrow strip of riparian vegetation, but this riparian fringe is directly adjacent to the wood by-product processing operation. The majority of the Project property has been extensively impacted by recent and historic uses, including: dredge material deposition, creation of a flood control levee, operation of a lumber mill, and construction of a perimeter berm for shoreline protection. Portions of the shoreline adjacent to the Multnomah channel is overly steep, which is an important factor affecting access and movement of river otter into and out of the water. The Restoration Site lacks in-stream habitat structures (e.g., logs and woody debris) that are important foraging areas for otters. The alterations made to the Restoration Site over the years have resulted in both a conversion of natural habitats to developed areas and fragmentation of natural habitats so that habitat connectivity has been lost.

Following construction, the Restoration Site will increase river otter habitat by creating channels, emergent marsh, mudflat, riparian scrub-shrub and forest, and upland forest. The Restoration Site will provide a contiguous area both waterward and landward of the SIDIC levee that would provide habitat for foraging, as well as opportunities for breeding and denning. The Project will also result in the installation of large woody debris along the created channels to mimic a mature riparian system until the planted trees have ample opportunity to establish and mature. The creation, restoration, and enhancement activities proposed for the Restoration Site are expected to improve foraging, breeding, and denning habitat for river otter across the Restoration Site.

PACIFIC LAMPREY (*ENTOSPHENUS TRIDENTATUS*)

Pacific lamprey spawn in habitat similar to that of salmon: gravel bottomed streams at the upstream end of riffle habitat. Spawning occurs between March and July depending upon location within their range. Embryos hatch in approximately 19 days at 59° Fahrenheit (F) and the ammocoetes drift downstream to areas of low velocity and fine substrates where they burrow, grow and live as filter feeders for 3 to 7 years. Ammocoetes generally move downstream as they age and but their distribution can be altered due to extreme weather events or habitat-altering anthropogenic impacts. Metamorphosis to the juvenile phase (macropthalmia) occurs gradually over several months, usually beginning in summer and is complete by winter. As developmental changes occur, including the appearance of eyes and teeth, the juveniles leave the substrate to enter the water column. Moving downstream, they migrate to the ocean between late fall and spring where they mature into adults.

Currently, habitat at the Restoration Site is constrained to a narrow riparian fringe around the outer perimeter of the Restoration Site, which provides limited near shore ACM functions during seasonal high water. This riparian fringe provides limited quality habitat. The majority of the Project property has been extensively impacted by recent and historic uses including: dredge material deposition, creation of a flood control levee, operation of a lumber mill, and construction of a perimeter berm.

Multnomah Channel and the Willamette River provide a migratory corridor for juvenile and adult Pacific lamprey as they may be able to access the sandy shallow shoreline portions of the Project adjacent to these waterways; however, portions of the shoreline have artificially steepened banks adjacent to the Multnomah Channel which would significantly limit access opportunity.

ODFW has identified numerous limiting factors in the Lower Willamette including lack of passage caused by barriers, loss of side channel habitat, scouring, and poor water quality, all of which will be improved and enhanced as a result of the Project. In order to address these factors, the Project will provide new habitat elements to support native fish, including: off-channel/side-channel waterways, shallow water, beach, edge habitats, high flow refugia, forested shoreline, and channel complexity resulting from topographic contouring and installation of LWD.

Section 4 Proposed Design

The proposed design for the Project consists of the following activities: Remove the existing sawmill infrastructure; remove pilings, overwater structures, and, if feasible, dolphins associated with the lumber mill; excavate material (including the perimeter berm) to create side channels, marsh, mudflat, beach, and riparian habitat; enhance existing riparian habitat; establish riparian habitat along Multnomah Channel, the Willamette River, and the created marsh/mudflat areas; establish forested upland; install large woody debris; and control invasive species. The Project has been designed primarily to provide habitat for native fish species occurring in the Willamette River and Multnomah Channel systems, specifically federally listed salmonids. The Project will also provide habitat benefits for numerous additional species occurring in the vicinity including Pacific lamprey, mink, otter, bald eagle, and osprey.

4.1 BASIS FOR DESIGN

The Restoration Site design was chosen to provide maximum benefits to Target Salmonids occurring in the Willamette and Columbia Rivers. Historically, the Willamette River Basin was an extensive system of open water with connected channels, emergent wetlands, and riparian and upland forests; however, over the last century the river system has been severely modified by human activities including dam and levee construction, river channelization, dredging and dredge material deposition, timber harvesting, and development. As a result, much of the high quality habitat for salmon and steelhead was removed or otherwise adversely affected.

The Restoration Project is located in the historic floodplain and tidally-influenced area of the Willamette River where Multnomah Channel diverges. The Project presents a unique opportunity for restoration and enhancement of natural floodplain and upland habitats adjacent to both the Willamette River and Multnomah Channel. Currently, the Restoration Site contains small areas around the outer perimeter that are functioning as moderate quality fish and wetland habitats, although the majority of the site has been severely impacted by previous land uses including dredge material deposition, creation of a flood control levee, operation of a lumber mill, and construction of a private perimeter berm. While portions of the Restoration Site currently support vegetation, the majority of the existing vegetation is invasive weeds such as Himalayan blackberry and reed canarygrass.

The locations and types of restoration and enhancement activities proposed for the Restoration Site were chosen based on a preliminary opportunities and constraints analysis, existing topography, and limiting factors for salmon and steelhead. Technical studies including: a Preliminary Title Report; Phase 1, Environmental Site Assessment; Phase 2, Environmental Site Assessment; Prospective Purchaser's Agreement, Consent Judgment; Cultural Resources Survey and Report; Cultural Resources Documentation of Existing Structures; Geotechnical Assessment; Wetland Delineation (sent to DSL and the Corps on 2/17/2012); Hydraulic and Hydrologic Analysis; and a Hazardous Building Materials Assessment have been conducted/prepared for the Project.

While the exact location of the Restoration Site may not have historically supported the mosaic of channels, marsh, and riparian habitat proposed for the Project, these proposed habitats were once abundant on Sauvie Island and in the lower Willamette River watershed. The location of the Restoration Site presents a rare opportunity within Portland Harbor to create high quality habitat for salmon and

steelhead while providing an area landward of the SIDIC levee to place excavated material and establish upland forest.

The Restoration Project will provide habitat for the various salmonid species occurring in the watershed as well as Pacific lamprey and possibly juvenile white sturgeon. Once constructed, the Restoration Project will provide habitats and habitat elements such as side channels, shallow water, beach, and edge habitats, refuge from high flow, forested shoreline, and large woody debris which have all been identified by the panel of experts convened by the Trustees as factors limiting the health and recovery of juvenile Chinook in the Lower Willamette River (2009). Riparian creation and enhancement will provide shade and cover, as well as additional insect production for food for salmon and steelhead populations that use the Restoration Site at varying stages of their life cycles. Large woody debris placed and/or recruited along the created channel margins and marsh will provide habitat complexity and added in-stream cover. Upland forest habitat established on the excavated material will provide habitat for numerous wildlife species. Restoration, creation, and enhancement of floodplain habitats and wetlands will provide additional habitat for salmonids during periods of high-water. Ultimately, the Restoration Project would improve designated critical habitat for five listed anadromous salmon stocks from NMFS' Willamette/Lower Columbia recovery domain (critical habitat has not been designated for LCR coho salmon).

In addition, the Project is located directly across Multnomah Channel from Fred's Marina where a 13-acre restoration project has been proposed (i.e., the Miller Creek Restoration Project). After both projects are constructed, high quality habitat will be present on both sides of Multnomah Channel in that area. The presence of two restoration projects across from one another increases the ecological value of each individual restoration project.

4.2 RESTORATION DESIGN ELEMENTS

The proposed restoration design consists of four main restoration elements: demolition; restoration of side channels and ACM; upland forest establishment; and habitat complexity establishment. These elements are described in more detail below.

Element 1 – Demolish existing sawmill complex and related infrastructure. The Alder Creek Lumber Mill and related infrastructure occur mainly waterward of the SIDIC levee although a large equipment storage building and the log storage yard are located landward of the levee. All of the structures on the Restoration Site will be demolished and removed as part of the restoration activities. These structures include: the sawmill, a pole barn, a planner, a bander shed, a truck barn, an equipment storage shed, offices, lunch room, and a bathroom. All of these structures will be dismantled and removed from the Restoration Site. To the degree practicable, materials will be recycled or salvaged. Materials that cannot be repurposed, sold, or recycled will be disposed of in appropriate land fill facilities.

Element 2 – Restore side channels, ACM, and riparian forest. Within the portion of the Restoration Site waterward of the SIDIC levee, material will be excavated to create meandering side channels flanked by tidally influenced mudflat, emergent marsh, and riparian scrub-shrub habitats. The side channels will be connected to Multnomah Channel to the west by one channel opening and the Willamette River to the east by two separate channel openings. These connections have been designed to coincide with the river levels in order to maintain flow and permanent inundation within the side channels. These connections will allow flow to enter the newly created channels, providing high-value, year-round, rearing habitat for juvenile salmon and steelhead as well as lamprey ammocoete.

Tidally influenced ACM including mud flat, emergent marsh, and scrub-shrub riparian habitats will also be created by excavating material waterward of the SIDIC levee. The created ACM habitats will be situated directly adjacent to the created channels and are expected to gradually transition from unvegetated mudflat, to emergent marsh, to low-growing scrub-shrub riparian, to riparian forest.

Element 3 – Create upland forest. The material excavated to create the side channels and the ACM will be transported to and placed within the area north and landward of the SIDIC levee (i.e., the log yard). Once the excavated material has been placed within the log yard, native upland tree species will be planted throughout the area to establish upland forest habitat. Upland forest habitat established landward of the SIDIC levee is expected to provide habitat for birds and terrestrial wildlife while also providing a buffer from adjacent land uses, and may contribute additional organic material to Multnomah Channel.

Element 4 – Provide habitat complexity: Large woody debris will be installed along the created channels and may be installed within the created marsh/mudflat habitat, if appropriate. Large woody debris provides cover and refugia from prey species as well as shade which helps to reduce high water temperatures. In order to provide a habitat complexity element for migratory birds (including bald eagles and osprey), perch sites in the form of tree snags may also be installed on the Restoration Site. Within the upland forest, debris piles may be added to provide cover for small mammals until the vegetation gets established. In addition, the upland forest habitat will include slight variations in topography, as feasible, to provide a non-uniform surface in order to more efficiently mimic a natural system.

4.3 DEMOLITION

The Restoration Site is currently occupied by the inactive Alder Creek Lumber Mill. A number of structures associated with mill operations remain on the Restoration Site. These structures include: the sawmill, a pole barn, a planner, a bander shed, a truck barn, an equipment storage shed, offices, lunch room, and a bathroom (**Figure 2**). All of these structures will be dismantled and removed from the Restoration Site. Materials that cannot be repurposed, sold, or recycled will be disposed of in appropriate land fill facilities. The industrial nature of the mill raises the potential for industrial products and by-products to be present. A Hazardous Materials Assessment for the Project site was completed by URS and hazardous materials abatement plans/specifications will be developed prior to demolition. All hazardous materials will be disposed of by Oregon Department of Environmental Quality (DEQ)-approved methods and/or in appropriate disposal facilities.

Utilities that service the mill facility, whether in service or non-functioning, will be disconnected by the appropriate utility and decommissioned in accordance with state and local regulations. Transformers located at the mill will be decommissioned by Portland General Electric personnel and the transformers and associated infrastructure will be removed from the Restoration Site and appropriately decommissioned. One on-site water supply well will also be decommissioned in accordance with Oregon Water Resources Department (OWRD) requirements. The septic tank on the Project site will be decommissioned in accordance with the City of Portland and Multnomah County requirements.

Demolition work will be completed by a wide variety of tools and specialized equipment. Such equipment ranges from hand tools (e.g. wrenches, pry bars, hammers, etc.) to specialized equipment (e.g. cutting torches, jack hammers, excavators, shears, and demolition hammers, etc.). Heavy equipment, such as dozers, excavators, dump trucks, will also be employed to move, load, and remove debris.

4.4 CONSTRUCTION

Construction of the Project will require the use of scrapers, graders, excavators, dump trucks, and/or other heavy equipment. The heavy equipment will be used to demolish the existing sawmill structures and improvements, and to create the shallow water side channels, marsh/mudflat habitat, scrub-shrub riparian habitat, riparian forest habitat, and upland forested habitat. Construction restoration activities will also include the removal of construction debris and returning areas not targeted for restoration back to pre-construction conditions. Post-construction restoration shall include the application of native seed on disturbed upland areas.

All habitat development and management activities will comply with applicable local, state, and federal regulations. Construction of the restored and enhanced habitats will be managed by the Sponsor to ensure that the habitats are constructed as designed, and that impacts to existing fish and wetland habitats as well as other sensitive resources will be minimized or avoided, where possible. In order to protect the avoided sensitive resource areas on the Project, the following measures will be implemented throughout construction.

- A Sponsor representative familiar with the project will manage habitat restoration/creation activities on a daily basis. If situations arise that could be detrimental to the avoided sensitive resource areas, the representative will have the authority to stop construction activities until corrective actions have been taken;
- The Sponsor will organize and attend pre-construction meetings and conduct environmental trainings regarding the location of wetland or other water features as well as other sensitive resources;
- Erosion control Best Management Practices (BMPs) will be implemented during construction to ensure that deleterious substances, such as sediment laden run-off from grading operations, do not enter preserved or avoided sensitive resource areas during or following construction. BMPs include, but are not limited to, grading during the dry season, temporary berms and upland spoils compaction, and seeding and mulching areas of exposed soil;
- Prior to construction, avoided sensitive resources will be marked on construction drawings. Orange construction fencing or an equivalent visual barrier will be installed around the avoided sensitive resources on the Project, as necessary to alert construction personnel to the location of these resources;
- Soil stockpiles will be located more than 50 feet from avoided sensitive resource areas, and will be surrounded with erosion control materials (i.e., silt fencing or sterile straw wattles). Stockpiles and other exposed soil will be watered for dust control and soil compaction. The application of water to exposed soils significantly reduces the potential for air quality contamination by fugitive dust. The amount of water applied to the Restoration Site will be carefully monitored to prevent erosion and surface runoff due to excessive watering. Water application will be directed away from avoided wetlands and surface water;
- All construction staging activities will occur within a designated staging area, to be identified by the restoration ecologist. The staging area will be located at least 100 feet from any avoided jurisdictional wetland or other waters of the United States, and will be marked in the field and on the construction plans. The staging area will be located landward of the SIDIC levee. All refueling and maintenance activities will occur within the staging area;

- Any hazardous materials spill will be cleaned up immediately, in accordance with all federal, state and local regulations. An Erosion and Sediment Control Plan (ESCP) will be prepared and implemented prior to the initiation of construction. Additional measures and BMPs identified in the ESCP to minimize potential impacts to water quality shall be implemented;
- A cultural resources report has been prepared and provides recommendations such as monitoring for sensitive areas. An Inadvertent Discovery and Monitoring Plan is currently being developed;
- The Sponsor will conduct a post-construction inspection to determine if any post-construction remediation is needed. If remediation actions are necessary, the Sponsor will ensure that those actions are performed by the construction personnel; and
- Upon completion of the proposed Project, the Sponsor shall provide a post-construction report within 120 days to the applicable agencies and parties. The post-construction report shall include at a minimum: (1) pre- and post-groundbreaking photographs of avoided and protected habitat for federally-listed species; (2) written documentation of all construction personnel to receive the Worker Environmental Awareness Training Program; and (3) as-built drawings with any modifications from the original designs clearly identified.

Due to the location of the Project and the nature of the proposed restoration activities, the following measures will be used to minimize any potential disturbance to threatened and endangered fish species:

- In-water work will be completed during the summer in-water work window of July 1 through October 31;
- Existing native vegetation outside of the designated construction area will not be disturbed;
- When possible, work will be done “in the dry” to reduce potential direct and/or indirect impacts to waterways;
- No dirt, sediments, petroleum products, cement or other substances deleterious to fish shall be allowed to enter jurisdictional waters during construction of the Project;
- Adequate precautions will be taken during construction to prevent the stranding of juvenile or adult fish; and
- If any listed fish becomes trapped within the work area it will be captured and released by a permitted and qualified biologist using methods approved by NMFS.

4.5 EARTHWORK

Earthwork activities associated with the project include the excavation of 442,000 cubic yards of material (consisting of dredge material, wood by-product, and native material) to create a mosaic of channel, ACM, and riparian habitats waterward of the levee. The majority of the excavated material will be transported over the levee and placed on the historic log storage yard. Approximately 100,000 cy of excavated material will be placed on the SIDIC levee and within the SIDIC easement for maintenance purposes, pending approval by SIDIC and USACE. Large equipment such as excavators, bulldozers, and possibly scrapers will be used to accomplish the earthwork.

Since some of the earth work will require excavation and fill within waters of the United States, authorization under Section 404 of the Clean Water Act from the USACE and a Removal/Fill permit from

DSL will be secured prior to commencement of construction activities for any work within waters of the State or waters of the United States, including wetlands. A Notice of Intent under Section 402 of the Clean Water Act will be submitted. An ESCP will be prepared, implemented, and kept on-site during construction. Authorization will be obtained from all other applicable agencies (e.g., Multnomah County, National Marine Fisheries Service, U.S. Fish and Wildlife Service, etc.), as required.

In addition to the earthwork described above, numerous pilings and an overwater structure off the shore of the Restoration Project will be removed. Two dolphins (i.e., group of pilings cabled together for the purpose of moorage) off the shore of the Restoration Project may also be removed.

4.6 POST-CONSTRUCTION HABITATS

Following restoration, the Restoration Project will be dominated by four main habitats: side channels, ACM (which includes mudflat, emergent marsh, beach, and riparian scrub-shrub), riparian forest, and upland forest (Figure 4).

4.6.1 Side channels

Side channels will meander throughout the portion of the Restoration Project that is waterward of the SIDIC levee. These side channels will be perennially inundated; however, the water level will fluctuate with the river level and the tidal fluctuations (during times of low flow). These side channels will provide year round habitat for salmonids occurring in the lower Willamette River and Multnomah Channel and will provide refuge, feeding opportunities, and escape from high velocity flows. The side channels will connect to both the Willamette River and Multnomah Channel by way of three created connections. In order to create flow-through channels, the channels will be designed so that the two connections to the Willamette River will function as inlets and the connection to Multnomah Channel will function as the outlet with flow generally moving from east to west. These connections will allow flow to enter the newly created channels, providing high-value, year-round, rearing habitat for juvenile salmon and steelhead as well as lamprey ammocoete. The elevations of the bottom of the side channels will range from 2.5 to 5.0 feet (NAVD 88).

4.6.2 Active Channel Margin

The ACM is a complex of habitats that includes unvegetated beach and mudflat as well as emergent marsh and woody scrub-shrub riparian areas once construction is complete. ACM will occur along the edge of the side channels, the Willamette River, and Multnomah Channel between the OHWL and the OLWL. The elevations for the ACM habitat complex range from 10 to 20 feet (NAVD 88) (Figure 11).

MUDFLAT AND BEACH

The un-vegetated beach and mudflat areas will be located between the shallow water (Willamette River, Multnomah Channel, and created side channels) and the emergent marsh. Due to wave action, the un-vegetated beach areas along Multnomah Channel and the Willamette River will be

between elevations 5 ft and 10 ft (NAVD88), while the mudflat adjacent to the side channels will be between elevations 5ft and 8 ft (NAVD88).

EMERGENT MARSH

This habitat will be semi-permanently flooded and will be contoured to facilitate flooding and draining with the fluctuating river levels. The marsh areas are expected to be vegetated with emergent marsh vegetation such as sedge and spikerush. This area will provide opportunities for rearing, foraging, and cover for juvenile salmon and steelhead as well as lamprey ammocoete. The substrate in this habitat will provide habitat for invertebrates, an important prey source for fish, shorebirds, and other wildlife.

RIPARIAN SCRUB-SHRUB FOREST

Riparian (e.g., woody) scrub-shrub habitat will be established directly adjacent to the emergent marsh. The scrub-shrub habitat will be located below the OHWL and will be characterized by low-growing woody vegetation such as willows and dogwood. This scrub-shrub habitat will provide a transition zone between the marsh habitat and the riparian forest habitat located above the OHWL (described below). Vegetation in this habitat will be dominated by trees and shrubs less than 15 feet tall.

4.6.3 Riparian Forest

Where feasible, at least 100 feet of riparian forest will be created above the OHWL and within the historic floodplain adjacent to the created scrub-shrub, marsh, mudflat, beach, and channel network. This riparian forest will be established at elevations between 20 and 31 feet (NAVD 88). The Trustees determined that while the ideal riparian buffer is 200 wide or more, a 100-foot riparian buffer will likely achieve the desired ecological benefits while working within the constraints of the Harbor. This riparian forest will be established by planting container stock, bare root, and/or live stakes of native riparian shrub and tree species. Riparian habitat along the channels and marsh/mud flat will shade open water helping to reduce water temperatures and will provide both cover from prey and food supply for fry, juvenile, and smolt salmon and steelhead, and Pacific lamprey. Riparian habitat is also expected to benefit water quality by filtering sediment and nutrients, buffer aquatic habitats from adjacent land uses, provide slope stabilization, trap woody debris, and when mature, provide large wood to the system. Portions of the eastern edge of the Restoration Site bordering the Willamette River support narrow areas of native tree and shrub species with non-native understory species. Some of these native overstory areas will be enhanced by invasive species understory control and planted with supplemental understory and overstory native species, where needed. Existing native trees and shrubs will be retained to the maximum extent practicable; however, small areas containing native woody species will need to be removed in order to create the side channel connections to Multnomah Channel and the Willamette River. Removed native woody trees will be salvaged and used onsite for habitat complexity features (e.g., large woody debris or upland debris piles) whenever practical. The amount of salvaged woody material will be determined during construction, and this material will help determine the number of LWD placed within the created side channels and ACM.

4.6.4 Upland Forest

Material excavated to create the channels and the marsh/mud flat areas will be moved north and landward of the SIDIC levee. This upland area will be planted with native tree species in order to establish forest habitat over the area. Upland forest habitat is expected to provide habitat for birds and terrestrial wildlife and a buffer from adjacent land uses, as well as contributing additional organic material to the ecosystem which could be an additional food source for salmonids. The upland forest areas will be established by planting container stock, bare root, and/or live stakes of native shrub and tree species. In addition, native upland seed will be applied to the area as well to establish native species within the understory. Within this area, micro-topography and habitat complexity elements (e.g., debris piles) will be used to increase the ecological value and to mimic a natural system. Regardless of elevation, areas on the landward side of the SIDIC levee will be forested and are classified as upland forest due to their location outside of the floodplain.

4.6.5 Habitat Structures and Complexity

Large woody debris will be installed along the created channels and may be installed within the created marsh/mudflat habitat, if appropriate. Large woody debris provides cover from prey species as well as shade which helps to reduce high water temperatures. In most cases, the large woody debris will consist of a large tree with root ball intact. In order to provide a habitat complexity element for migratory birds (including bald eagles and osprey), perch sites in the form of tree snags may also be installed on the Restoration Site.

Within the upland forest, habitat structures in the form of debris piles may be added to the area to provide cover to small mammals while the native trees become established. Small variations in topography will be added to the surface of the upland forest area in order to add habitat complexity.

4.7 PLANTING

While implementing the grading plan elements, care will be taken to minimize disturbance to existing native vegetation. While there is only minimal native vegetation on the Restoration Site, small patches of native tree species do occur along the southeastern and northwestern edge. While the channel connections to the Willamette River were located to avoid native trees to the maximum extent practicable, some trees will need to be removed. If native vegetation is disturbed during construction, any healthy native wetland herbaceous species that can reasonably be salvaged will be removed and either returned after grading is complete, or transplanted to a similarly disturbed location elsewhere on the Restoration Site. Any trees that are removed during restoration activities will be used as LWD elsewhere on the Restoration Site, as appropriate.

A planting plan, including a cross-section, will be included in the grading plan drawings. Plant sources will vary depending upon vegetation type. Herbaceous, emergent, and grass species will be installed using seed and/or plugs. Woody vegetation will be container stock, bare root, and/or live stakes. All container plants will be procured from native plant nurseries in northwestern Oregon or southwestern Washington. Choice of plant material type and size will depend upon availability of plant material at the time of implementation. Some live stakes may be collected from the existing habitats on the Project.

It is expected that the area waterward of the SIDIC levee will not require any irrigation as long as the installation year is a normal precipitation year. The northwestern area (landward of the SIDIC levee) may require irrigation for the tree plantings in the first few years in order for the trees to fully establish and for the roots to grow deep enough to utilize groundwater.

Broadcast seeding will be used to apply seed mix to all disturbed upland areas. Seeding will occur prior to the rainy season in order to provide soil stabilization on the Restoration Project. Seed mix containing suitable native upland plant species will be applied to all disturbed upland areas. The seed mix will be developed in order to minimize the extent of non-native and invasive species establishment on the Project.

Section 5 Restoration Site - Specific Goals, Objectives, and Performance Standards

The goals and objectives of the proposed restoration activities are based on improving the functions and values of the habitats on the Restoration Project. Goals are broad statements that generally define the intent or purpose of the proposed restoration. Objectives specify the direct actions necessary to achieve the stated goals. Performance standards are the measurable values of specific variables that verify when objectives have been met. They provide the basis for determining if the restoration is a regulatory success.

5.1 PROJECT GOALS AND OBJECTIVES

5.1.1 Goals and Objectives

Project Goal 1: Permanent protection and stewardship of the Restoration Project.

Objective 1A: Complete the development of a Restoration Plan agreement and supporting documentation approved by the appropriate agencies/parties.

Objective 1B: Protect habitat function by placing a conservation easement over the Restoration Project.

Objective 1C: Establish a long-term management and maintenance endowment fund, and establish financial assurances for the Restoration Project

Objective 1E: Implement long-term maintenance, financing, and protection.

Project Goal 2: Remove industrial facility (i.e., Alder Creek Lumber Mill) from the floodplain of the Willamette River.

Objective 2A: Demolish and remove the buildings, improvements, infrastructure, and fill material associated with the Alder Creek Lumber Mill from the floodplain of the Willamette River.

Objective 1A: Implement invasive vegetation controls; prevent significant re-colonization during habitat establishment.

Project Goal 2: Create approximately 2.11 acres of side channel habitat directly connected to Multnomah Channel and the Willamette River.

Objective 2A: Through grading and excavation, create new side channel habitat accessible to all fish species found in Multnomah Channel and the Willamette River.

Project Goal 3: Restore and or enhance approximately 3.47 acres of ACM in the form of mudflat and beach habitat.

Objective 3A: Through grading and excavation, restore mudflat and beach habitat accessible to all fish species found in Multnomah Channel and the Willamette River.

Project Goal 4: Restore approximately 5.65 acres of ACM in the form of vegetated marsh surrounding the restored mudflat habitat.

Objective 4A: Through grading and excavation, restore a strip surrounding the mudflat and channels to elevation 8.5 to 10 (NAVD 88) to support marsh habitat.

Objective 4B: Install marsh plug plantings per the approved planting plan throughout the marsh habitat to facilitate the establishment of emergent marsh vegetation adjacent to the restored mudflat habitat.

Project Goal 5: Restore and/or enhance approximately 11.74 acres of ACM in the form of riparian scrub-shrub and forest habitat.

Objective 5A: Through grading and excavation, restore riparian scrub-shrub and riparian forest habitat adjacent to the created marsh and along Multnomah Channel and the Willamette River.

Objective 5B: Install woody riparian scrub-shrub and tree species per the approved planting plan throughout the restored riparian scrub-shrub and forest habitat. In addition, plant and/or seed with native understory species.

Project Goal 6: Restore and/or enhance approximately 8.92 acres of riparian forest within the historic floodplain.

Objective 6A: Through grading and excavation, restore riparian forested habitat within the historic floodplain of the Willamette River.

Objective 6B: Install tree species per the approved planting plan throughout the restored and enhanced riparian forest areas. In addition, plant and/or seed with native understory species.

Project Goal 7: Restore and/or enhance approximately 20.38 acres of upland forest.

Objective 7A: Place the excavated material landward (i.e., north) of the SIDIC levee and grade to 5:1 or greater slopes with small topographic variations to create upland forest habitat.

Objective 7B: Install native woody tree species per the approved planting plan throughout the upland forest area. In addition, plant and/or seed with native understory species.

Project Goal 8: As necessary and appropriate, remove overwater structures, pilings, and dolphins from Multnomah Channel and the Willamette River.

Objective 8A: Remove the overwater structures, pilings, and dolphins using the methods in NOAA's SLOPES IV Restoration.

5.2 LONG-TERM GOALS

The long-term goal of the Project is to create, restore, and enhance habitat for the Target Salmonids in order to benefit species survival within the lower Willamette River while also providing benefits to additional important natural resources such as Pacific lamprey, mink, otter, bald eagle, osprey, wetlands, and uplands.

