ATTACHMENT A

Project Narrative

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1. APPLICANT INFORMATION

This information provided on Joint Permit Application (JPA) Form.

2. PROJECT LOCATION

Location information is provided on JPA form. A site location figure (Figure 1) is included in Appendix A of Attachment A.

3. PROPOSED PROJECT INFORMATION

3.1 BACKGROUND

The Columbia River Crossing (CRC) project as described in the Record of Decision includes a suite of transportation improvements over a 5-mile stretch of the I-5 corridor, known as the locally preferred alternative (LPA). The area of investigation for environmental impacts for the LPA is known as the Area of Potential Impact (API). The construction of the LPA will be phased to match available funding while providing significant transportation benefits. The first construction phase is referred to as the Initial Construction Program (ICP). In this project description, the LPA is described first and the ICP description follows (see Figure 1 in Appendix A of this attachment).

This permit application is requesting approval for fill activities in jurisdictional waters for the ICP improvements and other in-water impacts associated with later programs.

The LPA for the 5-mile project corridor includes:

- A new river crossing over the Columbia River and I-5 highway improvements.
- Improvements to seven interchanges, from south to north: Victory Boulevard, Marine Drive, Hayden Island, SR 14, Mill Plain, Fourth Plain and SR 500. Related enhancements to the local street network.
- Three new structures over North Portland Harbor associated with I-5, and one new multi-modal bridge carrying light rail transit, local traffic, pedestrians and bicyclists.
- Demolition of the existing Columbia River structures.
- A variety of bicycle and pedestrian improvements throughout the project corridor. A multiuse path connecting to the existing system. The path would allow users to travel from north Portland, over Hayden Island and the Columbia River into downtown Vancouver.
- Extension of light rail transit from the Expo Center in Portland to Clark College in Vancouver and associated transit improvements. Transit stations would be built on Hayden Island, in downtown Vancouver, and a terminus near Clark College. Three park and rides are to be built, Columbia (near the SR 14 interchange), Mill (in uptown Vancouver) and Central (near Clark College). Improvements would be made to the tracks on the Steel Bridge. Also, bus route changes and the expansion of the Ruby Junction light rail transit maintenance facility.
- Transportation demand and system management measures to be implemented with the project, including the use of tolls, subject to the authority of the Washington and Oregon Transportation Commissions.

The first construction phase is referred to as the ICP, and includes the following multi-modal elements:

- The new river crossing over the Columbia River and the I-5 highway improvements, including improvements to four interchanges, as well as associated enhancements to the local street network.
- Two new structures over North Portland Harbor associated with I-5, and one new multi-modal bridge carrying light rail transit, local traffic, pedestrians and bicyclists.
- Demolition of the existing Columbia River structures.
- Extension of light rail from the Expo Center in Portland to Clark College in Vancouver, and associated transit improvements, including transit stations, park and rides, bus route and station changes, and expansion of a light rail transit (LRT) maintenance facility.
- Upgrades and modifications to the Steel Bridge track and signals and transit command center.
- Purchase of 19 light rail vehicles (LRV), public art and other transit-related procurements.
- Bicycle and pedestrian improvements throughout the project corridor that connect to the transit system.
- Toll system for the river crossing.
- Transportation demand and system management measures to be implemented with the project.

Aspects of the ICP and later programs associated with in-water work and those activities that might affect jurisdictional waters are discussed in more detail in Section 4 of this attachment.

3.2 IMPACT TABLES AND SEQUENCING

The project is proposed to permanently fill approximately 1.6204 acres with 50,486 cubic yards (cy) and temporarily fill up to 0.9477 acres with 60,408 cy of jurisdictional waters in the Columbia River and North Portland Harbor in both Oregon and Washington with structure.[1] The project proposes to permanently remove 0.6385 acre of and 43,928 cy of existing structures in the Columbia River.[2]

No jurisdictional wetlands will be impacted in Oregon or Washington during construction or operation of the project.

For the purposes of this Section 404 CWA and Section 10 RHA application, fill below the ordinary high water (OHW) level on the mainstem Columbia River consists of the following structures:

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[1] The USACE, Oregon Department of State Lands, Washington Department of Ecology, and Washington Department of Fish and Wildlife regulate material placed in or removed from subject jurisdictional waters in different ways. For USACE, structures consist of that material that acts as a structure that could affect hydrologic characteristics. Temporary piles, wharf piles, barges, and other floating structures are not considered structure under this definition.

[2] Volume calculations do not include the material that would be removed from within the casings for the drilled shafts from the mudline to tip elevation in the Troutdale Formation; likewise fill calculations do not include the fill material that would be placed