The main goals of the Alder Creek Restoration Project include: removing an industrial facility from the floodplain of the Willamette River; and creating/restoring side channel, ACM (including emergent marsh, mudflat, beach, scrub-shrub, and riparian forest), and riparian and upland forest habitat for the benefit of

native fish as well as terrestrial and avian species occurring in the vicinity of the Project. The objectives of the restoration activities proposed for the Project include:

- Creating new side channel habitat which will restore connectivity between the Restoration Project and Multnomah Channel and the Willamette River;
- Creating marsh, mudflat, scrub-shrub, and riparian habitat within the floodplain of the Willamette River;
- Creating upland forest habitat adjacent to the floodplain;
- Enhancing riparian vegetation through invasive species control and native understory planting;
- Installing habitat complexity elements including large woody debris and debris mounds to improve habitat complexity;
- Providing high quality, self-sustaining habitat for salmonids and other wildlife within Portland Harbor.

By implementing the above objectives, upon project completion, the Project will include the following created/restored/enhanced habitats:

- Side channel habitat – 2.11 acres;
- Mudflat or beach – 3.47 acres;
- Vegetated marsh – 5.65 acres;
- Riparian scrub-shrub and forest habitat – 11.74 acres;
- Riparian forest within the historic floodplain – 8.92 acres
- Upland forest – 20.38 acres

Over the long-term, the created/restored/enhanced habitats are expected to continually provide the intended habitat functions without significant human intervention.

5.3 PERFORMANCE STANDARDS

The Sponsor anticipates that development of the Project will result in substantial increases in aquatic, riparian, and upland forest habitats that are critically important to the majority of salmon and steelhead stocks and other native fish, including Pacific lamprey, in the lower Willamette River system. Because the restored and enhanced habitats will be used to offset impacts to species and comparable habitat in the region, Sponsor shall document that it has successfully achieved increases in the acreage and functional performance of the Project's habitats.

Monitoring at the Restoration Site will strive to answer the following questions related to performance standards:

- Was the Restoration Project constructed according to its approved design? Are any adjustments necessary to meet desired site conditions as described in the restoration plan for the site?

- Is the total quantity and quality of side-channel and ACM habitat that was created being retained over time?
- Are the vegetative communities that were retained or planted in the riparian, upland, and ACM surviving and healthy?
- Are invasive plant species being managed so they are kept to minimal levels throughout the site?
- Is the Restoration Project on track to meet its performance standards by the end of the 10-year performance period?
- Did the Restoration Project meet its performance standards? If so, can it move into the long-term stewardship phase?

Performance standards have been created for the following habitat parameters:

Hydrology

Geomorphic/structural features

Vegetation

- Emergent marsh
- Shrub-scrub and Riparian (ACM)
- Riparian Forest
- Upland forest
- Invasive plant species

Permanent protection

The performance standards reflect that riverine ecosystems are dynamic, both in terms of their plant communities and the animal populations they support. The Project will be subject to periodic natural disturbances that will affect habitat acreages as well as habitat use and value; however, these natural disturbances are an important and necessary part of sustaining ecological succession and function. The Sponsor fully expects substantial beneficial change in plant communities as well as in physical habitats based on the Project's location, geomorphological changes, and anticipated changes in hydrology following active restoration including flood control benefits. Restoration of the Project will provide increases in the quality and extent of essential habitat for Chinook salmon, steelhead, waterfowl, shorebirds, raptors, and terrestrial species. While performance standards are not prescribed for the presence or diversity of fish and other wildlife using these habitats, their use will be monitored throughout the establishment phase to inform the progress of habitat restoration conditions.

Two types of monitoring are required by the Trustees: monitoring questions related to performance standards and monitoring requirements related to Harbor-wide restoration goals. Monitoring requirements related to Harbor-wide restoration goals will address parameters that will gauge how the Restoration Site is developing and being used by fish and wildlife, but will not be tied to the performance period of the project.

5.3.1 Hydrology

Hydrologic connections to the Willamette River and Multnomah Channel will be created by excavating side channels waterward of the SIDIC levee. The following performance standards will be used to demonstrate the success of newly created hydrologic connections:

Constructed side channels and ACM (beach, mudflat, emergent marsh, and riparian scrub-shrub/forest) will flood (i.e., filling and partially or completely draining) in response to fluctuations in the daily tidal regime and seasonal river stages in the Willamette River and Multnomah Channel;

Connections shall remain open (not blocked or clogged with debris or sediment to the extent that it prevents hydrologic connectivity to the Willamette River and Multnomah Channel; and

Created and enhanced emergent marsh and riparian wetland areas will remain flooded, ponded, or saturated for a duration of time sufficient to maintain wetland hydrology (i.e. 14 or more consecutive days) or show reliable Group A or B primary wetland hydrology indicators as described in the Regional Supplement to the Corps of Engineers Wetland Delineation manual: Western Mountains, Valleys, and Coast Region (Version 2.0, May 2010).

5.3.2 Geomorphic/Structural/Large Woody Debris

This performance standard will use topographic surveys, aerial photography, hydrology, and visual site inspections to verify that the total quantity of ACM and side channel habitat is being maintained, that there are no barriers to fish entering or exiting the side channel, and that structural habitat features were installed as designed and are being retained.

Large woody debris ("LWD") performance will be based on retention of pieces and/or natural recruitment, and the following standards will be used:

Years 2, 3, 5, 7, and 10: woody debris will have an 80 percent retention rate including naturally recruited material;

Additional performance standards include:

- During years 1, 3, 5, 7, and 10, topographic surveys will be completed once a year after the wet season to document changes in site topography and structural habitat features.
- Annual inspection to document any fish barriers
- Aerial photos of the site will be collected once during later summer during years 1, 3, 7, and 10.
- Water level data loggers will be placed at a minimum of two locations and continuous data will be collected, as feasible. If determined that continuous monitoring is not feasible, an alternative monitoring schedule will be determined in consultation with the Trustee Council representatives.

If the amount of large wood on-site fails to meet performance standards in Years 2 through 10 and if existing conditions and hydraulics will allow the retention of replacement materials, LWD will be in the interior channels (and marsh/mudflat where appropriate) to achieve the targeted density. The amount of LWD will be dependent on the amount, type, and quality or suitable material salvaged during construction of the restoration project.

The following changes at the site would trigger a project review with Trustee Council representatives to determine what, if any, adaptive management actions are necessary:

- Identification of any fish passage barriers
- Changes of more than 10% in ACM and side channel habitat acreages from the as-built surveys.

- Changes of more than 20% in side channel depths from the as-built surveys. Channel depths will be measured from the OHWM.

5.3.3 Vegetation

Establishment of native vegetation at the Project is anticipated to result from both active planting and volunteer recruitment. Invasive plant species will be based on the current Oregon Department of Agriculture Noxious Weed list. Non-native plants will be labeled as such if they are listed as non-native on the USDA Plants Database (Designated A and B Lists). These lists are regularly updated and will serve as a tool to identify and target species for treatment. Specific performance standards for native habitats are described below.

Emergent Marsh

Per the approved planting plan, plug plantings of native vegetation will be installed throughout the marsh habitat to facilitate the establishment of emergent marsh vegetation adjacent to the created side channels and mudflat habitat. It is anticipated that this area will partially vegetate naturally by volunteer recruitment. However, due to the fluctuations in river levels and based on analog sites observed on Sauvie Island, the emergent marsh vegetation is expected to be sparse and narrow, dominated by two species, and flanked by scrub-shrub riparian on one side and unvegetated mudflat on the other. The following performance standards will be used to assess the successful establishment of emergent marsh vegetation:

Year 5:

- Cover:
  - ≥ 30% native herbaceous
  - ≤ 10% invasive herbaceous
  - < 40% reed canarygrass

Years 7 and 10:

- Cover:
  - ≥ 40% native herbaceous
  - ≤ 10% invasive herbaceous
  - < 40% reed canarygrass

Riparian Scrub-shrub and Riparian forest (ACM)

Establishment of riparian scrub-shrub and forest within the ACM on the Project will require active management to ensure that plant densities and percent cover performance criteria are met. The following performance standards will be used to assess successful riparian scrub-shrub and riparian forest vegetation establishment.

Years 1-5:

A minimum of 1,200 native woody stems per acre

At least 5 native woody species

Cover (during the first 5 years, woody species will be excluded from percent cover):

- ≥ 10% native herbaceous
- ≤ 10% invasive herbaceous
- < 40% reed canarygrass
- ≤ 10% invasive shrubs

Year 7:

Cover:

- ≥ 55% native woody species
- ≥ 10% native herbaceous
- ≤ 10% invasive herbaceous
- < 35% reed canarygrass
- ≤ 5% invasive shrubs

Year 10:

Cover:

- ≥ 10% native herbaceous
- ≥ 80% native woody species
- ≤ 5% invasive herbaceous and shrubs
- < 35% reed canarygrass

Volunteer recruitment of native shrubs and trees in the riparian scrub-shrub and forest planting areas may be credited towards the density per acre performance standard. If the density rates fall below the required performance standards, the Sponsor will consult with the Reviewing Parties regarding the precise plan for replanting. Replanting will be conducted during the appropriate season following monitoring. Beyond Year 5, mortality rates are expected to be minimal given the ideal conditions present at the Project for riparian vegetation, and natural succession of the plant community is anticipated to direct long-term habitat development.

Riparian forest

Establishment of woody riparian forest habitat (above the OHWL and within the 100 year historic floodplain) vegetation on the Project will require active management to ensure that plant densities and percent cover performance criteria are met. The following performance standards will be used to assess successful riparian scrub-shrub and riparian forest vegetation establishment

Years 1-5:

A minimum of 1,200 trees/shrubs per acre

At least 3 native tree species and 5 native shrub species

Cover (during the first 5 years, trees/shrubs will be excluded from percent cover):

- ≥ 10% native herbaceous
- ≤ 10% invasive herbaceous
- < 40% reed canarygrass
- ≤ 10% invasive shrubs

Year 7:

Cover:

- ≥ 50% native woody species
- ≥ 10% native herbaceous
- ≤ 10% invasive herbaceous
- < 35% reed canarygrass
- ≤ 5% invasive shrubs

Year 10:

Cover:

- ≥ 80% native woody species
- ≥ 5% native herbaceous
- ≤ 5% invasive herbaceous and shrubs
- < 35% reed canarygrass

Volunteer recruitment of native trees and shrubs in the riparian forest planting areas may be credited towards the density per acre performance standard. If the density rates fall below the required performance standards, the Sponsor will consult with the NMFS and/or the Trustees regarding the precise plan for replanting. Replanting will be conducted during the appropriate season following monitoring. Beyond Year 5, mortality rates are expected to be minimal given the ideal conditions present at the Project for riparian vegetation, and natural succession of the plant community is anticipated to direct long-term habitat development.

Upland Forest

Establishment of upland forest vegetation (which is located above the OHWL and outside the 100-year historic floodplain) will require active management to ensure that plant species survival and percent cover performance criteria are met. The following performance standards will be used to assess successful upland forest vegetation establishment.

Years 1-5:

A minimum of 500 trees/shrubs per acre

At least 1 native tree species and 4 native shrub species

Cover (during the first 5 years, trees/shrubs will be excluded from percent cover):

≥ 25% native herbaceous

≤ 15% invasive herbaceous

< 40% reed canarygrass

≤ 15% invasive shrubs

Year 7:

- ≥ 25% native woody species
- ≥ 25% native herbaceous
- ≤ 10% invasive herbaceous
- < 35% reed canarygrass
- ≤ 5% invasive shrubs

Year 10:

- ≥ 40% native woody species (at least 10% of woody species cover will be provided by oaks)
- ≥ 25% native herbaceous
- ≤ 5% invasive herbaceous and shrubs
- < 25% reed canarygrass

Volunteer recruitment of native trees and shrubs in the upland forest planting areas may be credited towards the density per acre performance standard; however, very little natural recruitment is expected to occur. If the density rates fall below the required performance standards, the Sponsor will consult with NMFS and/or the Trustees regarding the precise plan for replanting. Replanting will be conducted during the appropriate season following monitoring. Beyond Year 5, mortality rates are expected to be minimal given the ideal conditions which will be present at the Project for upland forest vegetation, and natural succession of the plant community is anticipated to direct long-term habitat development.

Invasive Plant Species Management

It is anticipated that invasive species in the marsh habitats will be managed by the establishment and proliferation of native plants following restoration activities. In the riparian areas and the upland forest, invasive species will be controlled during the establishment phase. The goal of reed canarygrass control is to keep it from out-competing the woody plantings in order to give the native plantings the competitive advantage. Baseline vegetation conditions were mapped in 2012. Invasive species performance standards have been incorporated into each habitat type above. In addition, the presence of the following invasive species will not be tolerated on the Project and will be removed when found:

- Butterfly bush (*Buddleja davidii* Franch)
- Japanese knotweed (*Polygonum cuspidatum*)

5.3.4 Permanent Protection

The Project will be permanently protected with a conservation easement. In addition, a long-term management and maintenance endowment fund account will be established and funded up to a previously determined target amount. Long-term activities covered by this fund include, but are not limited to, the following: maintenance, monitoring, remediation, management, debris removal if hydrologic function is impaired; removal of invasive vegetation impairing habitat function; beaver control if habitat function is impaired by their activity; and maintaining appropriate access to the Project.

Section 6 Monitoring

To ensure that the mitigation is progressing toward the pre-established performance standards and success criteria, Sponsor staff and/or its consultants will monitor the created and enhanced habitats on the Project. Monitoring provides an important internal feedback role in Project management and maintenance, serving as an essential link in the internal adaptive management process, which guarantees the overall success of restoration. Sponsor will prepare and submit monitoring reports to the reviewing agency after each monitoring period until all performance standards have been met. The reports will be submitted by December 31 of each monitoring year for which a report is required. These reports will document the progress that has been made towards achieving the specified performance standards. Reports will also include descriptions of remedial actions that have been approved by the reviewing agency and applied to the Project if standards are not being met. Further discussion of remedial actions can be found in Section 7.0. Monitoring will also help to guide adaptive management and evaluate/guide site stewardship activities.

Monitoring during the establishment period is directed at closely evaluating the performance of initial Project restoration treatments (Years 0 through 10) and is designed to closely evaluate the Project's trend towards meeting the project's stated success criteria and performance standards. Long-term monitoring (Years 11 and beyond) will contribute to the general knowledge of target species use of the restored habitats for the benefit of future restoration programs.

Two types of monitoring are required by the Trustees: monitoring questions related to performance standards and monitoring requirements related to Harbor-wide restoration goals. Monitoring requirements related to Harbor-wide restoration goals will address parameters that will gauge how the Restoration Site is being used by fish and wildlife and how it is contributing to the overall restoration goals for the Harbor, but will not be tied to the performance period of the project.

6.1 ESTABLISHMENT PERIOD MONITORING

Establishment period monitoring for the Restoration Site will be conducted in Years 0 through 10 and is aimed at tracking the progress of establishing the habitats including hydrology; native vegetation; recruiting and retaining large woody debris; and controlling invasive plant species. Baseline conditions will be recorded prior to construction in Year 0, where appropriate. Monitoring will be repeated, as necessary, if performance standards are not met and remedial actions are undertaken.

Monitoring reports for each Monitoring Year will be submitted to the approving agencies and parties (collectively referred to as the "Reviewing Parties"). "Monitoring Year" refers to each year in which sampling occurs. The monitoring reports shall document federally listed or candidate species identified during the monitoring surveys as well as other species targeted for restoration including Pacific lamprey, bald eagle, osprey, river otter, and mink. Performance standards have been developed for each of the enhanced and created habitat types on the Restoration Site to ensure that the acreage and habitats provide the intended functions.

If remedial activities are required to meet hydrologic and vegetation success criteria, annual monitoring of any remediated habitat will occur for two successive growing seasons after remedial actions were implemented in order to verify that hydrologic and vegetation performance standards have been met without further human intervention. Once the two years of consecutive monitoring are complete, enhanced and created habitats will continue to be monitored during any successive Monitoring Years left within the 10-year initial monitoring period.

6.1.1 Monitoring Design

In order to appropriately monitor the Restoration Site to ensure that the restoration goals are being met, a repeatable and systematic monitoring methodology will be employed. This monitoring design includes designating monitoring transects that divide the Restoration Site into even sections with transects oriented perpendicular to the axis of the floodplain. Sampling will occur randomly along selected transects.

6.1.2 Baseline Biological Monitoring for Existing Habitats

Baseline biological monitoring for the Site will be done prior to construction. For created or enhanced habitats, baseline biological monitoring will establish a baseline, or reference condition, against which establishment period and long-term monitoring can be compared in order to assess the overall lift in function of the restored or enhanced habitats over time. Comparison of long-term monitoring data against an established baseline condition will be useful in guiding adaptive management decisions to ensure the continued presence of the aquatic and forest habitats the Project was established to enhance and create. Baseline monitoring will include, but is not limited to, the following:

- Bird Assemblages – On-site point counts will be established along transects to characterize bird species composition representative of pre-construction site conditions for comparison with post-construction habitats on the site. These transects will be monitored once a month in April, May, and June 2013. If feasible, monitoring will continue through July 2013. Point counts will be placed approximately every 100 meters along each transect (as appropriate for site conditions) and will cover areas where observers can document birds in portions of each existing habitat type. Species occurrences, proportionate abundance, species richness and information such as percent native/non-native and sensitive species presence will be reported.

- Mink – Camera traps will be placed along the shoreline in at least three locations from April through June 2013 to record mink use and movement along the waterway. If feasible, monitoring will continue through August 2013. Visual surveys for tracks, scat, and den sites will be conducted in potential use areas during camera trap maintenance or at least twice a month.

- Bald Eagle – Surveys to document bald eagle use of the site will be conducted using a combination of monitoring stations along the levee and a continuous route to more closely observe existing trees. Monitoring will occur once a week, as feasible, for a total of two hours per day (vary between 2 hours dawn and 2 hours dusk) from January until either construction begins or until August 2013, whichever occurs first.

6.1.3 Aerial Photo Interpretation

Overall Project monitoring will be conducted by aerial photography in Years 1, 3, 5, 7, and 10, and then every ten years thereafter. Aerial photos will be taken during late summer each year that aerial photography is required. This will allow a year to year comparison of the development of planted vegetation, geomorphology, and will allow the tracking of general changes to the Restoration Site that may be difficult to detect during surveys constructed from the ground.

6.1.4 Photo Documentation

Photo documentation of the Project will occur during all monitoring years. Ten locations will be selected to illustrate year-to-year progress of the Project. Photo locations will be recorded with Global Positioning System (GPS) equipment and subsequent photos will be taken from the same location each year. At these permanent photograph locations the monitoring biologist will take four direction photos, one in each cardinal direction (N, E, S, W), unless the photo location borders the Project boundary, in which case photos will be taken from all directions that show the Project.

6.1.5 Hydrology and Geomorphology

During years 1, 3, 5, 7, and 10, topographic surveys will be completed once a year after the wet season to document changes in site topography and structural habitat features. Topographic surveys will include collecting topographic readings along the 5 pre-selected, permanent monitoring transects. In addition, once a year after the wet season a visual inspection will be made to document any barriers that prevent fish from entering or exiting the site. Aerial photos of the site will be collected once during late summer during years 1, 3, 5, 7, and 10. Water level data loggers should be placed at a minimum of two locations and, if feasible, data should be collected continuously. If continuous monitoring is not possible, an alternative monitoring schedule should be discussed with Trustee Council representatives.

6.1.6 Native Vegetation

Riparian and Upland Forest

Riparian and Upland Forest plantings will be monitored in late summer or early fall prior to entering winter dormancy. In order to assess plant density and survival, monitoring will include:

- direct counts of a sub-sample of live installed woody plants,
- direct counts of volunteer plants by species within established sample plots at various locations,
- vegetation cover estimates (herbaceous species only during Years 2-5 and all species thereafter), and
- representative photographs taken from (a minimum of ten) permanent photographic documentation points.

Quantitative monitoring data will be primarily collected using five main baseline transects running more or less north/south across the site (Figure X).

For density measurements, direct counts will occur in 20 to 25 sample plots, with each plot measuring 10 meters by 10 meters. Monitoring results will be tallied by species and each plant will be assessed for plant vigor (i.e., good, fair, poor).

Cover and diversity will be quantified using a quadrat method. Sampling transects will be run perpendicular to the baseline and permanent quadrats will be established along the sampling transect to evaluate vegetation development over time. Cover classes will be used to determine cover values for each species identified within the quadrat. A maximum of 10 plots will be evaluated per sampling transect. Bare soil, rock, wood, or other non-plant cover will also be quantified. The size of the quadrat will be determined based on pilot sampling data.

As part of the riparian monitoring, the presence and extent of any exotic invasive plant species will be documented throughout the riparian areas.

Emergent Marsh

Monitoring of emergent marsh vegetation will be conducted in Years 2, 3, 4, 5, 7, and 10. Monitoring shall include visual surveys of the emergent marsh vegetation. The methodology for collecting vegetation cover and species diversity will be the same basic approach as described above for riparian and upland forest. However, the location of the sampling transect will need to be determined in the field because the extent of this habitat type occurs in a fairly narrow belt along the shore. A sampling transect will be run perpendicular to the baseline transect and quadrat data will be collected along the sampling transect. The frequency of sampling quadrats and the size of quadrats will be tailored to best assess this habitat type. The sampling interval and the size of the quadrat will be determined in the field based on pilot sampling data.

The extent of existing habitat will then be compared to construction drawings and design goals in order to assess the relative success of management efforts.

6.1.7 Large Woody Debris

Large woody material monitoring will be performed in Years 2, 3, 5, 7, and 10 following winter-spring floods to assess overall quality and stability of placed large woody material as well as any natural recruited wood, and to assess their function. Monitoring will consist of visual inspections by foot or by boat.

6.1.8 Invasive Species Monitoring

The extent and percent cover by species of invasive plant vegetation was mapped prior to construction to establish baseline conditions. In Years 2 through 5, 7, and 10 invasive vegetation field surveys will be conducted annually in spring and summer. In addition, invasive species cover will be documented during the riparian, marsh, and forest habitat monitoring.

6.1.9 Fish Monitoring

Fish will be monitored at standard locations to determine the presence of native fish. The goal of fish monitoring is to document the presence of juvenile salmonids within the created side channels. The monitoring will occur within the newly created channels in Years 1, 3, 5, 7, and 10, or until juvenile salmonids are documented on the site. Sampling will take place two times per month from February through May in each monitoring year. The timing of fish monitoring is subject to weather and other ecological factors and may change based on field conditions. During fish monitoring, habitat conditions will be recorded, including shade, cover, depth, substrate, and water quality (including water temperature, dissolved oxygen, turbidity). Water quality measurements should be taken where fish monitoring occurs and at locations in the Willamette River and Multnomah Channel adjacent to the Project site. During fish surveys, occurrences of aquatic plants will be noted by species, location, and relative abundance. All potential permits necessary for the authorization of fish sampling will be acquired from the appropriate regulatory agencies. Sampling methods will adhere to all permit conditions.

Monitoring will be conducted using snorkel surveys or beach seining. Beach seining will only be conducted until juvenile salmonids are captured. Once juvenile salmonids are captured, beach seining will no longer continue. Snorkel surveys may continue through the remainder of the monitoring period, as feasible.

6.1.10 Other Wildlife Monitoring

- Bald eagle and osprey monitoring
    - Bald eagle surveys are intended to document bald eagle presence/absence and activity type if present, and any changes in bald eagle use at the site over time. Monitoring will take place in Years 3, 5, 7, and 10, once per month from January through August. Although these surveys are targeting bald eagle, other rapter sightings and behavior will also be recorded. The monitoring will be conducted from least intrusive vantage point(s) for observing bald eagle use at the Project site for a total of 2 hours per sample, varying between dawn and dusk and other daylight hours. It may be acceptable to use just one survey site if a location can be identified that can be used to monitor the entire site at once with little disturbance that could affect bald eagle behavior.
- Investigate potential bald eagle and osprey nests
    - During site visits, all potential bald eagle and osprey nests will be identified and the location recorded with a GPS. Using binoculars or spotting scopes, the nest will be observed until it can be determined if it is actively being used, and by what type of bird. This information will be recorded and the nest will be documented for future visits.
- Bird assemblages including diversity and abundance
    - Bird monitoring data will be used to document species occurrences, proportionate species abundances, species richness, and how the bird assemblage changes over time. Bird monitoring will be completed in Years 1, 3, 5, 7, and 10 and will be done in April, May, and June by point counts on transects throughout the Project site. A few randomly selected point count locations may be added, if needed, to ensure all habitat types are represented.
- Mink

- Mink usage monitoring will take place along the waterways of the Restoration Project including a 50-foot buffer from each waterway in the spring and summer in Years 3, 5, 7, and 10. Waterways include mainstem shorelines, backwater areas and side channels. Particular attention should be given to aquatic and terrestrial large wood and other cover structures during monitoring to capture use of den sites, foraging areas, and travel corridors. Survey methods include camera traps at three locations with scent stations to lure animals into camera view. Searches for tracks, scat, and den sites should also occur in designated areas with potential for mink use and shall be conducted during camera trap data collection and maintenance or at least twice a month. Monitoring should take place for at least 12 weeks of spring/summer.

- Pacific lamprey
  - Lamprey monitoring will be conducted as part of a Harbor-wide monitoring effort done by USFWS staff in accordance with the Lamprey Monitoring Plan developed by the Trustees.

During monitoring efforts for specific species, any observation or sign of other Target Species will be documented.

6.2 ESTABLISHMENT PERIOD MONITORING SCHEDULE

All created and enhanced areas will be monitored until the performance criteria have been met or a minimum of 10 years. A table containing the approximate monitoring schedule for any given year during the establishment period is provided. The month of monitoring indicated in the table is approximate and will be adjusted every year to account for rainfall, weather, and plant growth.

Monitoring reports, which summarize the results of the monitoring effort, will be submitted to the Agencies by December 31st of each Monitoring Year ("Monitoring Year" refers to each year in which sampling occurs). The monitoring reports shall document federally listed or candidate species identified during the monitoring surveys as well as other targeted species including Pacific lamprey, bald eagle, osprey, mink, and river otter. Performance standards have been developed for each of the created and enhanced habitat types on the Restoration Site to ensure that the habitats function as designed.

If remedial activities are required to meet hydrologic and vegetation success criteria, annual monitoring of any remediated habitat will occur for two successive growing seasons after remedial actions were implemented in order to verify that hydrologic and vegetation performance standards have been met without further human intervention. Once the two years of consecutive monitoring are complete, enhanced and created habitats will continue to be monitored during any successive Monitoring Years left within the 10-year initial monitoring period.

Table 2. Establishment Period Monitoring Schedule

Biological Resource *Component*	**Monitoring Frequency**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Hydrology & Geomorphology													
Visual Surveys (including LWD retention)	Years 1-10								X				
Topography	Years 1, 3, 5, 7, 10								X				
Invasive Plant Species													
Vegetation	Years 1, 2, 3, 4, 5				X				X				
Native Vegetation													
Riparian Scrub/Shrub, Riparian Forest, Upland Forest	Years 1-5, 7, 10								X				
Emergent Marsh	Years 2, 3, 4, 5, 7, 10								X				
Wildlife													
Fish Surveys	Years 1, 3, 5, 7, 10		X		X		X		X		X		X
Bald Eagle Surveys	Years 3, 5, 7, 10	X	X	X	X	X	X	X	X				
Bird Surveys	Years 1, 3, 5, 7, 10				X	X	X						
Mink Surveys	Years 3, 5, 7, 10						X						
General Site Monitoring													
Aerial Photographs	Years 1, 3, 5, 7, 10								X				
Photo Documentation	Years 1-10								X				

6.3 LONG-TERM MONITORING

Annual observational monitoring of the Project's habitats is prescribed after Year 10 to track habitat development. Long-term monitoring will be less intensive, but sufficient to provide information to allow the Sponsor to determine if habitat values are being restored and maintained as planned. The endowment for the Project will fund monitoring of basic protections and habitat maintenance needs at the end of Year 10 and beyond, in perpetuity. See the Long-Term Management Plan (Exhibit B-2) for more details. Long-term monitoring activities are summarized below.

General Site Monitoring

Overall aerial and general photographic Restoration Site monitoring will continue in Year 10 and every 10 years thereafter.

Hydrology

Visual monitoring of the channel connections, channels, mudflat, marsh, and riparian wetlands at low water will continue in Year 10 and every 10 years thereafter.

Vegetation Monitoring

Visual monitoring of vegetation will continue in Year 10 and every 10 years thereafter. An aerial photograph will be taken during the summer and photographs of established vegetation will be taken at 10-year intervals beginning in Year 10 to track Project conditions. Riparian habitats will be documented using GIS maps developed from rectified aerial photos. Sample plots evaluated during the Habitat Establishment Period will be used to ground truth and verify aerial interpretation and assess plant assemblages. Emergent marsh areas will continue to be documented through assessments of absolute cover, identification of species observed, and assessment of relative cover by species. The results of the vegetation surveys will provide feedback on how existing habitats evolve over time.

Invasive Species Monitoring

Monitoring for invasive species will continue in Year 10, with invasive species mapping. Every 10 years thereafter, invasive species cover will be assessed and control methods will be implemented, as needed.

6.4 MONITORING REPORTS

The Sponsor shall submit reports to each approving agency, in hard copy and in electronic format, on or before December 31st of each Monitoring year following the Project establishment date. Each report shall cover the period from November 1st of the preceding year (or if earlier, the Establishment Date for the first annual report) through October 31st of the current year (the “Reporting Period”).

Reports documenting the methods and results of each of the monitoring elements, including survival and percent cover assessments, and achievement of performance standards will be prepared for each monitoring year during Years 1 through 10 (the establishment period) or until all performance standards are met. These reports will detail the general Project conditions, and will include photographs of restored habitats and connecting channels, and notes on management activities for the monitoring period. During the long-term management period, monitoring reports will be prepared for each year that long-term habitat monitoring is required.

Following the achievement of all performance standards, the final establishment phase management report will be completed and submitted to the Agencies. This report will detail the general condition of the Project at the end of the establishment period and will address overall performance of the Project’s habitat development and success of management activities related to the following:

- Hydrologic function;

- Sedimentation and erosion;
- Plant community development;
- Condition of Project facilities (gates, access roads, etc.);
- Trash and debris management; and
- Fish sampling results summary.

6.4.1 Habitat Monitoring Reports

During the habitat establishment period, Sponsor shall submit habitat monitoring reports, during Years 1, 2, 3, 4, 5, 6, 7, 8, 9, and 10. After the habitat is established, habitat monitoring reports will be submitted in Year 20 and every 10 years thereafter.

The original monitoring period may be extended upon a determination that hydrologic and/or vegetation performance standards have not been met or the plantings are not on track to meet them (e.g., high mortality rate of vegetation). The monitoring requirements may also be revised in cases where adaptive management or remediation is required.

The monitoring reports will provide the Agencies with sufficient information to assess whether the Project is meeting performance standards, and to determine whether a compliance visit is warranted. Sponsor may submit monitoring reports electronically or in hard copy.

Monitoring reports will include a monitoring report narrative that provides an overview of Project conditions and functions. This monitoring report narrative should be concise and generally less than 10 pages.

Monitoring reports will also include appropriate supporting data to assist the Agencies in determining how the planting areas are progressing towards meeting vegetation performance standards. Such supporting data may include plans (such as as-built plans), maps, and photographs to illustrate Project conditions, as well as the results of functional, condition, or other assessments used to provide quantitative or qualitative measures of the functions provided by the Project.

The monitoring report narrative will include the following:

1. Project Overview (1 page)

    a. Project name.

    b. Name of party(ies) responsible for conducting the monitoring and the date(s) the inspection was conducted. All persons who prepared the report, did the monitoring, and/or wrote or edited the text will be listed.

    c. Written description of the location, any identifiable landmarks of the Project including information to locate the Project perimeter(s), and coordinates of the Restoration Site (expressed as latitude, longitudes, UTMs, state plane coordinate system, etc.).

    d. Dates any planting commenced and/or was completed.

    e. Short statement on whether the performance standards are being met.

f. Dates of any recent corrective or maintenance activities conducted since the previous report submission.

g. Specific recommendations for any additional corrective or remedial actions.

2. Requirements (1 page). List the monitoring requirements and performance standards, as specified in the approved conservation Projecting agreement and evaluate whether the Project is successfully achieving the approved performance standards or trending towards success. A table is a recommended option for comparing the performance standards to the conditions and status of the developing Project.

3. Summary Data (maximum of 4 pages). Summary data should be provided to substantiate the success and/or potential challenges associated with the Project. Photo documentation may be provided to support the findings and recommendations referenced in the monitoring report and to assist the Agencies in assessing whether the Project is meeting applicable performance standards for that monitoring period. Submitted photos should be formatted to print on a standard 8 ½-inch by 11-inch piece of paper, dated, and clearly labeled with the direction from which the photo was taken. The photo location points should also be identified on the appropriate maps.

4. Maps and Plans (maximum of 3 pages). Maps should be provided to show the location of the Project relative to other landscape features, habitat types, locations of photographic reference points, transects, sampling data points, and/or other features pertinent to the monitoring plan. In addition, the submitted maps and plans should clearly delineate the Project perimeter(s), which will assist the Agencies in locating the planting area(s) during subsequent Project inspections. Each map or diagram should be formatted to print on a standard 8 ½-inch by 11-inch piece of paper and include a legend and the location of any photos submitted for review. As-built plans may be included.

5. Conclusion (1 page). A general statement should be included that describes the conditions of the Project. If performance standards are not being met, a brief explanation of the difficulties and potential remedial actions proposed by Sponsor, including a timetable, will be provided.

6. Additional Information. The monitoring reports shall provide the following additional information.

   a. Interim Management – The report shall contain an itemized account of the management tasks conducted during the establishment period in accordance with this plan, including the following:

      i. A description of each management task conducted, the dollar amount expended and time required

      ii. The total dollar amount expended for management tasks conducted during the reporting period.

   b. Financial Operation – the report shall include information on financial operations including an itemized account of any and all activity of Sponsor regarding the Interim Management Account and the Endowment Fund.

   c. Distribution list – the report shall include the names, titles, and companies/ agencies of all persons receiving a copy of the report.

Section 7 Remedial Actions

Minor corrective measures not requiring notification or approval of the Agencies (e.g., prevention of unexpected runoff, prevention of unauthorized access to the area by placing locks on gates, etc.) will be carried out by the Sponsor or Owner within sixty (60) days of identification of the problem, unless Project conditions warrant delay (e.g., if soil is saturated and equipment will damage the upland habitat on the Project, it may be necessary to delay work until conditions improve). All other corrective actions will take place when conditions are best suited for restoration to occur, and after the Agencies have been notified or the Sponsor has received approval. A list of potential remediation guidelines are described in Table 3.

Table 3. Remediation Guidelines for the Project

Type of Disturbance	Mitigation Guideline
Channels become blocked by debris or sediment	If channels become blocked by debris or sediment such that performance standards are not being met, the potential causes will be evaluated. If it is determined that conditions will not likely be remedied by natural processes, then re-excavating the areas of the blocked channels will be considered in discussions between the Sponsor and the Agencies/Parties.
Riparian vegetation fails to establish	If mortality of planted riparian vegetation is such that performance standards are not being met, additional riparian plantings will be installed and, if needed, herbivore deterrents will be installed.
Marsh vegetation fails to establish	If the desired marsh vegetation has failed to establish such that performance standards are not being met, additional marsh plugs of desired species will be installed and, if needed, herbivore deterrents will be installed.
Invasive vegetation establishes onsite during the interim period.	Should invasive vegetation establish during the interim period, then the methods described in Section 3.2.2 the Management Plan (Exhibit B-1b) will be employed until the invasive vegetation is controlled.

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Attachment 1

APPENDIX G
CREDIT RELEASE SCHEDULE FOR ALDER CREEK

ALDER CREEK RESTORATION PROJECT
CREDIT EVALUATION

Credits for the Alder Creek Restoration Project ("Project") have been forecasted using a methodology to evaluate ecological services to juvenile salmon. The functional methodology uses units of Discounted Service Acre-Year (DSAY) values. For the purposes of this Project, one DSAY shall be equivalent to one "Credit". The following DSAY values have been forecasted for the restoration and enhancement actions on the Project:

Number of Acres	DSAY Value
52.28 acres restored and protected	749.7 DSAYs
Removal of an overwater structure, 2 registered structures (dolphins), and 253 pilings	1.6 DSAYs
Total	**751.3 DSAYs**

These DSAY numbers are based on an evaluation done by the Portland Harbor Natural Resource Trustee Council using a Habitat Equivalency Analysis, which compares the existing functional value of the Project site to the proposed functional value to determine the functional lift (measured in DSAYs). The spreadsheet used to calculate the DSAYs is attached. The DSAY evaluation was based on the conceptual design prepared for the Project. Any changes to this design may result in changes to the number of Credits potentially generated by the Project.

CREDIT TABLE AND RELEASE SCHEDULE

	Release Schedule for Restored and Enhanced Habitat	Credits/DSAYs Released
1	15% release upon recordation of the conservation easement.	112.45
2	15% release upon demolition of buildings and infrastructure.	112.45
3	20% release upon approval of the as-built drawings.	149.94
4	30% release upon achievement of year 2 performance standards.	224.91
5	10% release upon achievement of year 5 performance standards.	74.97
6	10% release upon achievement of year 10 performance standards.	74.97
	Total Credits	**749.7 DSAYs**

Notes:

1.) The number of Credits/DSAYs has been based on preliminary calculations. The final number of Credits/ DSAYs shall be based on the final acreage of habitat as shown in the final as-built drawings, attainment of performance standards, and a commitment to fund long-term stewardship of the Project.

2.) Any mitigation requirement specified as an acreage requirement shall be deducted from the available Conservation Credits/DSAYs at a ratio of 1 acre = 14.34 Credits/DSAYs.

	Release Schedule for Piling, Dolphin, and Over-water Structure Removal	Credits/DSAYs Released
1	100% release upon removal of the in-water structures.	1.6
	Total Credits	**1.6 DSAYs**

Notes:

1.) The number of Credits/DSAYs has been based on preliminary calculations. The final number of Credits/ DSAYs shall be based on the final acreage of habitat as shown in the final as-built drawings, attainment of performance standards, and a commitment to fund long-term stewardship of the Project..

APPENDIX H
MANAGEMENT PLAN

ALDER CREEK RESTORATION PROJECT

MULTNOMAH COUNTY, OREGON

MANAGEMENT PLAN

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List of Acronyms

ACM	Active Channel Margins
APN	Assessor Parcel Number
Approving Parties	Any agency or party who approved the Restoration Site for use to offset damages to natural resources to fulfill all or a portion of a restoration or mitigation obligation.
AWW	active work window
BMP	best management practices
CFR	Code of Federal Regulations
Conservation Easement Monitor	[To be determind]
Corps	U.S. Army Corps of Engineers; see also USACE
DPS	Distinct Population Segment
DSL	Oregon Department of State Lands
ESA	Federal Endangered Species Act
ESCP	Erosion and Sediment Control Plan
ESU	evolutionarily significant unit
FEMA	Federal Emergency Management Agency
FIRM	Federal Insurance Rate Map
GLO	General Land Office
GPS	global positioning system
Harbor	Portland Harbor
Land Manager	Portland Harbor Holdings II, LLC.
LCR	Lower Columbia River
LWD	large woody debris
msl	mean sea level
MUA	multiple use agriculture
NAVD 88	North American Vertical Datum of 1988
NGVD 29	National Geodetic Vertical Datum of 1929
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NRD	Natural Resources Damages
ODFW	Oregon Department of Fish and Wildlife
OHWL	Ordinary High Water Line
OLWL	Ordinary Low Water Line

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Overall Property	64-acre property owned by Portland Harbor Holdings II, LLC
Owner	Portland Harbor Holdings II, LLC
OWRD	Oregon Waters Resource Department
PAR	Property Analysis Record
Plan	Alder Creek Long-term Management Plan
Restoration Site	52.3-acre Alder Creek Restoration Project
Restoration Project	52.3-acre Alder Creek Restoration Project
Reviewing Parties	Any agency or party with review authority over the Project
RTK	real time kinematic
SIDIC	Sauvie Island Drainage Improvement Company
Sponsor	Portland Harbor Holdings II, LLC
Steward	Portland Harbor Holdings II, LLC or other natural resource conservation-oriented organization approved by the Approving Parties
Target Salmonids	Upper Willamette River (UWR) spring-run Chinook salmon (*Onchorhynchus tshawytscha),* Lower Columbia River (LCR) Chinook salmon, LCR steelhead (*Onchorhynchus mykiss*), UWR steelhead, and LCR coho salmon (*O. kisutch*)
Target Species	Target Salmonids, Pacific lamprey (*Lampetra tridentate)*, bald eagle (*Haliaeetus leucocephalus)*, osprey (*Pandion haliaetus)*, river otter (*Lutra canadensis)*, mink (*Mustela vison)*
Trustees	Portland Harbor Natural Resource Trustee Council
Trustee Council	Portland Harbor Natural Resource Trustee Council
URS	URS Corporation
USACE	U.S. Army Corps of Engineers
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWR	Upper Willamette River
Wetland Delineation Study Area	Area studied for the wetland delineation which includes the overall property, the DSL lease area, and the portion of the work area within State Lands for a total of 69.23 acres.

Section 1 Introduction

1.1 PURPOSE OF ESTABLISHMENT

The Alder Creek Restoration Project ("Restoration Project" or "Project") is being established to satisfy restoration obligations for past Natural Resource Damages (NRD) as determined by the Portland Harbor Natural Resource Trustee Council ("Trustees" or "Trustee Council"). Portland Harbor Holdings II, LLC, owns approximately 64 acres at the southern tip of Sauvie Island, Multnomah County, Oregon ("Overall Property"). The Restoration Project will encompass approximately 52.3 acres of the Overall Property. The Restoration Project is being developed under guidance from the Portland Harbor Trustee Council, the federal conservation banking program, and endangered species recovery planning efforts for federally listed Upper Willamette River (UWR) spring-run Chinook salmon (*Onchorhynchus tshawytscha),* Lower Columbia River (LCR) Chinook salmon, LCR steelhead (*Onchorhynchus mykiss*), UWR steelhead, Columbia River chum salmon (*O. keta*), and LCR coho salmon (*O. kisutch*), referred to as the "Target Species". In addition, the Project is expected to provide habitat and benefits to all native fish occurring within the lower Willamette River, as well as numerous avian and terrestrial species occurring in the vicinity of the site.

1.2 PURPOSE OF THIS MANAGEMENT PLAN

This Management Plan ("Plan") outlines the collective long-term monitoring and maintenance activities prescribed for the Restoration Project. Monitoring and maintenance activities described in this Plan were developed to assess Project goals and objectives and address habitat management requirements. This Plan is a binding and enforceable instrument, implemented by the conservation easement covering the Restoration Project.

In the case of any inconsistency in determining the legal responsibilities of the Project's Owner, Land Manager, or Conservation Easement Monitor, the Conservation Easement(s) shall take precedence over this Plan.

It should be noted that while it is the intent of this Plan to comply with federal, state and local permits, if any discrepancies between this Plan and the permits exist, the permits override the Plan stipulations unless written approval is received from the agency exerting the appropriate jurisdiction.

1.3 LAND MANAGER AND RESPONSIBILITIES

The land manager role is held by Portland Harbor Holdings II, LLC. ("Land Manager"). The Land Manager, and subsequent Land Managers upon transfer, shall implement this Plan, managing and monitoring the Restoration Project property in perpetuity to preserve its habitat and conservation values in

accordance with the conservation easement and this Plan. Long-term management tasks shall be funded through a non-wasting endowment fund ("Endowment Fund"). The Land Manager shall be responsible for providing an annual report to any approving agency or party including but not limited to the National Marine Fisheries Service ("NMFS"), the Trustee Council, and any other agency or party approving the terms and conditions of the Restoration Plan (collectively referred to as "Approving Parties") detailing the time period covered, an itemized account of the management tasks and total amount expended. Any subsequent grading or alteration of the Restoration Project's hydrology and/or topography by the Land Manager or its representatives must be approved by the "Approving Parties" and the necessary permits, agreements and consultations, such as a Section 404 permit, must be obtained, if required, in addition to consultation under the federal Endangered Species Acts.

The Land Manager's responsibilities shall include, but not be limited to, overseeing or completing the following:

- Upholding the Land Manager's responsibilities and obligations as outlined in the Conservation Easement and this Plan;
- Implementing all habitat management activities;
- Performing general inspections of the Restoration Project as required by this Plan;
- Performing or coordinating biological surveys by a qualified biologist;
- Analyzing monitoring data and recommending and coordinating any corrective action with the Approving Parties;
- Coordinating with individuals or groups wishing to use the Restoration Project for educational purposes;
- Maintaining a file for the Restoration Project. The file will contain a record of management and maintenance related activities, correspondence and determinations regarding the Restoration Project, and shall be made available to the Approving Parties and Conservation Easement Monitor upon request;
- Assessing and seeking correction for impacts to the Restoration Project from harmful uses or activities, and arranging for any corrective action necessary to ensure the performance of the habitat within the Restoration Project, as required by this Plan;
- Submitting annual reports to the Approving Parties detailing:
    - Project management activities planned for the following year;
    - Known discrepancies from the terms of the Conservation Easement(s) and this Plan;
    - General plant health in the Project;
    - Assessment of invasive plant cover;
    - Hydrological conditions on the Restoration Project;
    - Wildlife use on the Restoration Project;
    - Any monitoring activities required for that year;
    - Vandalism, trespassing, and trash problems on the Project; and
    - Summary of the Endowment Fund.
- All other Land Manager responsibilities not otherwise described in this Plan.

1.4 CONSERVATION EASEMENT MONITOR AND RESPONSIBILITIES

The Conservation Easement Monitor is the Restoration Project Monitor. For the purposes of this Plan, the term "Project Monitor" is synonymous with the "holder of the Conservation Easement". As such, the terms of the Conservation Easement govern any transfer of obligations or rights as the Project Monitor.

The responsibilities and duties of the Conservation Easement Monitor shall include:

- Upholding responsibilities and obligations as outlined in the Conservation Easement and this Plan.
- Enforcing the terms of the Conservation Easement.

1.5 OWNER

Portland Harbor Holdings II, LLC owns the Overall Property.

1.6 QUALIFIED PERSONNEL / MONITORING BIOLOGIST

The Land Manager shall retain professional biologists, botanists or other types of specialists (the "Qualified Personnel", including the "Monitoring Biologist") to conduct specialized tasks. The Monitoring Biologist shall be familiar with Oregon flora and fauna, and shall have knowledge regarding fisheries ecology. If the Land Manager or the Qualified Personnel are changed, the outgoing and incoming personnel will tour the Restoration Project site together, and the former will advise the latter of trends, problem areas, and any administrative difficulties. Duties of the Qualified Personnel may include but are not limited to:

- Monitoring and maintaining Target Species and habitat function.
- Monitoring and maintaining erosion control.
- Evaluating the presence of newly introduced invasive plant species and recommending management, if needed.
- Conducting biological surveys, collecting data on the Restoration Project, and preparing reports required by this Plan.
- Evaluating site conditions and recommending corrective action to the Land Manager.
- Assisting in reviewing or planning restoration activities, use of the Restoration Project for education or other tasks such as grant proposals.

Section 2 Property Description

2.1 SETTING AND LOCATION

The Alder Creek Restoration Project is an approximately 52.3-acre site located within the Willamette Basin, on the southernmost tip of Sauvie Island in Multnomah County, Oregon (Figure 1). The Restoration Project is part of the 64-acre Overall Property located immediately adjacent to the Willamette River and Multnomah Channel at the southernmost end of Sauvie Island (Figure 2). The Restoration Project consists of approximately 32 acres to the south (and waterward) of the Sauvie Island Drainage Improvement Company's (SIDIC) levee easement and approximately 20 acres to the north (and landward) of the SIDIC levee easement. The Project site is bordered by Multnomah Channel to the west, the Willamette River to the east, to the northwest by ESCO Landfill, and to the northeast by private property. The Project area is bisected by a north-south running utility easement. Both the SIDIC levee and the utility easement footprints are excluded from the proposed conservation easement area of the Project.

The Restoration Project is hydrologically separated into two distinct areas by the SIDIC levee: so that approximately 32 acres of the Project occur waterward of the levee while approximately 20 acres of the Project occur landward of the levee. The Restoration Project is located within Township 2N, Range 1W, Sections 27, 28, and 34 of the Linnton and Sauvie Island, Oregon 7.5-minute U.S. Geological Survey quadrangle maps, Willamette Meridian, identified by Multnomah County tax lot numbers 700 and 800. The Restoration Project is located at the divergence of the Willamette River and Multnomah Channel at the uppermost reach of the Portland Harbor Superfund site (Figure 3).

2.2 HISTORY AND LAND USE

As described in the Cultural Resources Survey prepared by Willamette Cultural Resources Associates (2011), land alterations on the site date back before the General Land Office (GLO) map from 1854 which shows a structure on the southeastern tip of the Site, which has been identified as the Menzies house, surrounded by cultivated land. The U.S. Army Corps of Engineers (USACE) maps produced in the 1880s show a dam extending across Multnomah Channel connecting to the southern boundary of the Site and shore protection works are indicated. An aerial photograph from 1929 shows the first indication that the Site was used extensively for placement of dredge material. The 1947 United States Coast and Geodetic Survey planimetric map depicts dolphins, numerous "old" pilings, a wreck, riprap, and a rock jetty off the shore of the site. According to the Alder Creek Mill owners, the lumber mill was built in the 1960s and began operating shortly thereafter.

The natural landscape on the site has been significantly modified as a result of the lumber mill activities. Modifications to the shoreline on the Site include the placement of fill, riprap, pilings, and overwater structures. Recent aerial photos show log rafts directly off-shore of the Site all along Multnomah Channel. Numerous buildings and operational areas (including wood by-product processing areas) cover almost the

entire southeastern portion of the property (Figure 4). The northwestern portion of the property consists of a few structures and a large, flat log storage area associated with the lumber mill activities.

The Site and surrounding properties are subject to Multnomah County zoning ordinances. The property is designated as Multiple Use Agriculture (MUA) 20 under the Multnomah County Code. While lumber mills are not listed in the permissible uses section of the MUA-20- zone, the existing lumber mill on the property is a lawfully established non-conforming uses as previously determined by Multnomah County. Given the purpose and operation of the Project as a public/private conservation area for habitat restoration, enhancement, and protection, the proposed use is consistent with the current zoning regulations.

The majority of the site is mostly devoid of vegetation; however, portions of the area adjacent to Multnomah Channel and the Willamette River are dominated by Himalayan blackberry (*Rubus discolor*), although there are small areas of native riparian tree and shrub species (including willow, cottonwood, and alder). Currently, only portions of the outer shoreline of the site, below the ordinary high water line (OHWL), are accessible to fish during normal daily tides.

The primary land use at the Site will be resource conservation. This will be accomplished through the recordation of a conservation easement over 52.3 acres of the site. Other uses will only be permitted in a capacity that does not interfere with the goals and objectives of the Project (e.g., bird watching, botanizing, nature study, photography, limited hunting, etc.).

2.3 TOPOGRAPHY

The Project is physically separated into two areas by the SIDIC levee: the southeastern portion of the Restoration Site is located on the waterside of the SIDIC levee, and the northwestern portion of the Restoration Site is located on the landward side of the SIDIC levee. The southeastern portion of the Restoration Site ranges in elevation from about 8 to 30 feet NAVD 88 in flat-lying areas to 65 feet NAVD 88 in the woodchip stockpile area. The area which currently houses the sawmill and associated infrastructure is generally flat while the wood by-product storage area has varying topography, and the shoreline is a combination of gently sloping beaches and artificially created steep banks. A berm consisting mainly of wood by-product and earthen material was created in 1996 to protect the sawmill complex from flooding and is still present around the perimeter of the southeastern portion of the Restoration Site. The northeastern portion of the Restoration Site is generally flat as well, but gently slopes towards the northeast. The SIDIC levee is approximately 36 feet NAVD 88 at its highest (Figure 8).

2.4 HYDROLOGY

The Project is located in an historic floodplain where the Willamette River and Multnomah Channel diverge around the southern tip of Sauvie Island and flow north to converge with the Columbia River which then flows north and west to the Pacific Ocean.

Several modifications to the natural environment have affected the hydrology on the Restoration Site. The Restoration Site has been used for dredge material placement since at least 1929. The SIDIC levee, built in the 1940s, resulted in the physical separation of the southeastern portion of the Restoration Site from the northwestern portion (Figure 4). Following the construction of the SIDIC levee, the southeastern portion of the Restoration Site was located adjacent to the Willamette River and hydrologically disconnected from the rest of Sauvie Island. The Multnomah Channel, a distributary channel, splits off from the mainstem Willamette River and flows north/northwest around the western side of Sauvie Island for approximately 21.5 miles before flowing into the Columbia River. The mainstem Willamette River flows north along the east side of Sauvie Island and then converges with the Columbia River approximately 2.6 miles downstream of the Restoration Site. The southeastern portion of the Restoration Site was further removed from natural hydrology in 1996 with the construction of a berm around the perimeter of the Restoration Site to protect the sawmill complex from high floodwaters.

The northwestern portion of the Restoration Site, which is located north and landward of the SIDIC levee, is no longer directly connected to either Multnomah Channel or the Willamette River. The area was developed as a log storage yard associated with the lumber sawmill. The development of the log yard included the creation of long linear strips compacted for log storage flanked by shallow drainages created specifically for the purpose of draining water away from the stored logs. The log storage area generally slopes gently to the northeast towards a large existing wetland area (Figure 8).

The climate in Multnomah County is a temperate marine climate typical of northwest Oregon influenced by winds from the Pacific Ocean. This area is characterized by mild, wet winters and moderately warm, dry summers. Freezing temperatures are experienced at times during the winter months. The average mean temperature for January is 41.3 ˚F while the average mean temperature in August is 68.4 ˚F. The annual precipitation on the Project is approximately 43 inches. The majority of the rainfall occurs between October and April (NRCS 2000).

Prior to restoration, the Project site contains approximately 1.76 acres of low to moderate functioning wetlands. The majority of these wetlands are mainly fed by direct precipitation. The highly degraded nature of the existing wetlands is due to the historic land uses and alterations on the Restoration Site. The Project's shoreline along Multnomah Channel and the Willamette River varies from gradually sloped, sandy beaches to artificially steepened banks. The tidal fluctuation during periods of low river levels can be as much as three feet, rising and falling twice daily (Greenworks, P.C., et al, 2001). The tidal influence is almost entirely muted during high river levels. The portion of the Restoration Site which is waterward of the SIDIC levee occasionally flooded when river levels are high (flood stage) which prompted the previous landowner to construct an earthen berm around the perimeter of the property to provide flood protection for the lumber mill. Existing wetlands on the northeastern portion of the Restoration Site (located landward of the SIDIC levee) are only connected to other waters of the United States by surface flow towards the northwest corner during large or sustained precipitation events when surface flows are substantial.

2.5 SOILS

The Project site is underlain by Quaternary Alluvium which is a surficial mantle of shallow, silty soils. These native soils have been overlain by artificial fill which consists of wood debris and emplaced dredge material. The Soil Survey of Multnomah County (Soil Survey Staff 2009) indicates that the study area contains two dominant soil mapping units, Sauvie silt loam and Sauvie silt loam (protected), with a minor

inclusion of Moag silty clay loam in the northwest portion of the site (Figure 5). The soil types are listed below in rough order of extent in the study area:

- Sauvie silt loam,
- Sauvie silt loam, protected
- Moag silty clay loam, protected, 0 to 1 percent slope.

Sauvie silt loam and Sauvie silt loam, protected, 0 to 3 percent slopes. Sauvie soil series consists of deep, poorly drained soils that formed mainly in alluvium on floodplains along the lower Columbia River and its tributaries. The soils are saturated from about December through June and are subject to freshwater overflow during high tides unless diked and artificially drained. These soils are poorly drained with the restrictive layer 80 inches deep or more. When diked and drained, the soils are used for improved hay and pasture, small grain, and truck crops. Areas that are not diked have native vegetation or are used for hay, pasture, and commercial waterfowl areas. The native vegetation supported by these soils includes red alder, ash, willow, cottonwood, grasses, and tussocks.

Moag silty clay loam, protected, 0 to 2 percent slopes. This soil type consists of very deep, very poorly drained soils formed on broad, nearly level, undulating floodplains of the Columbia River with the parent material consisting of alluvium with volcanic ash. The soils are saturated throughout the year and subject to freshwater overflow during high tides and spring floods unless diked and artificially drained. These soils are very poorly drained with a restrictive layer occurring at more than 80 inches deep. These soils are used for hay, pasture, and truck crops. Other uses include recreation and wildlife habitat. Where this soil is not cultivated, the vegetation is black cottonwood, willow, rose, and common snowberry with sedges, cattails, and grasses.

A Geotechnical report was prepared for the site in July 2011 (and updated in February 2013). As part of the geotechnical investigations, 8 borings were drilled: three within the SIDIC levee easement and 5 within the sawmill facility outside of the levee. Boring depths ranged from 30 to 71.5 feet below the existing ground surface. Soils encountered in the borings generally consisted of fill material and alluvium. The fill material was loose to medium density gray silty sand with gravel and discontinuous pockets of wood debris. Wood debris was encountered in all eight borings and varied from 5.5 to 10 feet thick with alluvial material occurring beneath the fill materials. The alluvial deposits consisted of very soft brown and gray silt with sand and trace clay to medium dense gray sand with silt. Deposits were weakly stratified and occasionally contained fine woody debris.

2.6 BUFFERS [ADJACENT LAND USES]

The Restoration Project contains several features which act as buffers for the conservation values on the site. Open water (i.e., the Willamette River and Multnomah Channel) is located to the south, southeast, and southwest of the Project. The northeastern portion of the Project is bordered by a line of mature trees, beyond which is mostly open space associated with a private residence. Beyond a line of mature trees on the northwest is the ESCO Landfill.

2.7 EXISTING HABITATS

Currently, the Project consists of a lumber mill and associated structures waterward of the SIDIC levee and a log yard and associated structures landward of the SIDIC levee. The majority of the Restoration Site is either unvegetated or sparsely vegetated with mainly non-native species. There are areas of riprap and bank stabilization along Multnomah Channel, including two small areas on either side of the Olympic Pipeline utility easement (which has been excluded from the Restoration Site). During the wetland delineation performed by URS Corporation (URS), a total of 2.071 acres of wetlands and 10.303 acres of waterways were identified within the wetland delineation study area. Approximately 1.76 acres of wetlands and 7.80 acres of waterways were identified within the 52.3-acre Restoration Site. This wetland delineation was verified by the DSL on June 12, 2012 and is pending verification by the USACE.

Natural habitats on the Project site have been significantly altered as a result of the historic and recent land uses including levee construction, lumber mill operations, wood by-product placement, dredge material deposition, bank armoring, and earthen berm construction. The existing wetlands on the Project are degraded from the historic and recent land uses on the Restoration Site and most are isolated from riverine influences as a result of manmade levees and berms. The dominant habitat type existing on the Restoration Site is developed habitat; however, patches of forest, ruderal, and active channel margin habitats also occur on the Restoration Site (Figure 6).

2.7.1 Developed

This habitat type is the most abundant on the Restoration Site (Figure 6). The developed areas include the area south and east of the levee which consists of the lumber mill, associated structures, and the wood chip sorting area. This area also includes a boat ramp/road. The developed area north of the levee consists of the developed areas of the log yard and associated structures. These areas are mostly devoid of vegetation. Where vegetation does exist, it is sparse and mostly non-native.

2.7.2 Ruderal

The second most abundant habitat type on the Restoration Site is ruderal habitat (Figure 6). This habitat type is dominated by non-native, invasive, and/or weedy species which are generally quick to colonize areas after disturbance. The ruderal habitat areas on the Restoration Site include the vegetated areas of the log storage yard, the vegetated areas around the sawmill complex, and the earthen berm which is vegetated almost entirely with Himalayan blackberry.

2.7.3 Forested

The Restoration Site contains a small amount of forested habitat (Figure 6). There is a small patch of forested habitat in the northwest portion of the Restoration Site. This habitat, which is outside of the floodplain and adjacent to the access road, consists of native trees with an understory dominated by non-native plant species. This habitat type is dominated by black cottonwood (*Populus trichocarpa*), dogwood (*Cornus sp*), Himalayan blackberry (*Rubus discolor*), common snowberry (*Symphoricarpos albus*), and Pacific blackberry (*Rubus ursinus*). There are also patches of forested habitat along the eastern edge of

the Restoration Site adjacent to the Willamette River. Some of these forested areas contain mature, tall, riparian trees while other areas contain low-growing woody tree and shrub species. Both of these forested areas have an understory that contains mostly non-native plant species.

2.7.4 Active Channel Margin

The ACM is found between the OHWL and the OLWL and occurs on the outer edge of the Restoration Site along the Willamette River and Multnomah Channel (Figure 6). The existing ACM on the Project consists of a combination of non-native and invasive herbaceous vegetation, native herbaceous vegetation, woody species (both non-native and native), mudflat, beach, and open water. Approximately 1.26 acres of unvegetated beach occurs along the perimeter of the Restoration Site, mostly on the eastern edge. As high waters recede, large woody debris, as well as various other debris (e.g., trash, small woody debris, etc.), tends to accumulate here.

2.7.5 Wetlands and Other Waters of the United States

As a result of the wetland delineation performed by URS Corporation in 2012, a total of 2.071 acres of wetlands and 10.303 acres of waterways were identified within the wetland delineation study area. In addition to the waterways identified in the wetland delineation, an additional 1.96 acres of state-owned lands within the Multnomah Channel and Willamette River have been identified for a total of 12.262 acres. According to the concurrence letter from DSL dated June 12, 2012, DSL is asserting jurisdiction over 1.655 acres of wetlands and 10.298 acres of waters within the study area. It is expected that the Corps will make a preliminary determination that all wetlands (2.071 acres) and waters (12.262 acres) within the wetland delineation study area will be considered jurisdictional by the Corps. Out of the wetlands and waterways identified, a total of 1.76 acres of wetlands and 7.80 acres of waterways (i.e., Willamette River, Multnomah Channel, and a drainage ditch) were identified on the Restoration Site.

The majority of the existing wetlands on the Restoration Site have been substantially affected by previous activities including dredge material placement, road and levee construction, and sawmill operations. The majority of the wetlands on the waterside of the levee are located on fill material within the sawmill facilities or the wood byproduct processing area. There are linear wetlands which are excavated drainage features located at the base of the SIDIC levee. During high water events, some of these features have a surface connection to the Willamette River or Multnomah Channel; however, the majority of the existing wetlands are isolated from high flows because of their elevation (e.g., perched on fill material) and due to the perimeter berm which was constructed in 1996. Within the area of the Restoration Site landward (i.e. northwest) of the SIDIC levee, the majority of the wetlands are linear features which were used to drain the log storage area. These linear features slope gently to the north and into additional wetlands (Figure 8).

2.8 WILDLIFE

A search of the USFWS and Oregon Department of Fish and Wildlife ("ODFW") databases of federally and state listed plant and wildlife species occurring within Multnomah County identified the following species with potential to occur within the vicinity of the Project.

Bald eagle (*Haliaeetus leucocephalus*), Bradshaw's desert-parsley (*Lomatium bradshawii*), bull trout (*Salvelinus confluentus*), Columbia River chum salmon, Columbian white-tailed deer (*Odocoileus virginianus leucurus*), Kincaid's lupine (*Lupinus sulphureus kincaidii*), LCR Chinook, LCR coho, LCR steelhead, Nelson's checker-mallow (*Sidalcea nelsoniana*), northern spotted owl (*Strix occidentalis caurina*), UWR Chinook, UWR steelhead, water Howelia (*Howellia aquatilis*), and Willamette daisy (*Erigeron decumbens* var. *decumbens*).

In addition to the state and federal listed species mentioned above, there are numerous federal candidate species and species of concern identified by USFWS as having the potential to occur within Multnomah County. These species will be evaluated to determine which of them have potential to occur on the Project. A special-status plant survey was conducted in spring of 2012 to determine which special-status species occur or have potential to occur on the Project site (Attachment A).

The main purpose of the Project is to create habitat for and contribute to the recovery of the Target Salmonids. The restoration activities on the Project will improve designated critical habitat of 5 listed andromous salmonid species (critical habitat has been proposed, but has not yet been designated for LCR coho) from the NMFS Willamette/Lower Columbia recovery domain. The Willamette/Lower Columbia domain includes the tidal lower Columbia River below Bonneville Dam and all of the Willamette River from its headwaters downstream to the mouth on the Columbia River. The Project will focus on habitat for all the special-status salmonids of the lower Columbia River and the Willamette River, including the following five ESUs and critical habitats for the species listed above with the exception of LCR coho salmon for which critical habitat has not yet been designated:

- LCR Chinook salmon (*O. tshawytscha*);
- UWR Chinook salmon;
- LCR coho salmon (*O. kisutch*);
- LCR steelhead (*Oncorhycus mykiss*); and
- UWR steelhead.

In addition to the listed salmon and steelhead species above, the Project is also expected to provide habitat for Pacific lamprey (*Lampetra tridentate*) and coastal cutthroat trout (*Oncorhynchus clarki* ssp.) as well as the numerous other fish, avian, and terrestrial species occurring on and within the vicinity of the Project. Specifically, in addition to the Target Salmonids, the Portland Harbor Wildlife Advisory Group has also identified the following species as injured species targeted for restoration within Portland Harbor: bald eagle, mink (*Mustela vison*), osprey (*Pandion haliaetus)*, and river otter (*Lutra canadensis*) as well as Pacific lamprey (These species together with the Target Salmonids are referred to collectively as "Target Species").

2.8.1 Target Salmonids

Habitat loss and modification are major factors in the decline of salmonid populations. Salmonid populations rely on the availability of diverse habitats with connections among those habitats. The lifecycle of salmonids involves adult salmonids that matured in the ocean returning to their home streams to spawn. Following spawning activities, embryos incubate and eventually fry emerge but they remain near the nest or "redd" until the egg sack is nearly or completely absorbed. Once the egg sack is absorbed, the juveniles swim into the stream to begin to feed. They continue to feed and grow eventually migrating as smolts to the estuary to acclimate to saltwater. The estuary environment provides critical feeding opportunities in preparation for their migration to the ocean. The freshwater habitat needs of salmonids are diverse and include:

- Cool, clean water
- Appropriate water depth, quantity, and flow velocities
- Upland and riparian vegetation to stabilize soil and provide shade
- Overhanging vegetation for refuge from flow and predators
- Clean gravel for spawning and egg-rearing
- Large woody debris to provide refuge from flow and predators
- Adequate food
- Varied channel forms

2.8.1.1 Chinook Salmon (*Oncorhynchus tshawytscha*)

Chinook salmon are the largest of any salmon species and have life-histories that can be divided into ocean-type and stream-type, depending on when adults return to fresh water, season in which spawning occurs, and duration of smolts in natal streams. Most ocean-type Chinook return to their natal streams as mature adult spawners in either the summer or fall and spawn in the fall. Ocean-type smolts out-migrate during spring and early-summer to marine habitat from freshwater rearing habitat as sub-yearling. Most stream-type Chinook return to their natal streams as immature adult spawners in spring, traveling higher into the watershed than fall or summer-run Chinook, and hold in deep pools until they spawn in the fall. Stream-type smolts out-migrate during spring and early-summer to marine habitat from freshwater rearing habitat as yearlings. Spring-run Chinook salmon only occur in a few tributaries (Myers et al., 1998).

From April through November, sub-yearling ocean-type juvenile Chinook salmon inhabit the estuaries and inter-tidal areas of the Pacific Coast. These estuarine areas with fresh and salt water wetlands and aquatic/riparian vegetation provide habitats that are crucial to juvenile Chinook salmon survival. Water quality within these areas is also crucial to their survival. Increases in siltation, changes in water temperature, and loss of riparian vegetation all have negative impacts on water quality. Riparian vegetation also provides habitat for juvenile Chinook (Myers et al., 1998).

2.8.1.2 Lower Columbia River ESU Chinook salmon

The LCR Chinook salmon ESU was listed as threatened by NMFS on March 24, 1999. The range of the LCR Chinook salmon includes the Columbia River and its tributaries including the Willamette River to

Willamette Falls. Factors limiting recovery for LCR Chinook salmon include reduced access to spawning/rearing habitat in tributaries, hatchery impacts, loss of habitat diversity and channel stability in tributaries, excessive sediment in spawning gravel, elevated water temperatures in tributaries, and harvest impacts (NMFS 2005, NMFS 2006). Critical habitat was designated for this species within the Columbia River on August 12, 2005, and includes the Restoration Site as well as the entire Lower Willamette River.

Adult and juvenile Chinook salmon use the Columbia River and the lower Willamette River for spawning, rearing, and migration. Adult fall Chinook salmon enter the Columbia River from August to late November, peaking early October through mid-November. Adult spring Chinook salmon enter the Columbia River from mid-January through late June, peaking mid-March through late May. Juvenile downstream migration peaks mid-March through late July. Juvenile Chinook rear in the Columbia and lower Willamette Rivers throughout the year. The Restoration Project will benefit LCR Chinook by providing refugia from high flows and important juvenile rearing habitat.

2.8.1.3 Upper Willamette River Chinook salmon

The UWR Chinook salmon ESU was listed as threatened by NMFS on March 24, 1999, and a second time on June 28, 2005 (70 FR 37160). NMFS completed a five-year review on this ESU on August 15, 2011, and concluded that this ESU should remain listed as threatened (76 FR 50448). Critical habitat was designated for this species within the Willamette River on August 12, 2005.

The ESU includes all naturally spawned populations of spring-run Chinook salmon in the Clackamas River and in the Willamette River, and its tributaries, above Willamette Falls, Oregon, as well as seven artificial propagation programs.

Adult and juvenile Chinook salmon use the lower Willamette River primarily for migration. Adult presence of UWR Chinook within the lower Willamette River would generally be found from mid-January through late June, peaking mid-March through late May. Juvenile downstream migration peaks mid-March through late July. The Restoration Project will benefit UWR Chinook by providing refugia from high flows and important rearing habitat.

2.8.1.4 Coho Salmon (Onchorynchus kisuch)

Lower Columbia River coho salmon

The LCR ESU of coho salmon is listed as threatened (70 FR 37160). Critical habitat for this ESU is under development. The ESU includes all naturally spawned populations of coho salmon in the Columbia River and its tributaries in Washington and Oregon, from the mouth of the Columbia up to and including the Big White Salmon and Hood Rivers, and includes the Willamette River to Willamette Falls, Oregon, as well as twenty-five artificial propagation programs (Weitkamp et al., 1995). Adult LCR coho salmon can be found migrating to their natal streams from June through February and spawning from September through March (Weitkamp et al., 1995). Coho generally spawn in the tributaries and headwater streams of large rivers, preferably in areas with low water velocity and small-sized gravel. Coho die soon after spawning. The eggs hatch in about one month, and the juvenile coho emerge from the gravel in about two to five weeks. The young coho usually remain in fresh water for one year, moving in and out of side-channels, sloughs, beaver ponds, and tributary streams, seeking food and shelter from the high winter currents (Weitkamp et al., 1995). Though they may begin their migration downstream from April through

August, most will migrate downstream approximately one year after emerging from the gravel (Weitkamp et al., 1995). The juvenile coho will generally spend two days to one month in the Columbia River estuary, feeding and adapting to salt water before entering the open ocean. Coho generally spend two years in the ocean, returning to natal streams to spawn in their third year of life. A small percentage of the coho, usually less than five percent of the population, will return early after only one year in the ocean and are known as "Jack salmon" (Weitkamp et al., 1995).

Spawning adults and out-migrating smolts of coho salmon from this ESU use the mainstem Columbia River and Willamette River for rearing and migration (URS, 2012). Out-migrating coho smolts likely use the Restoration Project for migration and rearing in suitable nearshore habitats. The Restoration Project will benefit adults and juvenile coho by providing increased off-channel habitat, increased prey availability, and habitat improvements.

2.8.1.5 Steelhead (Onchorynchus mykiss)

Lower Columbia River steelhead

The LCR steelhead DPS was listed as threatened by NMFS on March 19, 1998, and reaffirmed on January 5, 2006. NOAA Fisheries issued results of a five-year review on Aug. 15, 2011, and concluded that this species should remain listed as threatened (76 FR 50448).

The DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in streams and tributaries to the Columbia River between the Cowlitz and Wind Rivers, Washington (inclusive), and the Willamette and Hood Rivers, Oregon (inclusive), as well as 10 artificial propagation programs. Excluded are steelhead populations in the upper Willamette River Basin above Willamette Falls, Oregon, and from the Little and Big White Salmon Rivers, Washington. Adult LCR steelhead enter the Willamette River from January to June, peaking from mid-January to late April. Juvenile steelhead rear in the Willamette River throughout the year. Juvenile downstream migration peaks from March to mid-August. The Restoration Project will benefit adults and juvenile LCR steelhead. Adults and juveniles will benefit from increased off-channel habitat, increased prey availability, and habitat improvements during out-migration.

2.8.1.6 Upper Willamette River steelhead

The UWR steelhead ESU was listed as threatened by NMFS on March 25, 1999. NOAA Fisheries issued results of a five-year review on Aug. 15, 2011, and concluded that this species should remain listed as threatened (76 FR 50448). Critical habitat was designated for this species within the Willamette River on August 12, 2005. The DPS includes all naturally spawned anadromous steelhead populations below natural and manmade impassable barriers in the Willamette River, Oregon, and its tributaries upstream from Willamette Falls to the Calapooia River (inclusive).

Adult and juvenile steelhead use the lower Willamette River primarily for migration. Adult and juvenile presence of UWR steelhead within the lower Willamette River would generally be found within the same timeframe as LCR steelhead (Section 3.5.3). The Restoration Project will provide benefits to UWR Chinook from increased off-channel habitat which provides refugia from high flows, increased prey availability, and habitat improvements,.

2.8.2 Other Target Species

2.8.2.1 Bald Eagle (Haliaeetus leucocephalus)

Bald eagles primarily nest in forested areas within 2 miles of fish-bearing water bodies including rivers, lakes and estuaries (DeGraaf et al. 1980; Peterson 1986). Bald eagles require the presence of large, mature trees, such as Sitka spruce, Douglas-fir, and black cottonwood to use for nesting and perching, and access to shallow-water areas for foraging. Nest trees are characterized by having large trunk forks or multiple forks of the trunk and are typically surrounded by a buffer of additional trees. Bald eagles are sensitive to human disturbance and protection from human disturbance is important for nesting, successful hunting, and feeding of young (Marshall et al. 2006).

Along the lower Columbia River, studies have reported that bald eagles forage mostly on fish (predominately large-scale sucker, American shad, and carp) which accounted for 71 percent of prey remains found at nest sites and 90 percent of direct foraging observations (Watson et al. 1991). Eagles also occasionally prey on smaller birds. Scavenging opportunities by eagles on the lower Columbia are rare and were not reported in previous studies; however, pirating of prey items from other species such as osprey and gulls is fairly common.

Eagles nesting along the lower Columbia and Willamette Rivers are year-round residents and even though their range may expand somewhat after the breeding season, they do not migrate. Migrating eagles from other areas also overwinter in the lower Columbia River.

Currently the Restoration Site supports only a very narrow band of native trees along the shoreline of the Willamette River. Due to the moderate size of the existing trees and their proximity to ongoing wood by-product processing operations, bald eagles are not expected to nest onsite. In 2012, an active bald eagle's nest was identified across Multnomah Channel in forested property owned by PGE. Portions of the Restoration Site are within a visual line-of-sight from the nest.

Following construction, the Project will include a variety of habitats, including riparian and upland forest. The forest areas will be planted with native tree species in order to establish forested habitat adjacent to the created aquatic habitat and existing waterways. The forest habitat is expected to provide habitat for a variety of bird species, including bald eagle nesting habitat (once the planted trees reach maturity). In the interim, the Restoration Site will benefit bald eagles by removing a sawmill and wood by-product processing operation and providing additional shallow water habitat as well as providing long-term benefits for salmonids in the Lower Willamette River system. In the created marsh/mudflat habitat, installed large woody debris will provide a habitat complexity element for migratory birds (including bald eagles and osprey). Perch sites in the form of tree snags may also be installed on the Restoration Site.

2.8.2.2 Osprey (Pandion haliaetus)

Osprey prefer to nest in forested regions due to their preference for large live tress and snags located within 2 miles of a large waterbody (Henny et al. 1978; Vana-Miller 1987). Due to the conversion of forest land for development and agricultural use, osprey have adapted to man-made structures such as channel markers and utility poles for nest sites (Marshall et al. 2006). Lack of nesting opportunities (large trees and nest platforms) appear to be the primary limiting habitat feature for osprey in the Lower Willamette, as suitable open water and foraging opportunity exists.

Osprey along the Willamette River feed on fish which include large-scale sucker and northern pike minnow (Henny et al. 2003). Osprey in the area spend about 6 months on their wintering grounds in Mexico and Central America and return to their breeding grounds along the Willamette River by mid-March to early April of each year (Henny et al. 2003).

Currently the Restoration Site supports only minimal nesting opportunities for osprey in some of the moderately sized trees along the Willamette River. The developed portion of the Restoration Site (which is the majority of the Restoration Site) provides little to no habitat for osprey due to the lack of suitable foraging and nesting areas.

Following construction, the Project will include a variety of habitats beneficial to osprey, including riparian forest and upland forest. The forest areas will be planted with native tree species in order to establish forested habitat adjacent to the created aquatic habitat and the existing waterways. The forest habitat is expected to provide habitat for a variety of bird species, including osprey nesting habitat (once the trees reach maturity). In the interim, the removal of the sawmill and wood by-product processing operations and the creation of shallow water habitat on the Restoration Site will provide direct benefits to osprey, while the long-term benefits to salmonids within the Lower Willamette River system will provide an indirect benefit to species dependent on salmonids for food source, including osprey. Once construction is complete, the existing trees on the Restoration Site will be more suitable as nesting habitat for osprey since the Restoration Site will no longer support a sawmill or wood by-product processing operation. In the created marsh/mudflat habitat, installed large woody debris will provide a habitat complexity element for migratory birds (including bald eagles and osprey). Perch sites in the form of tree snags may also be installed on the Restoration Site.

2.8.2.3 Mink (Neovison vison)

Mink are semi-aquatic mammals primarily found around streams, riverbanks, lake shores, and fresh and saltwater marshes. Mink are associated with brushy or vegetative cover next to aquatic habitats, especially in wet areas with irregular or diverse shorelines. Mink activity occurs close to open water and prey availability is the primary factor influencing mink movement and habitat use through the year (Allen 1986).

Mink prey includes fish, crayfish, waterfowl and other water-associated mammals. Upland prey includes rabbits and rodents (Gerell 1967; Allen 1986; Verts and Carraway 1998). Bank slopes are an important factor affecting access and movement of mink into and out of the water, with steep slopes making it difficult for mink to access aquatic prey. In-stream habitat structures such as logs and logjams are important foraging areas for mink (Verts and Carraway 1998). Connectivity between habitats is also important for mink, providing access between various foraging locations and den sites. Ideal habitat in the Willamette River would consist of a nearly continuous, structurally complex corridor along the river bank that provided overhead cover (woody vegetation and debris), permitting mink to travel between upstream and downstream foraging areas, tributaries, and upland habitat. Although mink are considered non-migratory, they have been found to travel distances up to 7.5 miles between forage locations and den sites (Whitaker and Hamilton 1998). Mink will use upland habitat if sufficient cover and prey are available (DeGraaf and Yamasaki 2001). Home ranges for both sexes tend to parallel the configuration of a body of water or wetland basin. Mink move back and forth to forage in a core area, which is located adjacent to the den site (Allen 1986). Gerell (1970) reported that mink had daily activity core areas that did not exceed more than 300m of shoreline. Based on this information, it is assumed that any wetland or wetland-associated habitat in the lower Willamette River has the potential to support mink or provide a corridor for mink passage.

Currently, the Restoration Site provides only limited habitat for mink in the narrow band of habitat around the perimeter of the Restoration Site. In many areas, the perimeter of the Restoration Site has steep slopes which would limit access and movement of mink into and out of the water making it difficult for mink to access aquatic prey. A small portion of the Restoration Site along the Multnomah Channel supports marsh habitat while a portion of the shoreline along the Willamette River supports a narrow band of riparian vegetation; however, these habitats are directly adjacent to the sawmill and wood by-product processing areas on the Restoration Site. The alterations made to the Restoration Site over the years have resulted in a conversion of natural habitats to industrial uses and fragmentation of habitats with limited connectivity and accessibility.

Following construction, the Project will support created channels, marsh/mudflat, riparian scrub-shrub and forest, and upland forest, all of which will be adjacent to the existing waterways (i.e., Multnomah Channel and the Willamette River). The continuous habitat which will be created or enhanced on the Restoration Site will provide mink direct access to the aquatic environment and direct access to upland areas. The marsh, riparian scrub-shrub, and riparian forest habitats which will be directly adjacent to the created channels will provide native vegetative cover. The upland forest areas will be planted with native tree and shrub species to provide an area with increased cover. Debris piles may be constructed throughout the upland forest area to provide cover until the trees and shrubs mature to a point that they can also provide sufficient cover. The Restoration Site is expected to provide linked foraging and den site locations and has the potential to provide a corridor for mink passage.

2.8.2.4 River Otter (Lontra canadensis)

The river otter is highly adaptable to a wide variety of aquatic habitats. Habitat requirements include connectivity between habitats with a preference for complex overhanging vegetative cover along shorelines and access to open water. These areas are used for loafing, consuming captured prey, and interacting socially. River otters primarily prey on fish and crayfish in the Columbia River Basin; however, they may also consume crabs, mussels, amphibians, waterfowl, small mammals and insects (Toweill and Tabor 1982; Melquist and Dronkert 1987; Melquist et al. 2003). Although river otter home ranges encompass a much larger area compared to mink, the habitat need not be as continuous because otter use the river itself as a travel corridor. Otter home range and habitat use are largely dependent on prey availability and shelter. Off-channel aquatic habitat is used extensively in spring and summer months by adult females when the kits first begin to accompany their mother on foraging excursions (Reid et al. 1994).

There is limited habitat available for the river otter along the lower Willamette River between RM 0 and 15, including the Restoration Site. This is primarily due to the absence of shoreline vegetation, complex woody debris structure, and the lack of breeding and denning areas.

Currently, river otter habitat at the Restoration Site is constrained to a narrow strip around the outer perimeter of the Restoration Site, which provides limited near shore ACM functions during seasonal high water. The shoreline along the Willamette River supports a narrow strip of riparian vegetation, but this riparian fringe is directly adjacent to the wood by-product processing operation. The majority of the Project property has been extensively impacted by recent and historic uses, including: dredge material deposition, creation of a flood control levee, operation of a lumber mill, and construction of a perimeter berm for shoreline protection. Portions of the shoreline adjacent to the Multnomah channel is overly steep, which is an important factor affecting access and movement of river otter into and out of the water. The Restoration Site lacks in-stream habitat structures (e.g., logs and woody debris) that are important foraging areas for otters. The alterations made to the Restoration Site over the years have resulted in both

a conversion of natural habitats to developed areas and fragmentation of natural habitats so that habitat connectivity has been lost.

Following construction, the Restoration Site will increase river otter habitat by creating channels, emergent marsh, mudflat, riparian scrub-shrub and forest, and upland forest. The Restoration Site will provide a contiguous area both waterward and landward of the SIDIC levee that would provide habitat for foraging, as well as opportunities for breeding and denning. The Project will also result in the installation of large woody debris along the created channels to mimic a mature riparian system until the planted trees have ample opportunity to establish and mature. The creation, restoration, and enhancement activities proposed for the Restoration Site are expected to improve foraging, breeding, and denning habitat for river otter across the Restoration Site.

2.8.2.5 Pacific Lamprey (Entosphenus tridentatus)

Pacific lamprey spawn in habitat similar to that of salmon: gravel bottomed streams at the upstream end of riffle habitat. Spawning occurs between March and July depending upon location within their range. Embryos hatch in approximately 19 days at 59° Fahrenheit (F) and the ammocoetes drift downstream to areas of low velocity and fine substrates where they burrow, grow and live as filter feeders for 3 to 7 years. Ammocoetes generally move downstream as they age and but their distribution can be altered due to extreme weather events or habitat-altering anthropogenic impacts. Metamorphosis to the juvenile phase (macropthalmia) occurs gradually over several months, usually beginning in summer and is complete by winter. As developmental changes occur, including the appearance of eyes and teeth, the juveniles leave the substrate to enter the water column. Moving downstream, they migrate to the ocean between late fall and spring where they mature into adults.

Currently, habitat at the Restoration Site is constrained to a narrow riparian fringe around the outer perimeter of the Restoration Site, which provides limited near shore ACM functions during seasonal high water. This riparian fringe provides limited quality habitat. The majority of the Project property has been extensively impacted by recent and historic uses including: dredge material deposition, creation of a flood control levee, operation of a lumber mill, and construction of a perimeter berm.

Multnomah Channel and the Willamette River provide a migratory corridor for juvenile and adult Pacific lamprey as they may be able to access the sandy shallow shoreline portions of the Project adjacent to these waterways; however, portions of the shoreline have artificially steepened banks adjacent to the Multnomah Channel which would significantly limit access opportunity.

ODFW has identified numerous limiting factors in the Lower Willamette including lack of passage caused by barriers, loss of side channel habitat, scouring, and poor water quality, all of which will be improved and enhanced as a result of the Project. In order to address these factors, the Project will provide new habitat elements to support native fish, including: off-channel/side-channel waterways, shallow water, beach, edge habitats, high flow refugia, forested shoreline, and channel complexity resulting from topographic contouring and installation of LWD.

2.9 SUMMARY OF HABITAT DEVELOPMENT PLAN

The design of the Restoration Project consists of several restoration elements, including removing a sawmill from the floodplain of the Willamette River, excavating approximately 442,000 cy of material to create a variety of natural habitats within the active channel margin (ACM) of the Willamette River, and placing material landward of the levee in order to establish upland forested habitat. The natural habitats restored, created, and/or enhanced on the Project site will benefit numerous salmonid species (Target Salmonids) occurring within the Willamette River, as well as providing benefits to other aquatic, avian, and terrestrial species.

This Project will create, enhance, and protect a mosaic of habitats that will enhance fish and wildlife resources in the Lower Willamette River, an area that has experienced significant degradation of habitat including channelization, off-channel habitat removal, floodplain removal, silt loading, and water temperature increases. The most limiting or scarce habitat types within the Lower Willamette River include refuge from mainstem Willamette River flows, shallow water, and beach habitats with or without large wood assemblages, and undulating natural shorelines (NOAA 2012).

The Project will be constructed with the use of heavy equipment including bulldozers, excavators, dump trucks, etc. Construction is proposed to be completed within one construction season, and all in-water construction work is scheduled to occur within the designated in-water work window in order to minimize potential impacts to the protected resources onsite. Following construction, the Restoration Project will be protected with an in-perpetuity conservation easement and managed with funds from a non-wasting endowment fund.

At Project completion, the Project will consist of approximately 2.11 acres of restored side channel habitat, 20.86 acres of habitat within the active channel margin (which includes 3.47 acres of mudflat and beach habitat, 5.65 acres of emergent marsh, and 11.74 acres of riparian scrub-shrub and forest habitat), 8.92 acres of riparian forest within the floodplain, and 20.38 acres of forest outside of the floodplain.

The restored habitats within the Project will be held to measureable performance standards, monitoring requirements and management standards, all of which are described in the Habitat Development Plan (Exhibit B-1). To verify that the Restoration Project has achieved performance standards, activities such as regular site visits, habitat maintenance, adaptive management, effectiveness monitoring (including hydrology, vegetation, and physical monitoring), and annual reports will be required to maintain and track Project effectiveness and function during the Establishment Period. The Establishment Period for the Alder Creek Restoration Project is 10 years. After 10 years, if the site has met all performance standards or if the Establishment Period is deemed complete by the Approving Parties, the Project will move into the long-term management phase as described in this Plan. Over the long-term, the restored habitats are expected to continually provide the enhanced and restored habitat functions without significant human intervention.

2.9.1 Objectives and Performance Standards

The main goal of the Restoration Project is to restore, enhance, preserve, and protect the aquatic and riparian habitats on the Project site for the benefit of the Target Salmonids occurring in the basin as well as other fish, avian, and terrestrial species occurring within or in the vicinity of the Willamette River. The specific goals of the Project include restoration and enhancement of natural habitats onsite by conducting the following tasks:

- Removal of Industrial Sawmill and In-water Structures
- Side Channel Habitat Restoration
- ACM Habitat Restoration
- Riparian Forest Restoration
- Upland Forest Restoration
- Invasive Species Control and Native Re-vegetation
- Habitat Complexity Improvement
- Hydrologic Reconnection

The Project area offers excellent opportunities to restore and enhance a variety of aquatic and riparian habitats important to the Target Salmonids and other native fish, including Pacific lamprey.

Performance standards have been created in order to ensure the Project is meeting its habitat goals during the Establishment Period. Performance standards are located in the Habitat Development Plan.

Section 3 Long-Term Monitoring and Management

3.1 LONG-TERM MONITORING

The overall goal of long-term management is to foster the viability of the Restoration Project after the establishment period. Routine monitoring and maintenance tasks are intended to ensure the viability of the Project site in perpetuity. The long-term monitoring schedule is presented in Table 1 and is described in the following sections. The monitoring schedule is intended to provide collective monitoring guidance for the Restoration Project. Long-term monitoring (Years 11 and beyond) will contribute to the general knowledge of Target Species use of the restored habitats for the benefit of future restoration programs. Qualified biologists will monitor the preserved and restored habitats. The monitoring results will help to:

- Ensure that the Restoration Project is continuing to meet stated objectives and goals,
- Guide adaptive management actions, and
- Evaluate and guide stewardship activities on the Restoration Project.

Long-term monitoring will be less intensive than during the establishment period, but sufficient to provide information to allow the Steward to determine if habitat values are being restored and maintained as planned. The endowment will fund monitoring of basic protections and habitat maintenance needs in Year 11 and beyond, in perpetuity. Annual monitoring will assess the Project's condition; this includes degree of erosion, invasive plant species colonization, and/or other aspects that may warrant management actions. While it is not anticipated that major management actions will be needed, an objective of this Plan is to conduct monitoring to identify any issues that arise, and use adaptive management to determine what actions might be appropriate.

Table 1. Long-Term Monitoring Schedule													
Biological Resource *Component*	**Monitoring Frequency**	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
General Site Monitoring													
General observational monitoring	Annually, in Years 11, 12, 13 and every year thereafter								X				
Aerial Photography	Years 15, 25, 35 and every 10 years thereafter								X				
Hydrology													
Side channels *Active Channel Margin* *Channel connections*	Years 15, 25, 35 and every 10 years thereafter.								X				
Vegetation													
Invasive Plant Species *Riparian Plant Species* *Marsh Plant Species*	Years 15, 25, 35 and every 10 years thereafter								X				

3.1.1 Hydrology Monitoring

Visual monitoring of the hydrology of the side channels, mudflat and beach, emergent marsh, scrub-shrub forest, riparian wetlands, and connections to the Willamette River and Multnomah Channel will continue in Years 15, 25 and every 10 years thereafter. Hydraulic connections, channels, and habitats within the active channel margin will be monitored to ensure that sediment or extensive deposits of woody material are not impeding flow and channels are still functioning as intended. Open water and other inundated areas within the active channel margin will be monitored to ensure that these areas are functioning as designed. Monitoring will consist of direct visual observations and aerial photograph assessment during low river flow periods. The site will be assessed to ensure that:

- Constructed Active Channel Margin (side channels, mudflat and beach, emergent marsh, and scrub-shrub forest) are being inundated (i.e., filling and partially or completely draining) in response to fluctuations in the daily tidal regime and seasonal river stages in the Willamette River and Multnomah Channel; and
- Connections remain open (not blocked or clogged with debris or sediment to the extent that it prevents hydrologic connectivity to the Willamette River and Multnomah Channel.

3.1.2 Vegetation Monitoring

3.1.2.1 Invasive Plant Species Monitoring

In Years 15, 25 and every 10 years thereafter, invasive plant species cover will be assessed through invasive plant species mapping. Based on the results of these mapping events, control methods will be implemented as needed. Annual qualitative assessments will continue to identify the colonization of invasive plant species and prescribe any treatment that may be needed in between the 10 year mapping events.

3.1.2.2 Riparian Plant Species Monitoring

Restored riparian vegetation will continue to be monitored in Years 15, 25 and every 10 years thereafter during the late summer months using the same sample plots used during the establishment period; however, the monitoring will consist of species cover instead of live counts. An aerial photograph and on the ground photographs from permanent photographic monitoring points will be taken during the late summer months at 10-year intervals beginning in Year 15 to track Project conditions over the long-term. Riparian habitats will be documented using GIS maps developed from rectified aerial photos.

3.1.2.3 Marsh Plant Species Monitoring

Visual monitoring of restored marsh vegetation will continue in Years 15, 25 and every 10 years thereafter during the late summer months. An aerial photograph and on the ground photographs from permanent photographic monitoring points will be taken during the late summer months at 10-year intervals beginning in Year 15 to track Project conditions. Marsh habitat will be documented using GIS maps developed from rectified aerial photos.

3.1.2.4 Upland Forest Plant Species Monitoring

Restored upland forest vegetation will continue to be monitored in Years 15, 25 and every 10 years thereafter during the late summer months using the same sample plots used during the establishment period; however, the monitoring will consist of species cover instead of live counts. An aerial photograph and on the ground photographs from permanent photographic monitoring points will be taken during the late summer months at 10-year intervals beginning in Year 15 to track Project conditions over the long-term. Upland forest habitats will be documented using GIS maps developed from rectified aerial photos.

3.1.3 General Site Monitoring

Annual reconnaissance and general qualitative monitoring of the Restoration Project will be conducted every year to identify any issues such as trash dumping, erosion, or invasive species colonization. An aerial photograph and on the ground photographs from set photographic monitoring points will continue in years 15, 25 and every 10 years thereafter.

3.2 LONG-TERM MANAGEMENT

3.2.1 Adaptive Management

The Land Manager shall adjust management actions, if necessary, to meet the Restoration Project's objectives. These changes shall be based on the results of monitoring data and observations and/or new information from ongoing research on anadromous salmonids and other species of relevance. Any adaptation of the methods described in this Plan must be agreed upon by the Land Manager, Monitoring Biologist and the Approving Agencies. Techniques to address management of the new conditions, if not addressed in this Plan, may be implemented by the Land Manager upon review and written approval by the Services. Adaptive management actions will be evaluated, prioritized and implemented as funding is available.

3.2.2 Vegetation Management

The main goal of the vegetation management program is to control plant species on the Restoration Project that inhibit the establishment of desired vegetation by maximizing work effort within the 10-year establishment period, thereby minimizing cost and work during the long-term management period. Management will focus on identifying and treating those pest plants that are observed out-competing or hindering the establishment of planted and seeded species during the initial habitat establishment period. In addition, the vegetation management program will implement early detection and removal of noxious species such as butterfly bush (*Buddleja davidii*) and Japanese knotweed (*Polygonum cuspidatum*) that are readily controlled if removed during their initial establishment. By focusing on those species, the vegetation program will support native plant establishment and growth and allow their presence and cover to provide for much of the long-term control of pest plants.

The Botanical Survey done by URS in 2012 identified several noxious weeds designated as "List B" by the Oregon Department of Agriculture including: butterfly bush, Canada thistle (*Cirsium arvense*), bull thistle (*Cirsium vulgare*), poison hemlock (*Conium maculatum*), field bindweed (*Convolvulus arvensis*), Scotch broom (*Cytisus striatus*), herb Robert (*Geranium robertianum*), common St. John's wort (*Hypericum perforatum*), yellow flag (*Iris pseudacorus*), purple loosestrife (*Lythrum salicaria*), Japanese knotweed, Himalayan blackberry (*Rubus armeniacus*), and tansy ragwort (*Senecio jacobaea*).

Both the Land Manager and the Monitoring Biologist will note the presence and assess the extent of any previously identified or newly introduced invasive plant species during general site inspections and annual surveys and recommend removal as needed. Primary methods of removing or controlling pest

plant species include: hand or mechanical removal and chemical treatment. These management techniques are discussed in detail below.

Reed canarygrass (*Phalaris arundinaceae*) and Himalayan blackberry are both pervasive plant competitors. Reed canarygrass, a species that is not on noxious weed lists but is recognized as needing control, is particularly troublesome with its rhizomatous spread, tolerance of wet soils and almost ubiquitous presence in degraded wetlands. Both reed canarygrass and Himalayan blackberry are fairly widespread on the Restoration Project, are difficult to control, and thrive on disturbance. It is likely that these two species will be the most prohibitive to native plant establishment. Therefore, special management strategies for these species have been developed and are described below.

3.2.2.1 Hand/Mechanical Removal for Invasive Pest Plant Management

Hand removal, use of small hand powered or handheld equipment (such as a Weed Wrench or a chainsaw), and mechanical methods (use of larger equipment with motors such as a small tractor with a mower or harrow) will be the preferred methods for the removal of invasive pest plant species from the Project. The Land Manager is not required to notify the Services if removal will be done by hand, hand-held equipment, mower, or tractor.

3.2.2.2 Herbicides

In some instances (i.e., extensive, severe, or persistent infestations) it may be necessary to use herbicides to control invasive plant species. All herbicides will be applied according to label instructions and will typically be applied using a low pressure spray. All herbicide applications will be conducted by a licensed pesticide applicator following all label instructions and in compliance with Oregon State laws.

3.2.2.3 Reed Canarygrass Management Strategy

When the grass has grown approximately one-foot tall, the reed canarygrass infested areas of the Project will be mowed down to a maximum of 4 inches tall (typically in early or mid-spring), followed by a broadcast application of herbicide in areas where the reed canarygrass forms a monotypic stand and no native forbs or shrubs will be affected. For areas where reed canarygrass is growing within desirable vegetation, infestations will be mowed and then followed up with a directed application of herbicide using a backpack sprayer with a hood to minimize drift. No applications will be done within twenty feet of any other surface water.

The application of glyphosate or imazapyr has been shown to be an effective tool in the management of reed canarygrass, especially when used in conjunction with mowing. Herbicide will be applied to the reed canarygrass infested areas twice a year. Herbicide applications will be conducted by a licensed pesticide applicator following all label instructions and in compliance with Oregon state laws.

Habitat restoration activities on the Project will result in areas planted with tall native shrub and tree species that can successfully outcompete and shade out the reed canarygrass (Sound Native Plants 2006). Native woody vegetation that is known to compete with and shade reed canarygrass includes willows (*Salix* sp.), big leaf maple (*Acer macropyllum*), alder (*Alnus rubra*), Oregon ash (*Fraxinus latifolia*), and black cottonwood (*Populus balsamifera* ssp. *trichocarpa*). Competitive native emergents include

American sloughgrass (*Beckmannia syzigachne*), common spikerush (*Eleocharis palustris*), and tufted hairgrass (*Deschampsia cespitosa*). All of these species, and others planted at the Project site, will be used to create structure, shade, and diversity to suppress the growth of reed canarygrass.

Management activities will also involve diligent monitoring and maintenance to control the reed canarygrass until native shrubs and trees become established. Spot spraying will be done, as appropriate, in subsequent years to control new recruits from the seed bank, staying at least twenty feet away from surface waters.

Other methods of controlling reed canarygrass that may be used on the Project include mulching using deep layers of organic material, or covering with sheets of opaque plastic, rubber, or other materials which would eliminate light to the plants, and result in killing the buried or covered plants. Plastic sheet barriers would need to be firmly anchored to the ground to prevent uplifting by the re-growth of the reed canarygrass. This method is only suitable for small areas of the Site where no planting of trees and shrubs is planned in order to minimize the growth of reed canarygrass long enough to allow native species to become established.

3.2.2.4 Himalayan Blackberry Management Strategy

Himalayan blackberry can be controlled by first cutting down the stems with a brush cutter or mower, preferably as the plants begin to flower. Then the root mass of each plant (the bulbous, gnarled mass of the crown that is visible just a few inches below ground) can be hand removed with a Weed Wrench, claw mattock, pulaski, or shovel. If this method of control is used, the entire root mass will be removed. Mulch will be placed in the resulting hole and native shrub species will be planted. All invasive plant species material removed during project implementation will be taken off-site for proper disposal. As an alternative to root mass removal after cutting/ mowing, another method of blackberry control that has proven effective onsite is a combination of mowing followed by an application of herbicide.

The re-growth of blackberry can be chemically controlled. If herbicide is applied in late spring, canes will be cut and the cut surface can be immediately brushed or dabbed with an approved herbicide. If this method is used in the late summer (August to September), a two percent solution of herbicide can be applied to the leaves. Subsequent treatments, if needed, will occur in early fall if weather permits and before the first frost. Using a lower concentration of herbicide allows the individual plant to continue functioning long enough to translocate the chemical to the roots. Several treatments may be necessary.

The types of herbicides and the methods used for blackberry control may change throughout time as technology and methods for invasive plant species improve. All herbicide applications will be conducted by a licensed pesticide applicator following all label instructions and in compliance with Oregon state laws.

3.2.3 Hydrologic Connections

Hydrologic connections between the Restoration Project and the Willamette River and Multnomah Channel have been designed to be self-maintaining; however, there may be times when sediment and/or debris may clog the Project's channels, such as major flood events. If a connection remains clogged by extensive deposits of sediment, woody material, or other debris for a full season to the point that it becomes non-functional and habitat values are degraded, PHH will work with the Approving Parties to determine if actions are necessary. If channel maintenance is determined to be necessary, maintenance

will be accomplished primarily using track type excavators, or in extreme cases, barges. If these maintenance activities are not covered under the original construction permits for the Project, additional federal, state, and local authorizations may be required prior to doing any maintenance work.

3.2.4 Large Woody Debris

It is anticipated that the Project will receive significant large wood recruitment via tidal action and natural processes. This will provide the primary supply of large woody debris on the outer perimeter of the Project along the shores of both the Willamette River and Multnomah Channel, until the riparian habitat on the Project site matures.

The large tree trunks with rootwads embedded/anchored within the created side channels and mudflat will provide habitat complexity and will also serve as collectors for natural woody debris until the forested areas of the Project can mature and begin adding woody material to the system. Annual maintenance will involve inspecting anchors and attachments to ensure that they are adequately securing the material. Maintenance will also include inspecting adjacent areas to ensure scour does not become excessive around the placed material. In the event that the woody debris needs to be re-anchored or relocated, the work will be conducted using a track type excavator. If these maintenance activities are not covered under the original construction permits for the Project, additional federal, state, and local authorizations may be required prior to doing any maintenance work.

3.2.5 Beaver and Nutria Control

Beavers may occur throughout the site, particularly along the river and channels. While certain beaver activities can benefit habitat for salmon, beavers can quickly become a nuisance (i.e. blocking restored channels, removing new riparian installations, etc…). In the event that beavers threaten the integrity of the land uses of the surrounding property or the restored and enhanced habitat, management activities will be undertaken to control the beaver population. Beaver management methods may include prevention, trapping and relocation, lethal control, or other legal methods of beaver management control. Control methods which require authorization from a Federal, State, or local agency will not be used until that authorization is obtained.

Nutria are an introduced species that can cause considerable damage to natural habitats. These large, herbivorous, semi-aquatic rodents have been observed on Sauvie Island so there is potential that they will occur on the Project site, once constructed. Because nutria burrow into the banks of rivers, sloughs, and ponds, and consume both herbaceous and woody plant species, they can cause significant damage to natural habitats in the form of erosion and plant predation (ODFW 2013). In the event that nutria are threatening the function of the restored and enhanced areas, management activities will be undertaken to control nutria on the Project site. Nutria management methods may include prevention, trapping, and/or lethal control. Control methods which require authorization from a Federal, State, or local agency will not be used until that authorization is obtained.

3.2.6 Trash Removal

The Land Manager will assess the need to remove accumulations of trash and other unwanted debris from the Project at least once per year. For the purposes of this Plan, trash and unwanted debris are defined as non-biodegradable, non-organic material including, but not limited to, household trash, derelict vessels, plastic containers, etc. Flood-transported organic material such as trees, shrubs, and branches will not be removed unless they pose a threat to habitat function.

3.2.7 Trespass and Public Access

The intent is to maintain the habitats of the Project in perpetuity, thus access to the Project site by the general public will be limited. Supervised access for educational or habitat restoration activities will be allowed. Unauthorized access to the Project will be discouraged through signage and locked gates. The Land Manager will be responsible for the maintenance of Project signage, and for keeping gates locked to prevent unauthorized motor vehicle access.

The Land Manager will be responsible for providing access to the Project. Access to the Project in emergency or law enforcement situations, by medical, fire or law enforcement personnel or vehicles is allowed. The Owner, Sponsor, Land Manager, and Approving Parties shall have access to the Project. Except in cases where the Approving Parties determine that immediate entry is required to prevent, terminate, or mitigate a violation of the Plan or the Conservation Easement(s), 48 hours notice will normally be given.

The Land Manager will be responsible for noticing any unauthorized motor vehicle use on the Project during routine inspections. No motorized vehicles, including pleasure boats, shall be used or permitted on any portion of the Project site with the exception of motorized vehicular use required for:

- Maintenance purposes;
- Biological monitoring purposes;
- Conservation easement monitoring purposes;
- Invasive plant species control and habitat maintenance;
- Emergency or law enforcement situations requiring access by medical, fire or law enforcement vehicles; and
- Access to Project for authorized recreational uses and site visits by Approving Parties.

3.2.7.1 Gates

The only gate controlling access to the Project site is a gate across the access road off of NW Gillihan Loop Road. This gate occurs on the adjacent property owner's property and they have assumed responsibility for maintaining this gate, and for keeping the gate locked to prevent unauthorized motor vehicle access. The gate will be used to provide access to the Project primarily for maintenance or monitoring work or other supervised activities.

3.2.7.2 Fencing and Signage

Fencing around the majority of the Project is not practical because a large portion of the Project is within the active floodplain of the Willamette River. The presence of fences waterward of the SIDIC levee would result in accumulation of flood debris and damage to fences, thus requiring frequent replacement. Fencing could also be ripped out by floodwaters and deposited downstream potentially posing a risk to boaters, swimmers, and other waterway users.

Currently, no fencing is proposed onsite since the Project is only accessible by car from a private road. The landowner to the north of the Project has a well maintained fence along the northwest boundary. "No-trespassing" signs will be posted in areas most likely to be accessed by trespassers (e.g., along the access road). If trespassing becomes a problem landward of the SIDIC levee, fencing may be installed around the perimeter of the site. If trespassing becomes a problem waterward of the SIDIC levee, trespassing will be discouraged by the placement of no trespassing signs that reflect the extent of restoration that is being undertaken on the Project. Any fencing and signage installed on the Project will be inspected annually and replaced as needed.

3.3 EDUCATION, RECREATION AND HABITAT RESTORATION

3.3.1 Educational Activities

Research and/or other educational programs or efforts may be allowed on the Project as deemed appropriate by the Approving Parties, but are not specifically funded or a part of this Plan. Individuals or groups wishing to use the Project for educational purposes shall obtain the consent of and coordinate with the Land Manager. If the educational activities will be passive in nature, such as a discussion of plants and animals of the habitats, then written permission of the Land Manager is sufficient. If active use (other than restoration activities) of the Project is proposed or regular but passive use of the Project is proposed, review and approval by the Approving Parties is required. To avoid repeated inquiries to the Approving Parties, a use plan could be developed by the interested party for a one-time approval.

3.3.2 Recreational Activities

Hunting shall be prohibited except by the Owner, Land Manager, or an employee or guest of the Owner or Land Manager. All hunting activities shall be carried out pursuant to current (i.e., season during which hunting occurs) Oregon state and federal laws and regulations.

It is the responsibility of the hunters, Owner, and Land Manager to ensure compliance with all relevant laws and prohibitions. If the Conservation Easement Monitor or the Approving Parties reasonably determine that the hunting is harmful to the habitat values of the Project, or if any of these restrictions have been violated, all hunting shall be prohibited.

3.3.3 Restoration Activities

In the future, the Owner, Land Manager, or other group/organization, may want to conduct additional habitat restoration or enhancement within the Project. This could include the removal of invasive plant species, planting native plants, or other restoration activities. Restoration activities that involve work in wetlands or other waters of the United States may require a permit under Section 404 of the Clean Water Act from the Corps, and/or a permit from the Oregon Department of State Lands. The Land Manager need not notify the Approving Parties if restoration activities do not require a permit; however, these activities will be reviewed by the Monitoring Biologist and will be described in the Annual Report. If there is a question regarding whether a restoration activity will require a permit, the Land Manager shall seek guidance from the Approving Parties.

3.4 REPORTING AND ADMINISTRATION

3.4.1 Annual Report

The Land Manager shall be responsible for preparing an annual report on all management tasks conducted and general Project conditions. The annual report will include a summary of monitoring and management activities undertaken during the previous year. The results of the general inspections and the biological monitoring surveys will be included in the annual report. The annual report will be completed and circulated to the Approving Parties and other parties (Owner and Conservation Easement Monitor) by December 31st of each year. The annual report will include the following at a minimum:

- A map of the Project;
- Photos documenting the status of the Project;
- A description of proposed activities and maintenance or management actions as required by this Plan;
- A description of actions for which notification or approval from the Approving Parties was not needed, but were carried out during the year;
- Observations from the monitoring inspections and habitat and biological surveys; and
- Recommendations for adaptive management practices as needed.

Annual reports will be provided to the Approving Parties and Conservation Easement Monitor, in perpetuity. The Land Manager shall make recommendations in the annual report with regard to (1) any habitat enhancement measures deemed to be warranted, (2) any problems that need short and long-term attention (e.g., invasive plant species removal and erosion control), and (3) any changes in the monitoring or management program that appear to be warranted based on monitoring results to date.

3.4.2 Permanent Protection

The portion of the overall property unencumbered by easements will be protected from development in perpetuity by the recordation of a conservation easement. In addition, a long-term management and maintenance endowment fund account will be established with a target amount designated for each phase. Long-term management and maintenance covered by this fund includes the activities discussed in this Plan.

3.4.2.1 Special and/or Emergency Notifications

The Land Manager shall be responsible for providing notification to the Approving Parties for any activities requiring Corps review and approval. All efforts will be made to outline the activities for the coming 12 months in the annual report. If this is not possible, the Land Manager will submit a separate letter to the Approving Parties (and the Corps, if applicable) with a written description of the activity, including when the activity will take place and what methodology will be used, as well as a map showing what areas will be targeted. The Approving Parties will have 30 days to contact the Land Manager to discuss the activity if they do not approve. If the Land Manager is not contacted within 30 days, the activity will be considered approved. Notification will be made either by fax, email, registered mail, or overnight transmittal. The Land Manager will remain responsible for obtaining any permits.

The Land Manager shall be responsible for identifying emergency situations that require immediate action. Should an emergency situation arise that requires immediate action, and would normally require that the Services be notified or have review and approval authority, the Land Manager shall notify the Services verbally within forty-eight (48) hours, with written confirmation of the actions taken within five (5) business days. In these situations, “emergency" is defined as a situation which will result in an unacceptable hazard to life, a significant loss of property, or an immediate, unforeseen, and significant economic hardship.

Should an emergency situation arise that requires immediate action in a wetland or waters of the U.S., but would normally require that a permit be obtained from the Corps, the Land Manager shall notify the Corps verbally within twenty-four (24) hours regarding the situation and the actions taken. The Corps will be notified in writing of the actions taken and further actions (if any) proposed, within five (5) business days. The Land Manager will work with the Corps to determine, what, if any further actions or compensation are necessary.

3.4.2.2 Force Majeure

The Project is vulnerable to catastrophic events, acts of force majeure, and unlawful acts that are beyond the control of the Land Manager to prevent or mitigate. The occurrence of any such act may necessitate changes to the Project, including revision of this Plan, to allow for activities that would offset and/or counteract the negative environmental impacts of that act. Depending upon the circumstances, it may be appropriate to let nature take its course, particularly when acceptable environmental conditions would be expected to eventually reestablish. If any such act occurs, then the Approving Parties, in consultation with the Land Manager, shall determine what changes will be in the best interest of the Project and its habitats. The Sponsor shall notify the Approving Parties within 24 hours of the discovery of a catastrophic event, event of force majeure, or unlawful act, and as promptly as reasonably possible thereafter Sponsor and the Approving Parties shall meet to discuss the course of action in response to

such occurrence. In the meantime, Sponsor shall continue to manage and maintain the Project to the full extent practicable. Catastrophic events, acts of force majeure, and unlawful acts addressed in this section shall not affect the status of previously released credits, whether or not they have yet been sold or transferred.

Section 4 Transfer, Replacement, Amendments, and Notices

4.1 TRANSFER

Any subsequent transfer of responsibilities under this Plan to a different Land Manager shall be done so with notice to the Approving Parties. Any subsequent Land Manager assumes the responsibilities described in this Plan and as required in the Conservation Easement, unless otherwise amended in writing by the Approving Parties.

4.2 REPLACEMENT

If the Land Manager fails to implement the tasks described in this Plan and is notified of such failure in writing by the Approving Parties, the Land Manager shall have 90 days to cure such failure. If failure is not cured within 90 days, the Land Manager may request a meeting with the Approving Parties to resolve the failure. Such meeting shall occur within 30 days or a longer period if approved by the Approving Parties. Based on the outcome of the meeting, or if no meeting is requested, the Approving Parties may designate a replacement Land Manager in writing by amendment of this Plan. If the Land Manager fails to designate a replacement Land Manager, then such public or private land or resource management organization acceptable to and as directed by the Services may enter onto the Project site in order to fulfill the purposes of this Plan.

4.3 AMENDMENTS

The Land Manager, Owner, and Approving Parties may meet and confer from time to time, upon the request of any one of them, to revise the Plan to better meet management objectives and preserve the habitat and conservation values of the Project. Any proposed changes to the Plan shall be discussed with the Approving Parties and the Land Manager. Any proposed changes will be designed with input from all parties. Amendments to the Plan shall be approved by the Approving Parties in writing, shall be required management components, and shall be implemented by the Land Manager.

If the Approving Parties determine, in writing, that continued implementation of the Plan would jeopardize the continued existence of a state or federally listed species, any written amendment to this Plan, determined by either the NMFS or USFWS as necessary to avoid jeopardy, shall be a required management component and shall be implemented by the Land Manager.

4.4 NOTICES

Any notices regarding this Plan shall be directed as follows:

Sponsor

Wildlands
Attn: General Counsel
3855 Atherton Road
Rocklin, CA 95765
Telephone: (916) 435-3555

Owner

Portland Harbor Holdings II, LLC
Attn: General Counsel
3855 Atherton Road
Rocklin, CA 95765
Telephone: (916) 435-3555

Approving Parties

National Oceanic and Atmospheric Administration, acting on behalf of U.S. Department of Commerce
Oregon State Habitat Office
Attn: Oregon State Habitat Director
1201 NE Lloyd Blvd., Suite 1100
Portland, OR 97232
Telephone: (503) 230-5400

U.S. Fish and Wildlife Service, acting on behalf of U.S. Department of the Interior
Pacific Region
Attn: Field Supervisor
911 NE 11th Avenue #1
Portland, OR 97232-4181
Telephone: (503) 231-6120

Oregon Department of Fish and Wildlife, acting on behalf of State of Oregon
3406 Cherry Avenue N.E.
Salem, OR 97303
Tel: (503) 947-6000 or (800) 720-ODFW [6339]

Confederated Tribes of the Grand Ronde Community of Oregon
Portland Office
4445 S.W. Barbur Blvd.
Portland, OR 97239
Tel: (503)-235-4230
Fax: (503) 239-8047

Confederated Tribes of Siletz Indians
Portland Area Office
12790 SE Stark Street, Suite 102
Portland, OR 97233
(503) 238-1512
(503) 238-2436 (fax)

Confederated Tribes of the Umatilla Indian Reservation
Nixyáawii Governance Center
46411 Timíne Way
Pendleton, Oregon 97801
Tel: (541) 276-3165
Fax: (541) 276-3095

Confederated Tribes of the Warm Springs Reservation of Oregon
1107 Wasco Street
Warm Springs, OR 97761
Tel: (541) 553-3007

Nez Perce Tribe
P.O. Box 305
Lapwai, ID 83540

Funding and Task Prioritization

4.5 FUNDING

During the interim monitoring period, the cost to conduct the monitoring and carry out the management activities will be fully funded by the Sponsor. Following the completion of the interim monitoring period, the annual cost of monitoring and management described in this Plan will be funded through the interest generated on an endowment account for the Project ("Endowment Fund"). The Sponsor will be responsible for depositing money into the Endowment Fund concurrent with the transfer of the credits (i.e., DSAYs). The Endowment Fund will be held and managed by the endowment holder in a dedicated, interest-bearing account.

The value of the Endowment Fund is based upon the costs necessary to manage the Project in perpetuity calculated using the Center for Natural Lands Management's Property Analysis Record ("PAR") software. The PAR analysis for the Endowment Fund is presented as Exhibit J. The accrued interest and earnings from the Endowment Fund shall be used exclusively to fund the permanent management and long-term maintenance of the Project.

The Endowment Fund shall remain as a permanent capital endowment to manage the Project consistent with this Plan and the Conservation Easement. The Owner or Land Manager may use interest and earnings from the Endowment Fund to pay any costs and expenses reasonably incurred through the monitoring, maintenance, or long-term management, including, without limitation, property taxes, contracts, equipment or materials, and signage related to the management of the Project and consistent with the Conservation Easement.

Endowment holder shall hold the endowment principal and interest monies. These interest monies will fund the long-term management, enhancement, and monitoring activities on habitat lands in a manner consistent with this Plan.

The Sponsor shall consult with the endowment holder on a year-to-year basis to determine the amount of funding available for management and monitoring activities. Following annual management activities, the Sponsor may invoice the endowment holder for management activities following the invoicing instructions provided by the endowment holder.

The Endowment Fund obligations, the management obligations described in this Plan, and the obligations under the Conservation Easement shall continue in perpetuity as a covenant running with the land.

4.6 INTERIM MANAGEMENT ACCOUNT

The Sponsor will furnish an irrevocable letter of credit (LOC) in the amount specified in Exhibit J-2, Interim Management Security. The Interim Management Account will be used as a contingency fund for management of the Project until the Endowment Fund Target Amount and Target Date are achieved, at which time the Interim Management Account may be terminated and all funds (excepting interest retained

by the Sponsor) will be transferred to the Endowment Fund for management of the Project for one year consistent and in accordance with the Agreement, this Plan, and the Conservation Easement. The Interim Management Account is further described in Exhibit J-2.

4.7 TASK PRIORITIZATION

Due to unforeseen circumstances, prioritization of tasks, including tasks resulting from new requirements, may be necessary if insufficient funding is available to accomplish all tasks. The Land Manager and the Approving Parties shall discuss task priorities and funding availability to determine which tasks will be implemented. In general, tasks are prioritized in this order:

1. Required by a local, state, or federal agency;

2. Tasks necessary to maintain or remediate habitat quality; and

3. Tasks that monitor resources, particularly if past monitoring has not shown downward trends.

Equipment and materials necessary to implement priority tasks will also be considered priorities. Final determination of task priorities in any given year of insufficient funding will be determined in consultation with the Approving Parties, as authorized by the Approving Parties in writing.

4.8 CREDITS AND CREDIT/DEBIT DETERMINATION

The Sponsor will generate credits (e.g., DSAYs) by restoring and permanently protecting approximately 52.28 acres of habitat at the Project site. For purposes of this Project, a credit is defined as the increase in salmonid habitat that will result from restoring, enhancing, or creating habitat on the Project site. While the actual number of credits generated cannot be determined until the Project is constructed and the activities assessed, it is estimated that the Project will generate 751.3 DSAYs. For the purposes of this Plan, one DSAY shall be equal to one credit. The final number of credits will be determined by the Approving Parties and will be based on the achievement of the performance standards for this Project.

Potential credits resulting from activities performed as part of this Project for wetlands, storm water retention, carbon sequestration, pollution, nutrient reduction, and other functions are retained by the Sponsor and may be sold separately at some point in the future, provided the generation of such credits does not produce a conflict with the provisions of the Agreement.

Nothing in the Agreement shall prevent the Sponsor from working with the Approving Parties or other authorized regulatory agencies to develop new credits or exchange Project credits for other types of endangered species or habitat credits defined in future years by regulatory authorities, provided this action does not conflict with the provisions of the Agreement.

4.8.1 Credit Release Schedule

Credits will be released by the Approving Parties for sale as the performance standards associated with those credits are met, (see Exhibit F: Credit Release Schedule). The Services may award partial credit for partial accomplishment of a performance standard. Once a credit is released, the Sponsor may sell or transfer that credit at any time, subject to the provisions of the Agreement.

The Approving Parties will normally approve the release of credits according to the table in Exhibit E, provided the Sponsor demonstrates success in meeting the subject performance standards and is in compliance with the provisions of the Agreement.

4.8.2 Service Area

The service area for the Project includes a portion of Multnomah County, representing the entire Portland Harbor Superfund Site area as associated upland sites. See Exhibit C for the full description and map of this service area.

4.8.3 Accounting Procedures

The Sponsor shall establish and maintain for inspection and reporting purposes, a ledger of all credit transactions. The following information will be recorded in the ledger for each transaction:

- Date of transaction
- Number of credits transacted
- For credits released for sale or transfer, reference the performance standard to which the released credits correspond
- For credit sales/transfers, include the name, address, telephone number, and contact for purchaser; and a reference number, if applicable.
- For credits withdrawn from the ledger for reasons other than credit purchase, include the specific reason for the withdrawal
- Number of credits available from the Project at the time of transaction
- Project's credit balance after this transaction

The Sponsor shall provide the Approving Parties with a copy of each credit transaction within 30 days of the transaction. The Sponsor shall also provide the Services a copy of the ledger, as of December 31 of the previous year, by February 15 of each year until all credits have been awarded and sold or otherwise transferred, or until Sponsor has informed the Approving Parties that it has terminated credit sales.

Section 5 References

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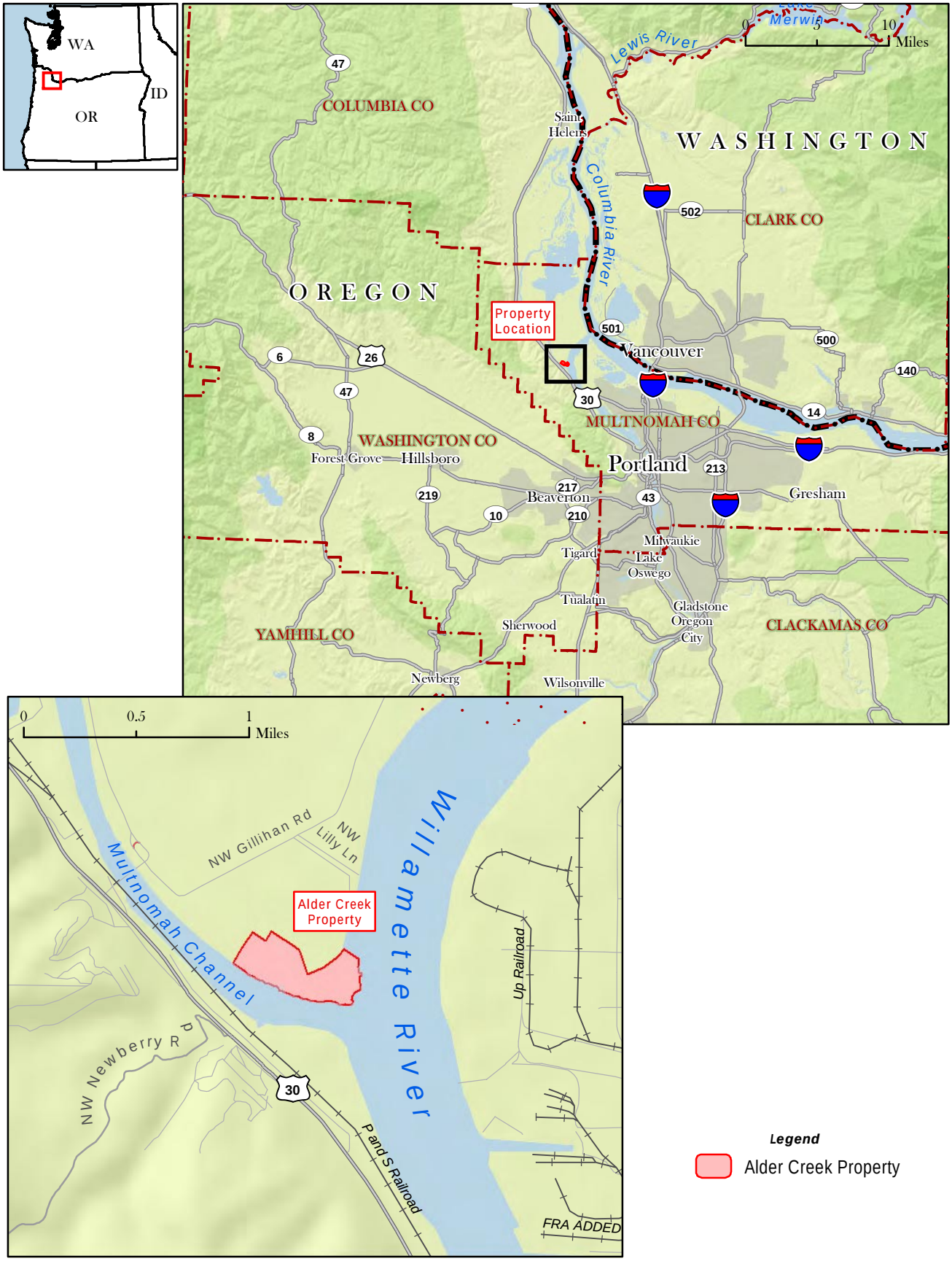
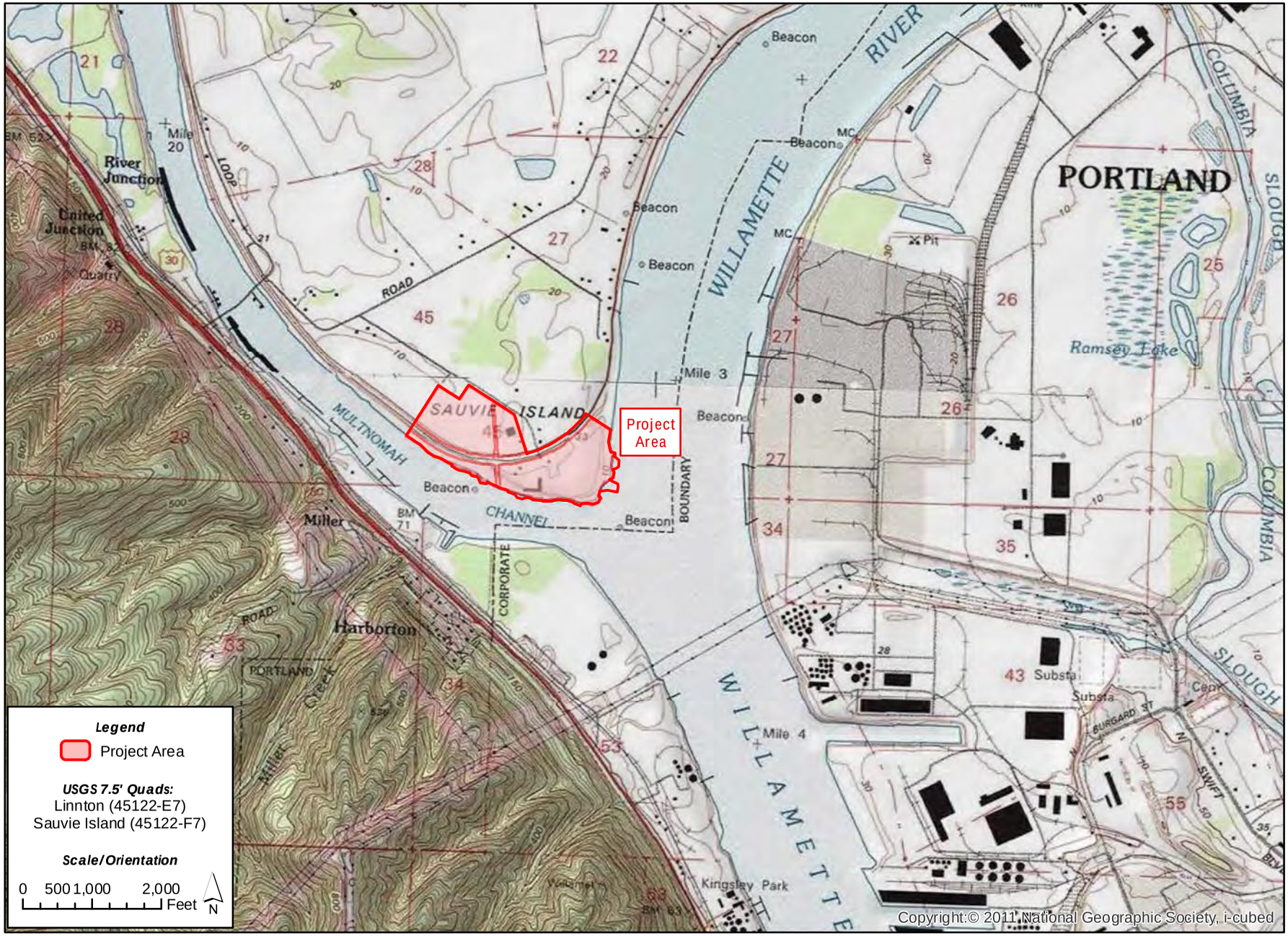
FIGURES



WILDLANDS

Alder Creek Restoration Project

Figure 1
Vicinity Map



WILDLANDS

Alder Creek Restoration Project

Figure 2
USGS 7.5' Quadrangle

Map Source: *Portland Harbor Natural Resource Trustee Council - Broader Focus Area for Ecological Restoration.*

WILDLANDS

Alder Creek Restoration Project

Figure 3

Portland Harbor Natural Resource Trustee Council

Broader Focus Area for Ecological Restoration

Source of Ordinary High Water Line:
US Army Corps of Engineers. (November 2004). *Portland-Vancouver Harbor Information Package; Second Edition; Reservoir Regulation and Water Quality Section* . Retrieved March 13, 2012, from http://www.nwd-wc.usace.army.mil/nwp/Reports/Portland_Harbor.pdf
and
Wetland and Other Waters Delineation Report: Alder Creek Mill Restoration Site . URS Corporation, Portland, OR. December 8, 2011.

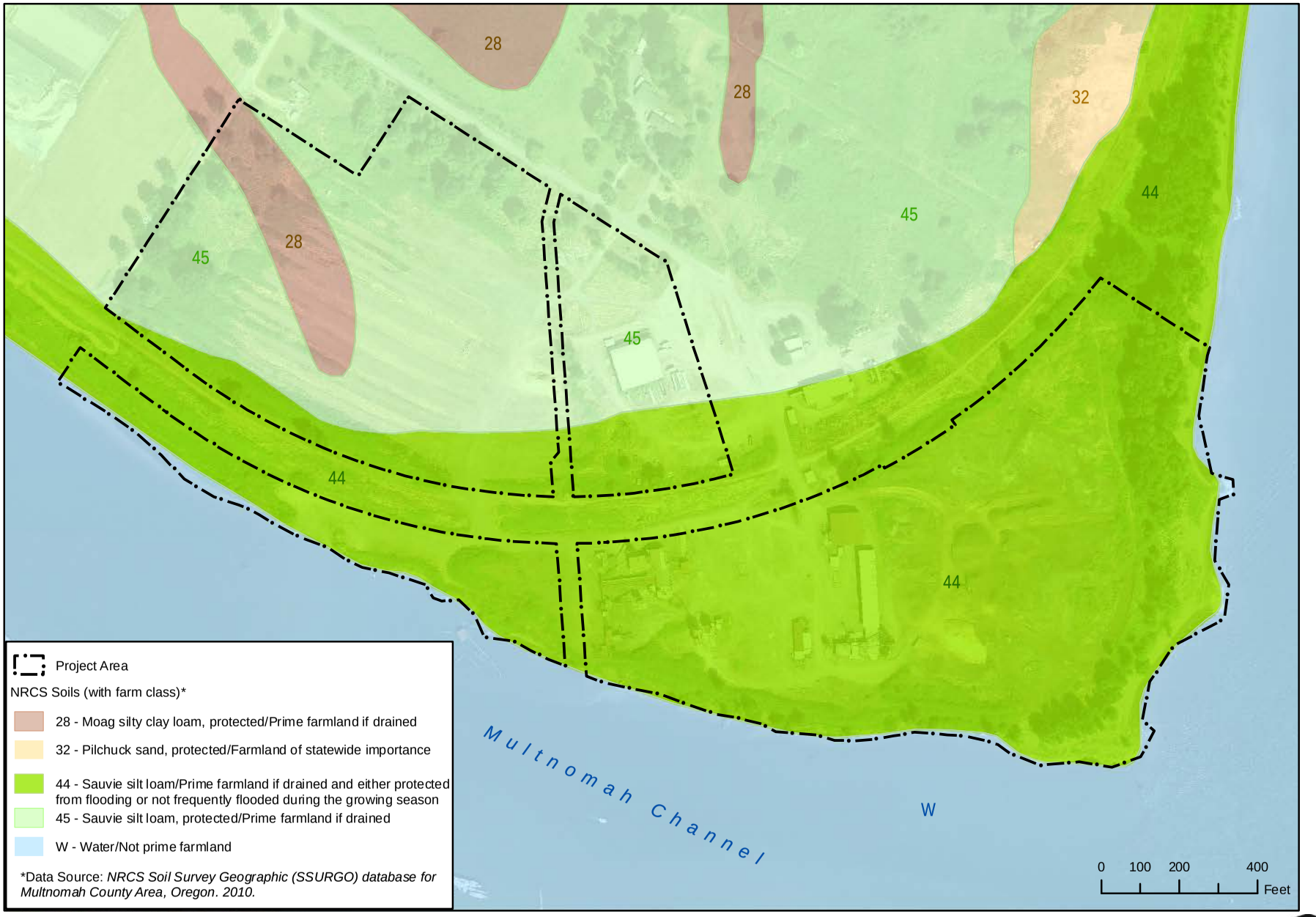
Aerial Photo: 45°37'18.88" N and 122°47'58.40" W. **Google Earth.** August 20, 2011.

NORTH 0 150' 300'

WILDLANDS

Alder Creek Restoration Project

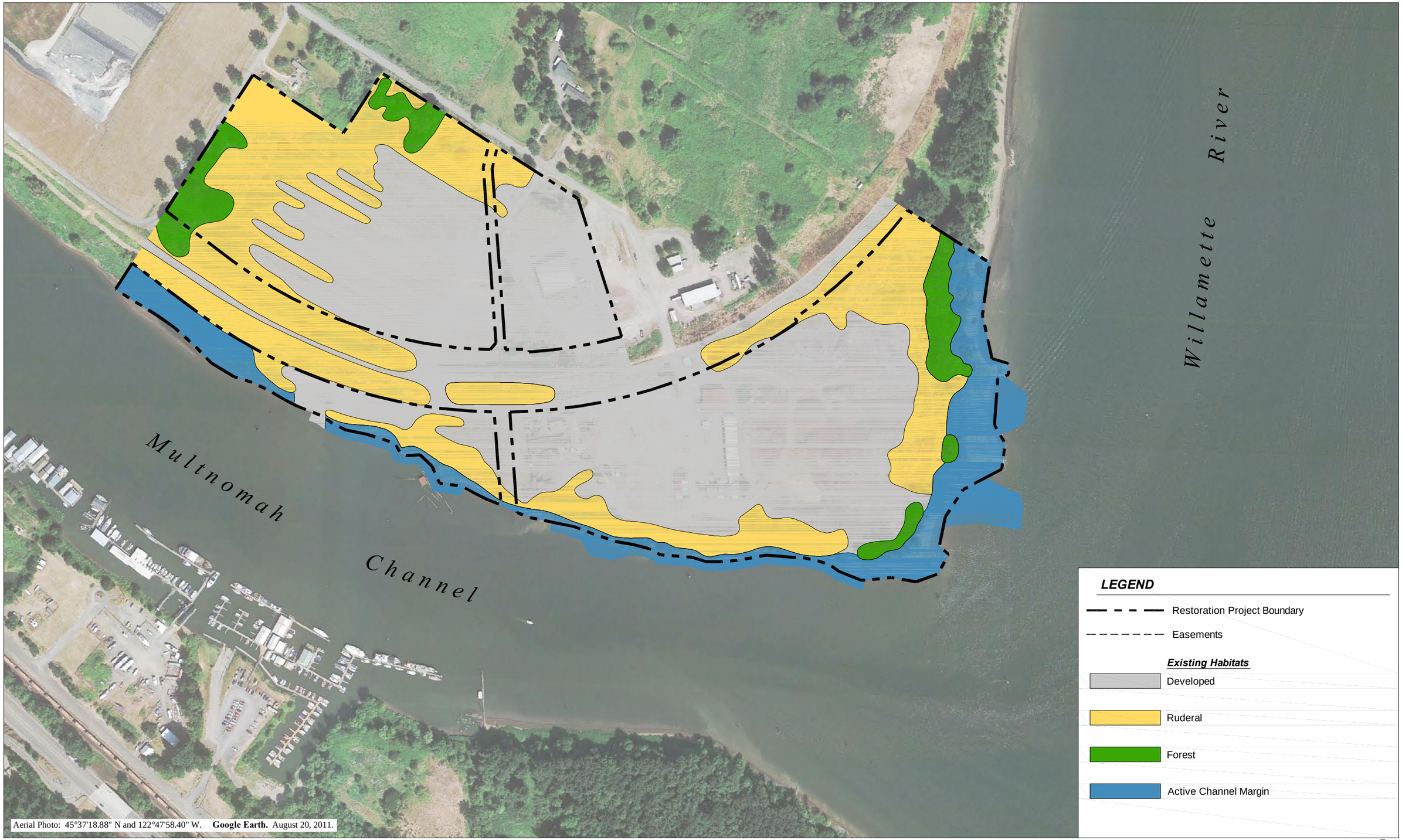
Figure 2
Overall Property and Existing Site Conditions
January 24, 2013



WILDLANDS

Alder Creek Restoration Project

Figure 5
Soils Map



WILDLANDS

Alder Creek Restoration Project

Figure 6

Pre-Construction Habitats

January 24, 2013

Source of Ordinary High Water Line: US Army Corps of Engineers. (November 2004). *Portland-Vancouver Harbor Information Package; Second Edition; Reservoir Regulation and Water Quality Section* . Retrieved March 13, 2012, from http://www.nwd-wc.usace.army.mil/nwp/Reports/Portland_Harbor.pdf

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Aerial Photo: 45°37'18.88" N and 122°47'58.40" W. **Google Earth.** August 20, 2011.

WILDLANDS

Alder Creek Restoration Project

Figure 7

Restoration Design

January 24, 2013

Elevation data: LiDAR Bare Earth DEM [computer file]. (2005). Seattle, WA: Puget Sound Regional Council. Available: Puget Sound LiDAR Consortium, Seattle, WA. http://www.pugetsoundlidar.org [August 15, 2011].

Aerial Photo: 45°37'18.88" N and 122°47'58.40" W. **Google Earth.** August 20, 2011.

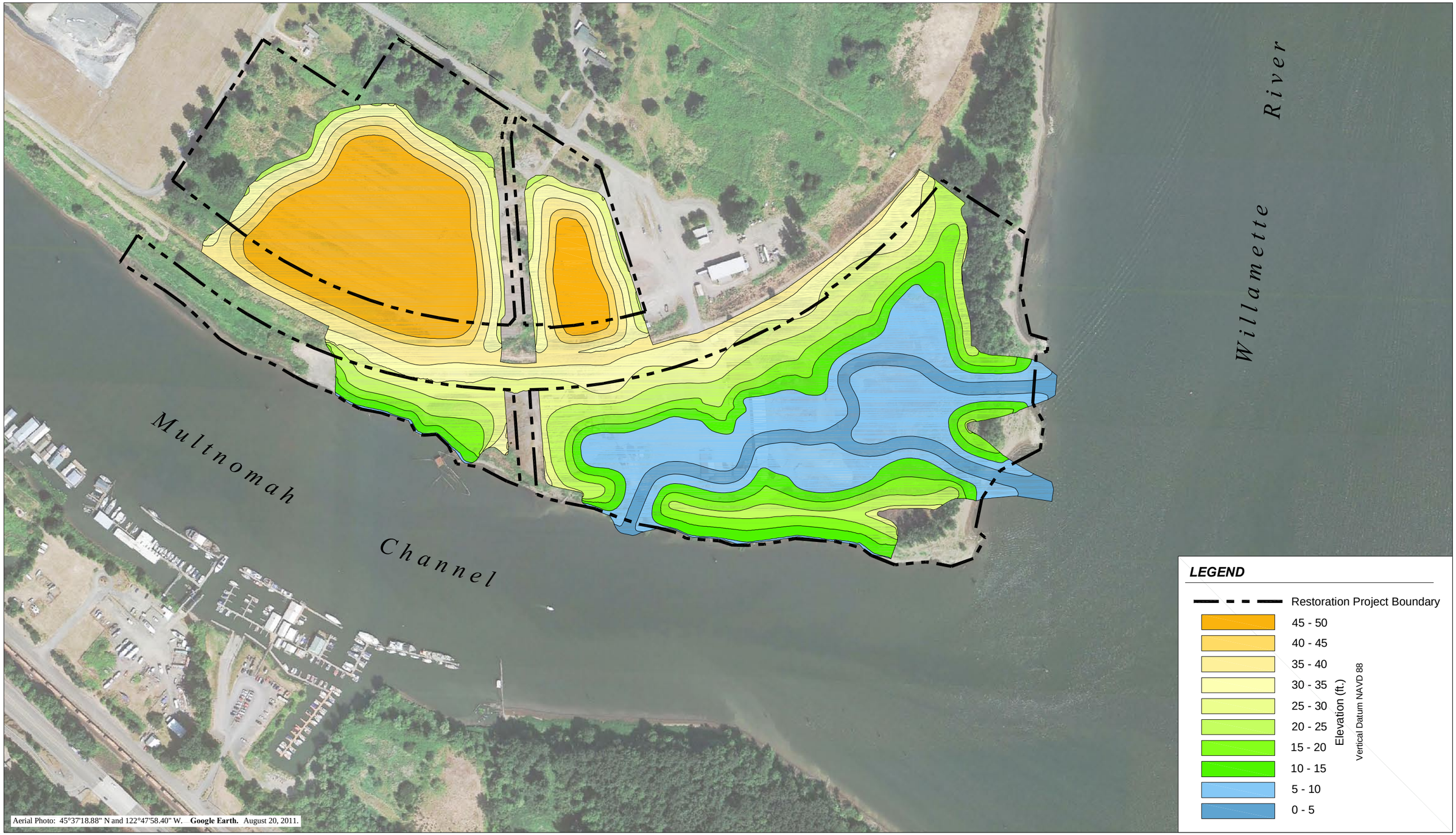
WILDLANDS

Alder Creek Restoration Project

Figure 7

Existing Elevations

January 24, 2013



WILDLANDS

Alder Creek Restoration Project

Figure 19

Post-Construction Elevations

January 24, 2013

Alder Creek Restoration Project

Post-Construction Elevations

January 24, 2013

ALDER CREEK RESTORATION PROJECT ENDOWMENT DEPOSIT, TARGET AMOUNT, AND INTERIM MANAGEMENT ACCOUNT

Financial Obligation	**Alder Creek Restoration Project**
Endowment deposit per credit (for the first 60% credits sold)	$778.00
Target amount (equals total endowment)	[a] $350,582
Interim Management Account	$16,139

Notes:

[a] The endowment deposit per credit, and the corresponding target amount, will be adjusted annually on the execution date of this Agreement in the calendar year following execution in accordance with any increase in the Consumer Price Index (CPI) until such time as the Endowment Fund is fully funded.

Section 10 - Financial Summary

Property Title: Alder Creek Restoration Project Dataset: CA005 PAR ID: ACCB 03/15/2013

PAR(52 ac.)

	Rate %	Total $
INITIAL FINANCIAL REQUIREMENTS		
I & C Revenue		0
I & C Management Costs		22,587
I & C Contingency Expense	10.00	2,259
Total I & C Management Costs		24,846
I & C Administrative Costs of Total I & C Management Costs	10.00	2,485
Total I & C Costs		27,332
Net I & C Management and Administrative Costs		27,332
ANNUAL ONGOING FINANCIAL REQUIREMENTS		
Ongoing Costs		10,685
Ongoing Contingency Expense	10.00	1,069
Total Ongoing Management Costs		11,755
Ongoing Administrative Costs of Total Ongoing Management costs	10.00	1,175
Total Ongoing Costs		12,930
ENDOWMENT REQUIREMENTS FOR ONGOING STEWARDSHIP		
Endowment to Provide Income of $ 12,930		323,250
Endowment per Acre is $ 6,183.		
Ongoing Management Costs Based on 4.00% of Endowment per Year.		
Ongoing Management Funding is $ 12,930 per Year Resulting in $247 per Acre per Year.		
TOTAL CONTRIBUTION		350,582

Section 9 - Ongoing Tasks and Costs

Property Title: Alder Creek Restoration Project Dataset: CA005 PAR ID: ACCB 03/15/2013

Budget: PAR

Task list	Specificaton	Unit	Number of Units	Cost / Unit	Annual Cost	Divide Years	Total Cost
BIOTIC SURVEYS							
Other	Annual General Inspection	L. Hours	8.00	55.00	440.00	1	440.00
Other	Annual General Inspection	L. Hours	8.00	75.00	600.00	1	600.00
Other	Vegetation Surveys	L. Hours	16.00	75.00	1,200.00	10	120.00
Other	Vegetation Surveys	L. Hours	16.00	55.00	880.00	10	88.00
Sub-Total							1,248.00
HABITAT RESTORATION							
Exotic Animal Control	Beaver Management	L. Hours	10.00	25.00	250.00	5	50.00
Sub-Total							50.00
HABITAT MAINTENANCE							
Exotic Plant Control	Hand Removal, Labor	L. Hours	8.00	75.00	600.00	1	600.00
Exotic Plant Control	Hand Removal, Labor	L. Hours	20.00	25.00	500.00	1	500.00
Exotic Plant Control	Herbicide	Gal.	1.00	500.00	500.00	2	250.00
Exotic Plant Control	Mow	L. Hours	16.00	25.00	400.00	1	400.00
Other	Woody veg removal-levee	L. hours	8.00	25.00	200.00	2	100.00
Sub-Total							1,850.00
WATER MANAGEMENT							
Other	Channel Maintenance	Item	1.00	1,000.00	1,000.00	5	200.00
Sub-Total							200.00
PUBLIC SERVICES							
Sign	T-posts	Item	20.00	5.00	100.00	5	20.00
Sign	Boundary 12" X 12"	Item	20.00	5.25	105.00	5	21.00
Sub-Total							41.00
GENERAL MAINTENANCE							
Other	Trash removal	L. Hours	12.00	25.00	300.00	1	300.00
Sub-Total							300.00
REPORTING							
Aerial Photo, 2 sets color	Standard 9"x 9"	Flight	1.00	1,300.00	1,300.00	10	130.00
Annual Reports	Prepare Annual Report	L. Hours	16.00	55.00	880.00	1	880.00
Annual Reports	Prepare Annual Report	L. Hours	4.00	75.00	300.00	1	300.00
Monitoring Reports	Prepare Monitoring Report	L. Hours	30.00	55.00	1,650.00	10	165.00
Monitoring Reports	Prepare Monitoring Report	L. Hours	8.00	75.00	600.00	10	60.00
Other	Aerial Photo Interpretation	L. Hours	8.00	55.00	440.00	10	44.00
Sub-Total							1,579.00

Task list	Specificaton	Unit	Number of Units	Cost / Unit	Annual Cost	Divide Years	Total Cost
FIELD EQUIPMENT							
Quad Runners, 4WD	Magnum, high quality	Item	0.10	7,500.00	750.00	8	93.75
Vehicle	Pickup	Item	0.10	35,000.00	3,500.00	8	437.50
Vehicle	Boat	Item	0.10	7,500.00	750.00	8	93.75
Vehicle	Fuel	Gallons	100.00	3.80	380.00	1	380.00
Sub-Total							1,005.00
OPERATIONS							
Insurance	General	Acres	52.28	2.16	112.92	1	112.92
Other	Easement Fee	Item	1.00	4,300.00	4,300.00	1	4,300.00
Sub-Total							4,412.92
CONTINGENCY & ADMINISTRATION							
Contingency							1,068.59
Administration							1,175.45
Sub-Total							2,244.04
Total							12,929.96

APPENDIX I
CONSERVATION EASEMENT

RECORDING REQUESTED BY
AND WHEN RECORDED MAIL TO:

Portland Harbor Holdings II, LLC

c/o Wildlands
Attn: General Counsel
3855 Atherton Road
Rocklin, CA 95765

Conservation Easement Deed
(Alder Creek Conservation Bank)

THIS CONSERVATION EASEMENT DEED ("Conservation Easement") is made this ___ day of _____, 2013, by Portland Harbor Holdings II, LLC. ("PHH") (the "Grantor"), in favor of [insert grantee name] ("Grantee").

RECITALS:

A. Grantor is the sole owner in fee simple of certain real property containing approximately 64 acres in the County of Multnomah, State of Oregon more particularly described in Exhibit A attached hereto and incorporated herein (the "Overall Property"). Grantor desires to grant the Conservation Easement over a 52.28-acre portion of the Overall Property (the "Property"). The Property is more particularly described in Exhibit B, which is attached hereto and incorporated herein.

B. The Property possesses wildlife and habitat values of great importance to Grantor, Grantee, and the people of the State of Oregon and the United States.

C. This Conservation Easement Deed is being executed and delivered pursuant to the Restoration Plan for the Alder Creek Restoration Project (the "Restoration Plan") and that certain "Alder Creek Restoration Project Memorandum of Agreement" (collectively, the "Conservation Agreement"). A specific habitat development plan and management plan for the Property has been developed as part of the Restoration Plan, entitled "Alder Creek Habitat Development Plan" (the "Development Plan") and the "Alder Creek Management Plan" (the "Management Plan"). Grantor and Grantee each have a copy of the Management Plan and the Development Plan, both incorporated herein by reference.

D. The Property provides or is capable of providing significant ecological and habitat values that benefit endangered, threatened, and other species (collectively, "Conservation Values"), as set forth in the Conservation Agreement, including "Essential Fish Habitat" for all life stages and associated habitat, for, among other things, Lower Columbia River steelhead (*Oncorhycus mykiss*), Lower Columbia River Chinook salmon (*O. tshawytscha*), Columbia River chum salmon (*O. keta*), Lower Columbia River coho salmon (*O. kisutch*), Upper Willamette River Chinook salmon, and Upper Willamette River steelhead (each a "Covered Species").

E. The Portland Harbor Natural Resource Trustee Council ("Trustee Council"), which consists of the National Oceanic and Atmospheric Administration ("NOAA") on behalf of the Department of the Commerce, the United States Fish and Wildlife Service ("USFWS") on behalf of the Department of Interior, the Oregon Department of Fish and Wildlife ("ODFW") on behalf of the State of Oregon, the Confederated Tribes of the Grand Ronde Community of Oregon, the Confederated Tribes of Siletz Indians, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, and the Nez Perce Tribe carry out a damage assessment for the Portland Harbor Superfund site ("Site"), and anticipate bringing claims for injuries to natural resources under the Comprehensive Environmental Response Compensation and Liability Act, 42 USC § 9601, et seq. ("CERCLA").

F. Additionally, NOAA and USFWS exercise jurisdiction with respect to the conservation, protection, restoration, enhancement, and management of threatened and endangered species and habitat pursuant to various federal laws including the Endangered Species Act, 16 U.S.C. § 1531 *et seq*. ("ESA"), the Fish and Wildlife Coordination Act, 16 U.S.C. §§ 661-666c, the Magnuson-Stevens Act ("MSA") as amended (16 U.S.C. 1801 *et seq*) and the Fish and Wildlife Act of 1956, (16 U.S.C. §742(f) *et seq*).

G. The U.S. Environmental Protection Agency ("USEPA") has enforcement and implementation authority under CERCLA and has jurisdiction over waters of the United States pursuant to the federal Clean Water Act, 33 U.S.C. Section 1251, *et seq.*

H. Grantor intends to convey to Grantee the right to preserve, protect, sustain, and enhance and/or restore the Conservation Values of the Property in perpetuity.

COVENANTS, TERMS, CONDITIONS AND RESTRICTIONS

NOW, THEREFORE, in consideration of the above recitals and the mutual covenants, terms, conditions, and restrictions contained herein, and pursuant to the laws of the United States and the State of Oregon, Grantor hereby voluntarily grants and conveys to Grantee the Conservation Easement in perpetuity over the Property of the nature and character consistent with the Conservation Agreement to the extent hereinafter set forth.

1. Purpose. The purpose of this Conservation Easement is to ensure that the Property will be retained forever in a condition contemplated by the Conservation Agreement and to prevent any use of the Property that will significantly impair or interfere with the Conservation Values of the Property. Grantor intends that this Conservation Easement will

confine the use of the Property to such activities including, without limitation, those involving the preservation and enhancement of native species and their habitats in a manner consistent with the conservation purposes of this Conservation Easement and the Conservation Agreement.

2. Rights of Grantee. To accomplish the purposes of this Conservation Easement, Grantor hereby grants and conveys the following rights to Grantee, along with the right of enforcement to the Trustee Council or their designee as third party beneficiaries hereof, consistent with the Conservation Agreement:

A. To preserve, protect, sustain, enhance, and/or restore the Conservation Values of the Property.

B. To enter upon the Property at reasonable times, subject to giving Grantor 48 hours notice, except in cases where Grantee determines that immediate entry is required to prevent, terminate, or mitigate a violation of the Agreement, to monitor Grantor's compliance with and to otherwise enforce the terms of this Conservation Easement; provided that Grantee shall not unreasonably interfere with Grantor's authorized use and quiet enjoyment of the Property.

C. To prevent any activity on or use of the Property that is inconsistent with the habitat conservation purposes of this Conservation Easement and to require the restoration of such areas or features of the Property that may be damaged by any act, failure to act, or any use or activity that is inconsistent with the purposes of this Conservation Easement.

D. All mineral, air and water rights necessary to preserve, protect and sustain the biological resources and Conservation Values of the Property, unless specifically excluded from this Conservation Easement, including Grantor’s right, title and interest in and to any waters consisting of: (a) any riparian water rights appurtenant to the Property; (b) any appropriative water rights held by Grantor to the extent those rights are appurtenant to the Property; (c) any waters, the rights to which are secured under contract between the Grantor and any irrigation or water district, to the extent such waters are customarily applied to the Property; and (d) any water from wells that are in existence or may be constructed in the future on the Property or on those lands described as excepted from the Property in the legal description and that were historically used by the Grantor to maintain the Property in a flooded condition (collectively, "Easement Waters"). The Easement Waters, mineral, air and water rights are limited to the amount of Grantor's waters reasonably required to maintain the Conservation Values of the Property.

E. All present and future development rights.

3. Prohibited Uses. Any activity on or use of the Property inconsistent with the conservation purposes of this Conservation Easement and the Conservation Agreement is prohibited. Without limiting the generality of the foregoing, Grantor, its personal representatives, heirs, successors, assigns, employees, agents, lessees, licensees and invitees are expressly prohibited from doing or permitting any of the following on the Property unless specifically authorized by the Grantee, Conservation Agreement, the Development Plan or the Management Plan:

A. Construction, reconstruction or placement of any permanent building or structure.

B. Unseasonable watering; use of fertilizers, biocides, or other agricultural chemicals; incompatible fire protection activities; and any and all other uses which may adversely affect the conservation purposes of this Conservation Easement.

C. Grazing and agricultural activity of any kind.

D. Commercial or industrial uses.

E. Depositing or accumulating soil, trash, ashes, refuse, waste, bio-solids or any other material.

F. Filling, dumping, excavating, draining, dredging, mining, drilling, removing, exploring for or extracting minerals, loam, gravel, soil, rock, sand or other material on or to a depth of 100 ft below the surface of the Property, or granting or authorizing surface entry for any of these purposes of the Property, or granting or authorizing surface entry for any of these purposes.

G. Altering the surface or general topography of the Property, including building roads, paving or otherwise covering the Property with concrete, asphalt, or any other impervious material.

H. Removing, destroying, or cutting trees, shrubs or other vegetation, except as required for: (i) fire breaks; (ii) maintenance of existing foot trails or roads; (iii) prevention or treatment of disease; (iv) utility line clearance; (v) levee easement clearance; or (vi) invasive species management.

I. Use of motorized vehicles, including off-road vehicles, except on existing roadways, inasmuch as they are harmful or adverse to the conservation purposes of the Conservation Easement, otherwise they shall be allowed for the purposes of land management and monitoring.

J. Transferring any water right necessary to maintain or restore the biological resources of the Property.

K. Planting, introduction, or dispersal of invasive or exotic plant or animal species.

L. Manipulating, impounding or altering any natural watercourse, body of water or water circulation on the Property and any activities or uses detrimental to water quality, including but not limited to degradation or pollution of any surface or sub-surface waters.

M. Permitting a general right of access to the Property.

4. Grantor's Duties. Grantor shall undertake all reasonable actions to prevent the unlawful entry and trespass by persons whose activities may degrade or harm the Conservation Values of the Property and are inconsistent with the Conservation Agreement.

5. Grantor's Reserved Rights. All rights accruing from Grantor's ownership of the Property, including the right to engage in or permit or invite others to engage in all uses of the Property that are not prohibited herein and are not inconsistent with the purposes of this Conservation Easement, are reserved to Grantor and Grantor's personal representatives, heirs, successors, and assigns.

6. Remedies for Violation and Corrective Action. If Grantee, Grantor, or the Trustee Council determines there is a violation of the terms of this Conservation Easement or that a violation is threatened, written notice of such violation and a demand for corrective action sufficient to cure the violation shall be given to Grantor or Grantee. In any instance, measures to cure the violation shall be reviewed and approved by the Trustee Council. If a violation is not cured within 30 days after receipt of written notice and demand, or if the cure reasonably requires more than 30 days to complete and there is failure to begin the cure within the 30-day period or failure to continue diligently to complete the cure, Grantee, Grantor, or the Trustee Council may bring an action at law or in equity in a court of competent jurisdiction to enforce compliance with the terms of this Conservation Easement, to recover any damages to which Grantee, Grantor, or the Trustee Council may be entitled for violation of the terms of this Conservation Easement or for any injury to the Conservation Values of the Property, or for other equitable relief, including, but not limited to, the restoration of the Property to the condition in which it existed prior to any violation or injury. Without limiting violator's liability therefore, any damages recovered may be applied to the cost of undertaking any corrective action on the Property.

6.1 Injunctive Relief. If Grantee, Grantor, or the Trustee Council, in each its sole discretion, determines that circumstances require immediate action to prevent or mitigate significant damage to the Conservation Values of the Property, Grantee, Grantor, or the Trustee Council may pursue its remedies under this Section without prior notice or without waiting for the period provided for cure to expire to enjoin the violation, *ex parte* as necessary, by temporary or permanent injunction without the necessity of proving either actual damages or the inadequacy of otherwise available legal remedies, and to require the restoration of the Property to the condition that existed prior to any such injury. The remedies described in this Section shall be cumulative and shall be in addition to all remedies now or hereafter existing at law or in equity. The failure of Grantee, Grantor, or the Trustee Council to discover a violation or to take immediate legal action shall not bar taking such action at a later time.

6.2 Standing. If at any time Grantee, Grantor, or any successor in interest or subsequent transferee uses or threatens to use the Property for purposes not in conformance with the stated conservation purposes contained herein, or releases or threatens to abandon this Conservation Easement in whole or in part, then, the Trustee Council shall have standing as an interested party in any proceeding affecting this Conservation Easement.

6.3 Costs of Enforcement. All reasonable costs incurred in enforcing the terms of this Conservation Easement including, but not limited to, costs of suit and attorneys'

fees, and any costs of restoration necessitated by violation or negligence under the terms of this Conservation Easement shall be borne by the violator.

6.4 Enforcement Discretion. Enforcement of the terms of this Conservation Easement shall be at the discretion of Grantee, Grantor, or third party beneficiaries, and any forbearance to exercise rights of enforcement under this Conservation Easement in the event of any breach of any term of this Conservation Easement shall not be deemed or construed to be a waiver of such term or of any subsequent breach of the same or any other term of this Conservation Easement or of any rights under this Conservation Easement. No delay or omission in the exercise of any right or remedy upon any breach shall impair such right or remedy or be construed as a waiver.

6.5 Acts Beyond Grantee's or Grantor's Control. Nothing contained in this Conservation Easement shall be construed to entitle Grantee, Grantor, or the Trustee Council to bring any action for any injury to or change in the Property resulting from causes beyond Grantee or Grantor's control, including, without limitation, fire, flood, storm, and earth movement, or from any prudent action taken by Grantee or Grantor under emergency conditions to prevent, abate, or mitigate significant injury to the Property resulting from such causes.

6.6 Third Party Beneficiary Right of Enforcement. All rights and remedies conveyed under this Conservation Easement shall extend to and are enforceable by the Trustee Council, NOAA, USFWS, or USEPA as a third party beneficiary. These rights of enforcement are in addition to, and do not limit, the rights of enforcement under the Conservation Agreement.

7. Costs and Liabilities. Grantor retains all responsibilities and shall bear all costs and liabilities of any kind related to the ownership, operation, upkeep, and maintenance of the Property, including transfer costs, costs of title and documentation review, and maintenance of adequate liability insurance coverage. Grantor remains solely responsible for obtaining any applicable permits and approvals required for any activity or use permitted on the Property by this Conservation Easement, and any such activity or use shall be undertaken in accordance with all applicable federal, state, local and administrative agency laws, statutes, ordinances, rules, regulations, orders and requirements.

7.1 Taxes; No Liens. Grantor shall pay before delinquency all taxes, assessments, fees, and charges of whatever description levied on or assessed against the Property by competent authority (collectively, "taxes"), including any taxes imposed upon, or incurred as a result of, this Conservation Easement, and shall furnish Grantee with satisfactory evidence of payment upon request. Grantor shall keep Grantee's interest in the Property free from any liens, including those arising out of any obligations incurred by Grantor for any labor or materials furnished or alleged to have been furnished at or for use on the Property.

7.2 Hold Harmless. Grantor shall hold harmless, indemnify, and defend Grantee and its members, directors, officers, employees, agents, and contractors and the heirs, personal representatives, successors, and assigns of each of them (collectively, "Indemnified Parties"), from and against all liabilities, penalties, costs, losses, damages, expenses, causes of action, claims, demands, orders, liens, or judgments, including, without limitation, reasonable attorneys' fees, arising from or in any way connected with (a) injury to or the death of any

person, or physical damage to any property, resulting from any act, omission, condition, or other matter related to or occurring on or about the Property, unless due to the negligence of any of the Indemnified Parties, and (b) the obligations, covenants, representations, and warranties of this Conservation Easement relating to Costs and Liabilities of this Section 7.

7.3 No Hazardous Materials Liability. Other than as described in the Work Plan, Phase I Environmental Site Assessment, Phase II Environmental Assessment, and the Hazardous Building and Material Survey , Grantor represents and warrants that it has no knowledge of any release or threatened release of hazardous materials in, on, under, about, or affecting the Property. Without limiting the obligations of Grantor as otherwise provided in this instrument, Grantor agrees to indemnify, protect, and hold harmless the Indemnified Parties against any and all Claims arising from or connected with any hazardous materials present, released in, on, from, or about the Property, at any time, of any substance now or hereafter defined, listed, or otherwise classified pursuant to any federal state, or local law, regulation, or requirement as hazardous, toxic, polluting, or otherwise contaminating to the air, water, or soil, or in any way harmful or threatening to human health or the environment, unless caused solely by any of the Indemnified Parties.

8. Best and Most Necessary Use. The habitat conservation purposes of the Conservation Easement are presumed to be the best and most necessary public use.

9. Conservation Easement Assignment or Transfer. This Conservation Easement may be assigned or transferred by Grantee or any successor in interest upon written approval of the Trustee Council and Grantor, which approval shall not be unreasonably withheld, but Grantee shall give Grantor and the Trustee Council at least thirty (30) days prior written notice of the transfer. Approval of any assignment or transfer may be withheld whenever it will result in a merger of the Conservation Easement and the Property in a single Property owner (thereby extinguishing the Conservation Easement) if no method or mechanism deemed adequate to preserve, protect, and sustain the Property in perpetuity has been established. Grantee or any successor in interest may assign or transfer its rights and obligations under this Conservation Easement only to an entity or organization as approved by the Trustee Council and Grantor. As a condition of such assignment or transfer, Grantee shall require that the conservation purposes of this Conservation Easement and the Conservation Agreement are carried out and notice of such restrictions, including the Conservation Agreement, shall be recorded in the County where the Property is located. The failure of Grantee to perform any act required by this paragraph shall not impair the validity of this Conservation Easement or its enforcement in any way.

10. Subsequent Property Transfer. Grantor agrees to incorporate the terms of this Conservation Easement in any deed or other legal instrument by which Grantor divests itself of any interest in all or a portion of the Property, including, without limitation, a leasehold interest. Grantor further agrees to give Grantee and the Trustee Council written notice of the intent to transfer any interest at least 30 days prior to the date of such transfer. Grantee or the Trustee Council shall have the right to prevent subsequent transfers in which prospective subsequent claimants or transferees are not given notice of the terms, covenants, conditions and restrictions

of this Conservation Easement or whenever a subsequent Property transfer will result in a merger of the Conservation Easement and the Property in a single Property owner (thereby extinguishing the Conservation Easement) if no method or mechanism deemed adequate to preserve, protect, and sustain the Property in perpetuity has been established. The failure of Grantor to perform any act required by this section shall not impair the validity of this Conservation Easement or limit its enforcement in any way.

11. Estoppel Certificates. Grantee shall, within 30 business days after receiving Grantor's request therefore, execute and deliver to Grantor a document certifying, to the best knowledge of the person executing the document, that Grantor is in compliance with any obligation of Grantor contained in this Conservation Easement, or otherwise evidencing the status of such obligation to the extent of Grantee's knowledge thereof, as may be reasonably requested by Grantor.

12. Notices. Any notice, demand, request, consent, approval, or other communication that Grantor, Grantee, or the Trustee Council desires or is required to give to the others shall be in writing and either served personally or sent by first-class mail, postage prepaid or by recognized overnight courier that guarantees next-day delivery addressed as follows:

To Grantor:	Portland Harbor Holdings II, LLC c/o Wildlands Attn: General Counsel 3855 Atherton Road Rocklin, CA 95765
To Grantee:	[Insert Grantee information]
To Trustee Council:	NOAA Oregon State Habitat Office Attn: Oregon State Habitat Director 1201 NE Lloyd Blvd., Suite 1100 Portland, OR 97232 United States Fish and Wildlife Service Pacific Region Attn: Field Supervisor 911 NE 11th Ave. # 1 Portland, OR 97232

Oregon Department of Fish and Wildlife
3406 Cherry Avenue N.E.
Salem, OR 97303

Confederated Tribes of the Grand Ronde
Community of Oregon
Portland Office
4445 S.W. Barbur Blvd.
Portland, OR 97239

Confederated Tribes of Siletz Indians
Portland Area Office
12790 SE Stark Street, Suite 102
Portland, OR 97233

Confederated Tribes of the Umatilla Indian Reservation
Nixyáawii Governance Center
46411 Timíne Way
Pendleton, OR 97801

Confederated Tribes of the Warm Springs Reservation of Oregon
1107 Wasco Street
Warm Springs, OR 97761

Nez Perce Tribe
P.O. Box 305
Lapwai, ID 83540

To NOAA:

National Marine Fisheries Service
Habitat Conservation Division
525 NE Oregon Street, Suite 500
Portland, OR 97232

To USFWS:	United States Fish and Wildlife Service Pacific Region 911 NE 11th Ave. Portland, OR 97232
To USEPA:	U.S. Environmental Protection Agency Region 10 1200 Sixth Avenue, Suite 900 Seattle, WA 98101

or to such other address as a party shall designate by written notice to the others. Notice shall be deemed effective upon delivery in the case of personal delivery or delivery by overnight courier or, in the case of delivery by first class mail, five (5) days after deposit into the United States mail.

13. Recordation. Grantor shall submit an original, signed and notarized Conservation Easement to Grantee and Grantee shall promptly record this instrument in the official records of the County in which the Property is located, and shall thereafter promptly provide a conformed copy of the recorded Conservation Easement to the Grantor and to the Trustee Council. Grantee may re-record at any time as may be required to preserve its rights in this Conservation Easement.

14. Amendment. This Conservation Easement may be amended by Grantor and Grantee only by mutual written agreement and written approval by the Trustee Council. Any such amendment shall be consistent with the purposes of this Conservation Easement and shall not affect its perpetual duration, and Grantee shall promptly record this amended instrument in the official records of the County in which the Property is located, and shall thereafter promptly provide a conformed copy of the recorded amended Conservation Easement to the Grantor and to the Trustee Council.

15. Warranty. Grantor represents and warrants that, except for the authorized encumbrances set forth in Exhibit C, which is attached hereto and incorporated herein, there is no outstanding mortgage, lien, encumbrance, or other interest in the Property which has not been expressly subordinated to this Conservation Easement, and that, except for another Conservation Easement established in accordance with the Conservation Agreement and which is not adverse to the Conservation Easement established herein, the Property is not subject to any other easement or interest that is adverse to or is not subordinate to this Conservation Easement.

16. Additional Interests. Except for another conservation easement established in accordance with the Conservation Agreement and which is not adverse to the Conservation Easement established herein, Grantor shall not grant any additional interest in the Property that is not subordinate to this Conservation Easement, nor shall Grantor grant, transfer, abandon, or

relinquish any water or water right associated with the Property, including without limitation any Easement Waters, without the prior written authorization of Grantee and the Trustee Council. Such consent may be withheld if the proposed interest or transfer is inconsistent with the purposes of this Conservation Easement and the Conservation Agreement or will impair or interfere with the Conservation Values of the Property. This Section shall not prohibit the transfer of a fee title or leasehold interest in the Property that is otherwise subject to and complies with the terms of this Conservation Easement.

18. Third-Party Beneficiaries and Access. Grantor and Grantee acknowledge that where neither Grantor, Grantee, nor the Trustee Council are a third-party beneficiary of this Conservation Easement with rights of access to the Property for monitoring or conservation activities contemplated by this Conservation Easement or the Conservation Agreement, except in cases where the Trustee Council determines that immediate entry is required to prevent, terminate, or mitigate a violation of the Agreement, such access is subject to providing the Grantor with 48 hours notice, and with rights to enforce all of the provisions of this Conservation Easement.

19. General Provisions.

19.1 Controlling Law. The interpretation and performance of this Conservation Easement shall be governed by the laws of the State of Oregon and applicable Federal law including the ESA.

19.2 Liberal Construction. Any general rule of construction to the contrary notwithstanding, this Conservation Easement shall be liberally construed in favor of the deed to affect the purposes of this Conservation Easement. If any provision in this instrument is found to be ambiguous, an interpretation consistent with the purposes of this Conservation Easement that would render the provision valid shall be favored over any interpretation that would render it invalid.

19.3 Severability. If any provision of this Conservation Easement or the application thereof is found to be invalid the remaining provisions of this Conservation Easement or the application of such provisions other than that found to be invalid shall not be affected thereby.

19.4 Entire Agreement. This Conservation Easement and the Conservation Agreement incorporated by reference herein, including all of the exhibits thereto, together set forth the entire agreement of the parties and supersede all prior discussions, negotiations, understandings, or agreements relating to the Conservation Easement, all of which are merged herein. No alteration or variation of this instrument shall be valid or binding unless contained in an amendment in accordance with the provisions herein.

19.5 No Forfeiture. Nothing contained herein will result in a forfeiture or reversion of Grantor's title in any respect.

19.6 Successors. The covenants, terms, conditions, and restrictions of this Conservation Easement shall be binding upon, and inure to the benefit of, the parties hereto and

their respective personal representatives, heirs, successors, and assigns and shall constitute a servitude running in perpetuity with the Property.

19.7 Termination of Rights and Obligations. A party's rights and obligations under this Conservation Easement terminate upon transfer of the party's interest in the Conservation Easement or Property, except that liability for acts, omissions or breaches occurring prior to transfer shall survive transfer.

19.8 Captions. The captions in this instrument have been inserted solely for convenience of reference and are not a part of this instrument and shall have no effect upon its construction or interpretation.

19.9 Counterparts. The parties may execute this instrument in two or more counterparts, which shall, in the aggregate, be signed by both parties; each counterpart shall be deemed an original instrument as against any party who has signed it. In the event of any disparity between the counterparts produced, the recorded counterpart shall be controlling.

IN WITNESS WHEREOF, Grantor has executed and delivered this Conservation Easement Deed as of the day and year first above written.
GRANTOR (Portland Harbor Holdings II, LLC):

By: _____

Title: _____

Date: _____

GRANTEE:

By: _____

Title: _____

Date: _____

Exhibit A
Overall Property

[legal description of overall property]

ALDER CREEK LEGAL DESCRIPTION

Overall Property

Parcel 1 (Adjusted TL 700)

A tract of land located in the James Menzie Donation Land Claim Number 45 also being located in Sections 27 and 28, Township 2 North, Range 1 West, Willamette Meridian, Multnomah County, Oregon, and being more particularly described as follows:

Beginning at a 4 inch brass disk at the most Northerly Corner of the James Menzie Donation Land Claim Number 45, thence South 57º04’51” East 1961.55 feet to a point on the centerline of Gillihan Road; thence along said centerline South 60º16’26” West 2254.26 feet to a 1/2 inch iron pipe; thence continuing along said centerline South 60º42’26” West 149.38 feet to a point; thence leaving said centerline South 59º01’00” East 23.03 feet to a point on the southeast right-of-way of Gillihan Road (20.00 feet from centerline) from which a 1 inch iron pipe bears South 59º01’00” East 0.76 feet; thence along the westerly northeast line of the tract per Book 524 Page 330 (recorded 09/01/1966) South 59º01’00” East 2630.64 feet to a point; thence along the northwest line of the tract per Book 2759 Page 2103 (recorded 09/29/1993) North 30º59’00” East 507.27 feet to a point; thence along the northeast line of said tract per Book 2759 Page 2103 South 59º01’00” East 915.32 feet to a point on the centerline of the Levee Easement per Book 490 Page 435 (Recorded 04/05/1939), Book 497 Page 251 (Recorded 05/19/1939), Book 518 Page 250 (Recorded 10/18/1939), Book 523 Page 91 (Recorded 11/22/1939), Book 535 Page 51 (Recorded 02/16/1940) and Book 2086 Page 291 (Recorded 10/18/1961), hereinafter called “Levee Easement”, also being the True Point of Beginning; thence along said “Levee Easement” along a non-tangent curve to the right (Radial North 53º55’48” West) with a Radius of 1637.02 feet, a Delta of 36º46’12”, a Length of 1050.57 feet, and a Chord of South 54º27’18” West 1032.63 feet to a point; thence leaving said “Levee Easement” North 19º14’19” West 593.80 feet to a point; thence along a line offset 60.00 feet southwesterly from said westerly northeast line of the tract per Book 524 Page 330 North 59º01’00” West 141.19 feet to a point; thence along the southeast line of the tract per Book 1968 Page 1822 (recorded 12/30/1986) South 30º59’00” West 675.87 feet to a point; thence along the southwest line of said tract per 1968 Page 1822 North 59º01’00” West 1008.31 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed “W&H PACIFIC”; thence along the southeast line of the tract per Document Number 2006-199633 South 30º59’00” West 423 feet, more or less, to a point on the mean low water line of the Multnomah Channel; thence southeasterly along the mean low water line of the Multnomah Channel and northerly along the mean low water line of the Willamette River and to a point on the northeast line of said tract per Book 2759 Page 2103; thence along said northeast line North 59º01’00” West 423 feet, more or less, to the True Point of Beginning.

The above described tract contains 50.25 acres, more or less.

Parcel 2 (Adjusted TL 800)

A tract of land located in the James Menzie Donation Land Claim Number 45 also being located in Sections 27 and 28, Township 2 North, Range 1 West, Willamette Meridian, Multnomah County, Oregon, and being more particularly described as follows:

Beginning at a 4 inch brass disk at the most Northerly Corner of the James Menzie Donation Land Claim Number 45, thence South 57º04’51” East 1961.55 feet to a point on the centerline of Gillihan Road; thence along said centerline South 60º16’26” West 2254.26 feet to a 1/2 inch iron pipe; thence

continuing along said centerline South 60º42’26” West 149.38 feet to a point; thence leaving said centerline South 59º01’00” East 23.03 feet to a point on the southeast right-of-way of Gillihan Road (20.00 feet from centerline) from which a 1 inch iron pipe bears South 59º01’00” East 0.76 feet; thence along said southeast right-of-way South 60º42’26” West 69.09 feet to a point; thence along a line offset 60.00 feet southwesterly from the westerly northeast line of the tract per Book 524 Page 330 (recorded 09/01/1966) South 59º01’00” East 1563.07 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed “W&H PACIFIC”; thence along the northwest line of the tract per Book 1968 Page 1822 (recorded 12/30/1986) South 30º59’00” West 240.22 feet to the True Point of Beginning; thence leaving said northwest line South 59º01’00” East 363.00 feet to a point; thence North 30º59’00” East 240.22 feet to a point; thence along said line offset 60.00 feet southwesterly from said westerly northeast line of the tract per Book 524 Page 330 (recorded 09/01/1966) South 59º01’00” East 645.31 feet to a point; thence along the southeast line of said tract per Book 1968 Page 1822 (recorded 12/30/1986) South 30º59’00” West 675.87 feet to a point; thence along the southwest line of said tract per Book 1968 Page 1822 (recorded 12/30/1986) North 59º01’00” West 1008.31 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed “W&H PACIFIC”; thence along said northwest line of Book 1968 Page 1822 (recorded 12/30/1986) North 30º59’00” East 435.65 feet to the True Point of Beginning.

The above described tract contains 13.64 acres, more or less (Tax Lot 800).

Parcel 3

Easements for access and temporary construction as set forth in Declaration of Access Easement and Temporary Construction Easement recorded March 7, 2012 at Recording No. 2012-026639.

Exhibit B
Property

[legal description of conservation easement area]

ENGINEERING PLANNING FORESTRY
13910 S.W. Galbreath Dr., Suite 100
Sherwood, Oregon 97140
Phone: (503) 925-8799
Fax: (503) 925-8969

LANDSCAPE ARCHITECTURE SURVEYING
AKS Group of Companies:
SHERWOOD, OREGON
SALEM, OREGON
VANCOUVER, WASHINGTON
www.aks-eng.com

EXHIBIT A

OVERALL TRACT:

A tract of land located in the James Menzie Donation Land Claim Number 45 also being located in Sections 27 and 28, Township 2 North, Range 1 West, Willamette Meridian, Multnomah County, Oregon, and being more particularly described as follows:

Beginning at a 4 inch brass disk at the most northerly corner of the James Menzie Donation Land Claim Number 45, thence South 12°30'05" East 3393.60 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed "AKS ENGR." at the westerly northern corner of the tract per Document Number 2012-031855 and the True Point of Beginning; thence along the northeasterly line of said Document Number 2012-031855 South 59°01'00" East 363.00 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed "AKS ENGR."; thence continuing along said northeasterly line North 30°59'00" East 240.22 feet to 5/8 inch iron rod with a yellow plastic cap inscribed " AKS ENGR."; thence along the northeasterly lines of the tracts per Document Number 2012-031855 and Document Number 2011-145120 South 59°01'00" East 786.50 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed " AKS ENGR."; thence continuing along the northeasterly line of said Document Number 2011-145120 South 19°14'19" East 593.80 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed " AKS ENGR."; thence along the centerline of the Levee Easement per Book 490 Page 435 (recorded 04/05/1939), Book 497 Page 251 (recorded 05/19/1939), Book 518 Page 250 (recorded 10/18/1939), Book 523 Page 91 (recorded 11/22/1939), Book 535 Page 51 (recorded 02/16/1940) and Book 2086 Page 291 (recorded 10/18/1961), partially quitclaimed per Document Number 2012-026638 hereinafter called "Levee Easement", along a non-tangent curve to the left (Radial: North 17°09'37" West) with a Radius of 1637.02 feet, a Delta of 36°46'12", a Length of 1050.57 feet, and a Chord of North 54°27'18" East 1032.63 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed " AKS ENGR."; thence leaving said Levee Easement centerline along the northeasterly line of said Document Number 2011-145120 South 59°01'00" East 423 feet, more or less to the Mean Low Water line of the Willamette River; thence southerly along the Mean Low Water line of the Willamette River and northwesterly along the Mean Low Water line of the Multnomah Channel 4330 feet, more or less to a point on the northwest line of said tract per Document Number 2011-145120; thence along the northwest line of said tracts per Document Number 2011-145120 and Document Number 2012-031855 North 30°59'00" East 859 feet, more or less to the True Point of Beginning.

EXCEPTING THEREFROM:
A tract of land located in the James Menzie Donation Land Claim Number 45 also being located in Section 27, Township 2 North, Range 1 West, Willamette Meridian, Multnomah County, Oregon, and being more particularly described as follows:

Beginning at a 4 inch brass disk at the most northerly corner of the James Menzie Donation Land Claim Number 45, thence South 12°30'05" East 3393.60 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed "AKS ENGR." at the westerly northern corner of the tract per Document Number 2012-031855; thence along the northeasterly line of said Document Number 2012-031855 South 59°01'00" East 363.00 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed "AKS ENGR."; thence continuing along said northeasterly line North 30°59'00" East 240.22 feet to 5/8 inch iron rod with a yellow plastic cap inscribed " AKS ENGR."; thence along the northeasterly line of the tract per Document Number 2012-031855 South 59°01'00" East 431.01 feet to a point on the westerly line of the 30.00 foot pipeline easement per Book 265 Page 113 (Recorded 04/05/1965) and the True Point of Beginning; thence along said westerly line South 11°44'00" West 89.00 feet to a point; thence continuing along said westerly line South 05°48'00" East 593.55 feet to a point; thence leaving said pipeline easement along the westerly line of the communications easement per Document Number 98179149 South 39°12'00" West 31.82 feet to a point; thence continuing along said westerly line South 05°48'00" East 525.01 feet to a point on the Mean Low Water Line of the Multnomah Channel; thence along said Mean Low Water line South 66°23'34" East 60 feet, more or less to a point on the easterly line of said pipeline easement; thence along said easterly line North 05°48'00" West 1166.02 feet to a point; thence continuing along said easterly line North 11°44'00" East 73.90 feet to a point on the northeasterly line of said Document Number 2012-031855; thence along said northeasterly line North 59°01'00" West 31.78 feet to the True Point of Beginning.

ALSO EXCEPTING THEREFROM:
A tract of land located in the James Menzie Donation Land Claim Number 45 also being located in Sections 27 and 28, Township 2 North, Range 1 West, Willamette Meridian, Multnomah County, Oregon, and being more particularly described as follows:

Beginning at a 4 inch brass disk at the most northerly corner of the James Menzie Donation Land Claim Number 45, thence South 12°30'05" East 3393.60 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed "AKS ENGR." at the westerly northern corner of the tract per Document Number 2012-031855; thence along the northwesterly line of the tracts per Document Number 2012-031855 and Document Number 2011-145120 South 30°59'00" West 544.67 feet to a point on northerly line of the "Levee Easement" (115.00 feet from centerline) and the True Point of Beginning; thence along the northerly line of said "Levee Easement" South 54°44'34" East 289.67 feet to a point; thence continuing along said northerly line along a non-tangent curve to the left (Radial: North 34°39'49" East) with a Radius of 1522.02 feet, a Delta of 39°47'41", a Length of 1057.12 feet, and a Chord of South 75°14'01" East 1036.00 feet to a point; thence continuing along said north line South 05°07'52" East 10.00 feet to a point; thence continuing along said northerly line (105.00 feet from centerline) along a non-tangent curve to the left (Radial: North 05°07'52" West) with a Radius of 1532.02 feet, a Delta of 11°53'11", a Length of

317.83 feet, a Chord of North 78°55'32" East 317.26 feet to a point on the northeasterly line of said Document Number 2011-145120; thence along said northeasterly line South 19°14'19" East 105.07 feet to a point on the centerline of said "Levee Easement"; thence along said centerline along a non-tangent curve to the left (Radial: North 17°09'37" West) with a Radius of 1637.02 feet, a Delta of 36°46'12", a Length of 1050.57 feet, and a Chord of North 54°27'18" East 1032.63 feet to a 5/8 inch iron rod with a yellow plastic cap inscribed "AKS ENGR." on the northeasterly line of said Document Number 2011-145120; thence along said northeasterly line South 59°01'00" East 90.34 feet to a point on the southerly line of said "Levee Easement" (90.00 feet from centerline); thence along said southerly line along a non-tangent curve to the right (Radial: North 54°11'45" West) with a Radius of 1727.02 feet, a Delta of 17°33'53", a Length of 529.44 feet, a Chord of South 44°35'11" West 527.37 feet to a point; thence continuing along said southerly line South 36°37'52" East 15.00 feet to a point; thence continuing along said southerly line (105.00 feet from centerline) along a non-tangent curve to the right (Radial: North 36°37'52" West) with a Radius of 1742.02 feet, a Delta of 07°00'00", a Length of 212.83 feet, and a Chord of South 56°52'08" West 212.70 feet to a point; thence North 29°37'52" West 10.00 feet to a point; thence continuing along said southerly line (95.00 feet from centerline) along a non-tangent curve to the right (Radial: North 29°37'52" West) with a Radius of 1732.02 feet, a Delta of 64°19'55", a Length of 1944.72 feet, and a Chord of North 87°27'55" West 1844.17 feet to a point; thence North 54°44'34" West 275.03 feet to a point on the northwest line of said Document Number 2011-145120; thence along said northwest line North 30°59'00" East 210.59 feet to the True Point of Beginning.

The above described conservation easement boundary contains 52.28 acres, more or less.

3-6-13

REGISTERED
PROFESSIONAL
LAND SURVEYOR

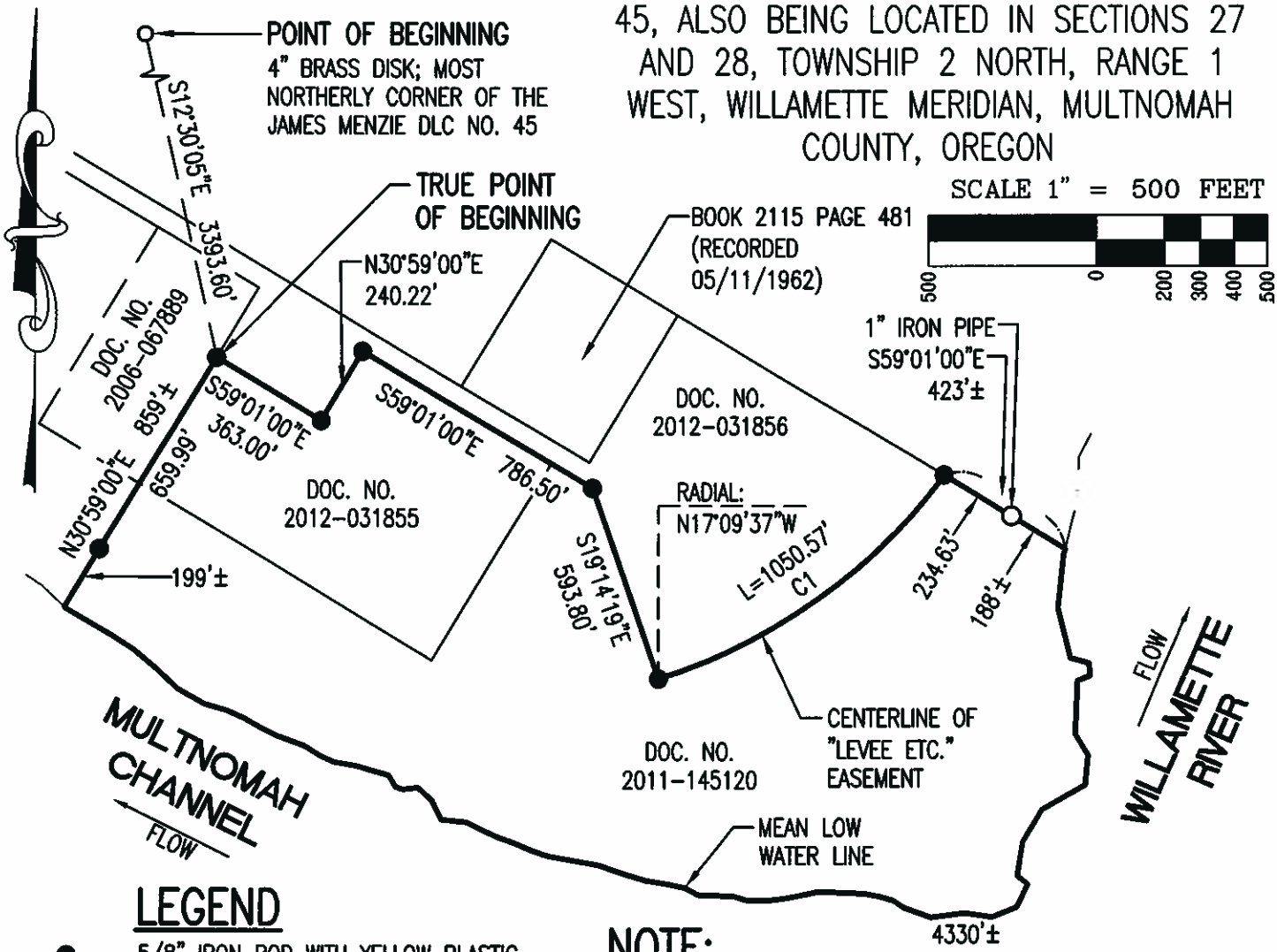
OREGON
JULY 15, 2003
MONTGOMERY B. HURLEY
58542LS
RENEWS: 6/30/13

EXHIBIT B

LOCATED IN THE JAMES MENZIE DLC NO. 45, ALSO BEING LOCATED IN SECTIONS 27 AND 28, TOWNSHIP 2 NORTH, RANGE 1 WEST, WILLAMETTE MERIDIAN, MULTNOMAH COUNTY, OREGON

PREPARED FOR

PORTLAND HARBOR HOLDINGS II, LLC.
3855 ATHERTON ROAD
ROCKLIN, CA 95765



LEGEND

- ● 5/8" IRON ROD WITH YELLOW PLASTIC CAP INSCRIBED "AKS ENGR."
- ○ MONUMENT AS NOTED
- DOC. NO. DOCUMENT NUMBER PER MULTNOMAH COUNTY DEED RECORDS

NOTE:

"LEVEE ETC." EASEMENT IS PER BOOK 490 PAGE 435 (04/05/1939), BOOK 497 PAGE 251 (05/19/1939), BOOK 523 PAGE 91 (11/22/1939), BOOK 535 PAGE 51 (02/16/1940), AND BOOK 2086 PAGE 291 (10/18/1961), PARTIALLY QUITCLAIMED PER DOC. NO. 2012-026638

CURVE TABLE

CURVE	RADIUS	DELTA	LENGTH	CHORD
C1	1637.02'	36°46'12"	1050.57'	N54°27'18"E 1032.63'

3-6-13

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JULY 15, 2003
MONTGOMERY B. HURLEY
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RENEWS: 6/30/13

JOB NAME: ALDER CREEK
JOB NUMBER: 2641
DRAWN BY: JOH
CHECKED BY: NSW
DWG NO.: 022813 2641EXB

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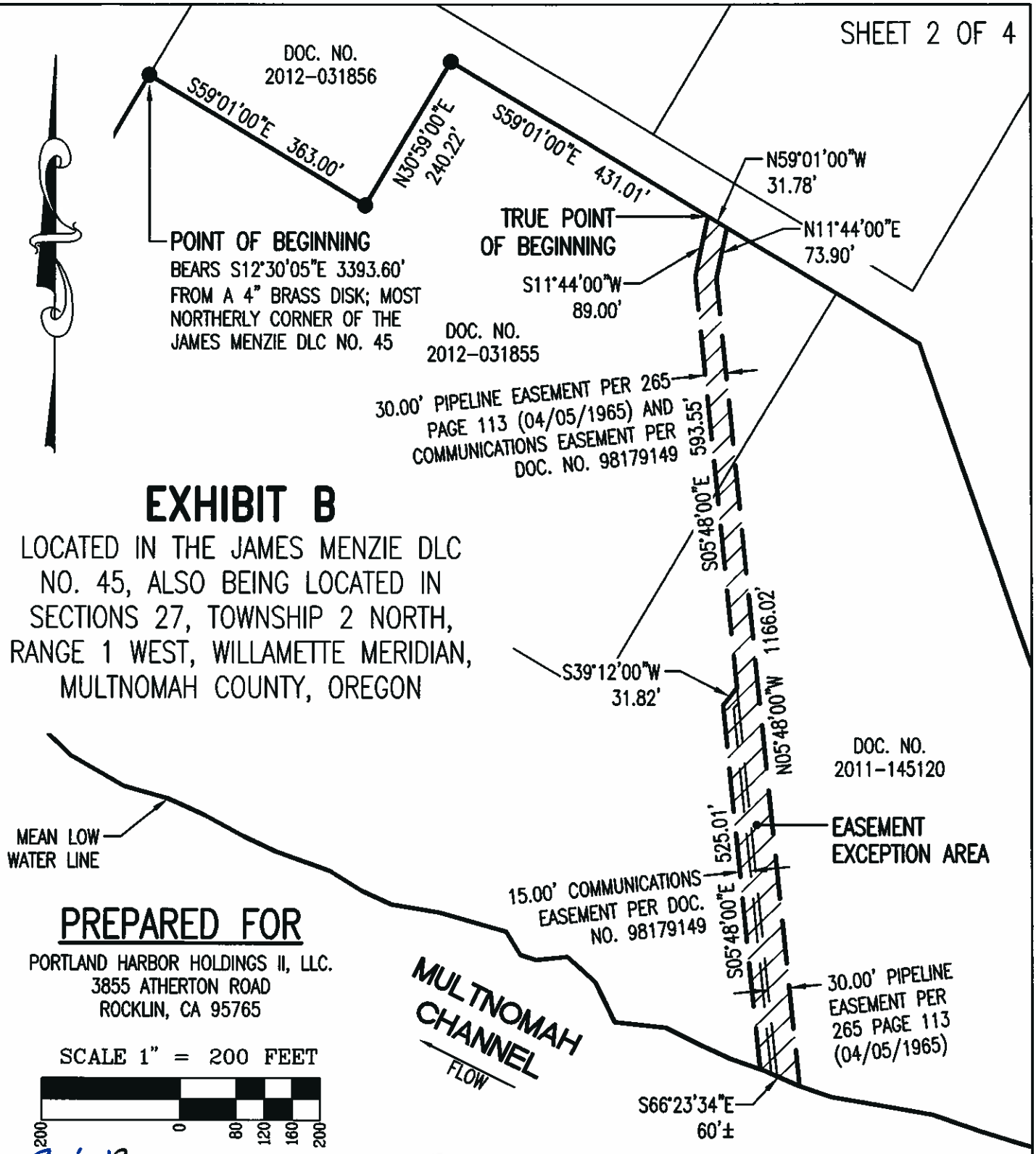
FORESTRY • SURVEYING

AKS ENGINEERING & FORESTRY

LICENSED IN OR & WA
13910 SW GALBREATH DRIVE, SUITE 100
SHERWOOD, OR 97140
PHONE: (503) 925-8799
FAX: (503) 925-8969

OFFICES LOCATED IN REDMOND, OR & VANCOUVER, WA



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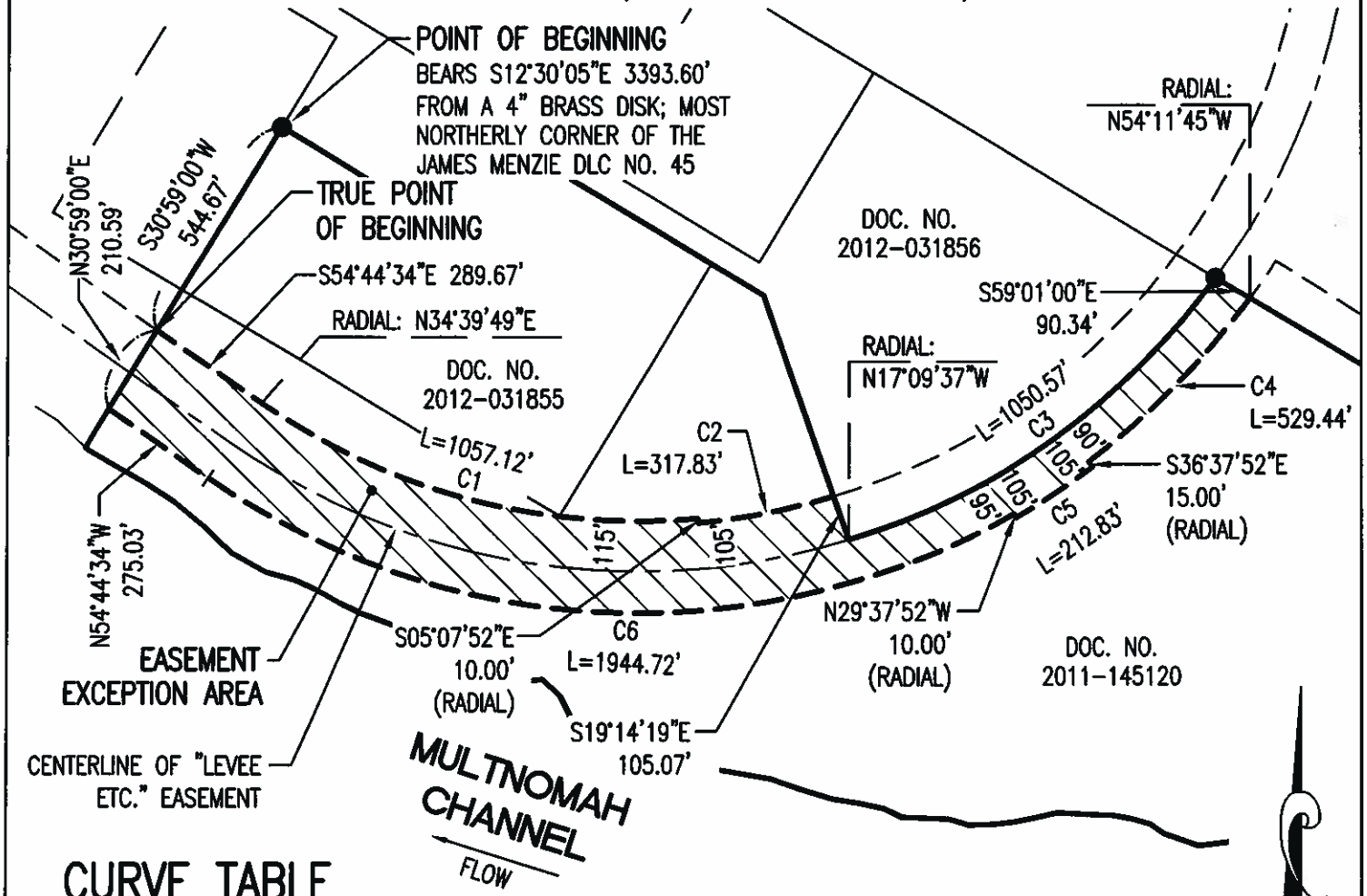

CURVE TABLE

CURVE	RADIUS	DELTA	LENGTH	CHORD	
C1	1522.02'	39°47'41"	1057.12'	S75°14'01"E	1036.00'
C2	1532.02'	11°53'11"	317.83'	N78°55'32"E	317.26'
C3	1637.02'	36°46'12"	1050.57'	N54°27'18"E	1032.63'
C4	1727.02'	17°33'53"	529.44'	S44°35'11"W	527.37'
C5	1742.02'	7°00'00"	212.83'	S56°52'08"W	212.70'
C6	1732.02'	64°19'55"	1944.72'	N87°27'55"W	1844.17'

SCALE 1" = 400 FEET

400 0 160 240 320 400

3-6-13

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OREGON
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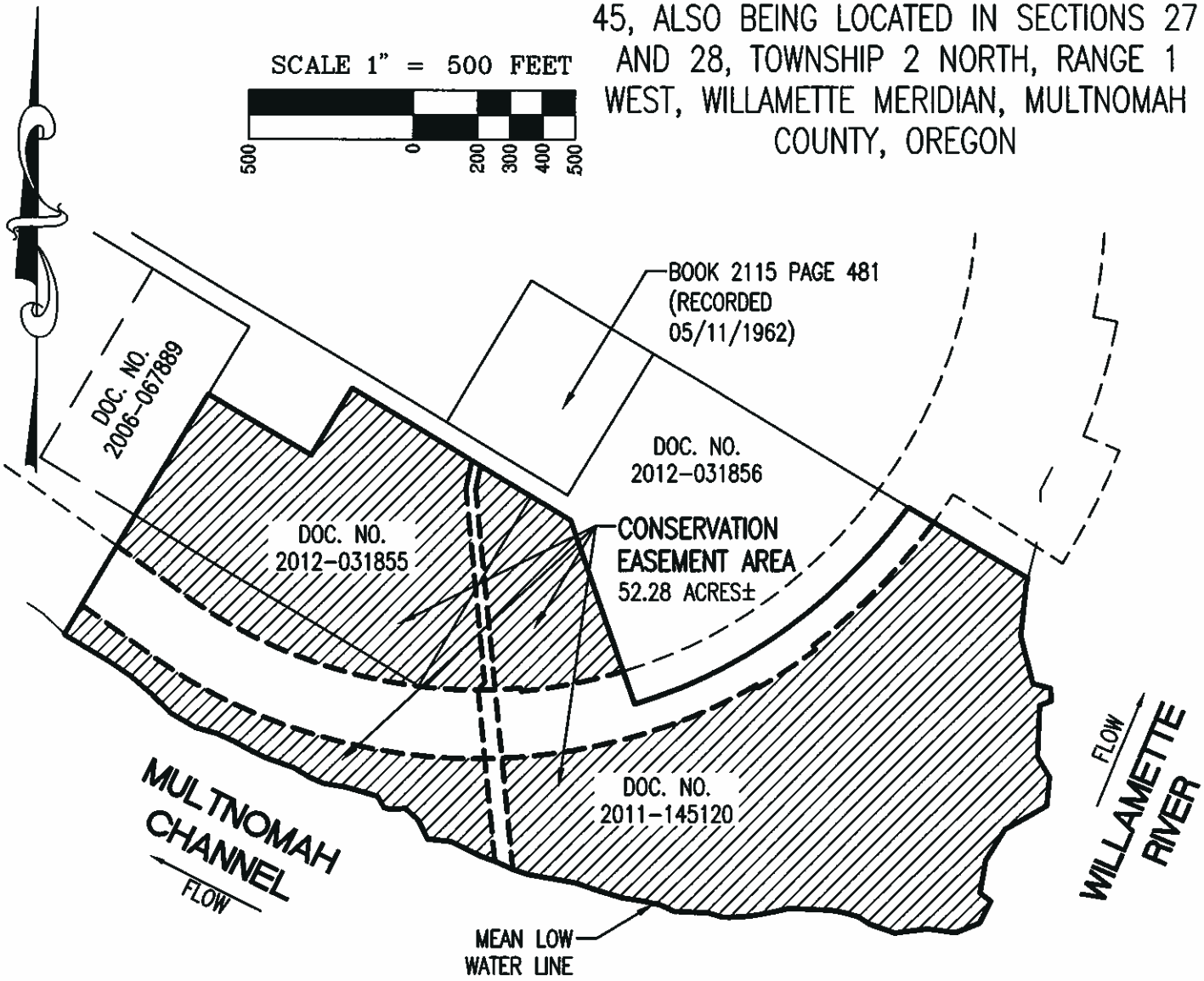

LEGEND

DOC. NO. DOCUMENT NUMBER PER MULTNOMAH COUNTY DEED RECORDS

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Exhibit C
Authorized Encumbrances

To be provided at a later date.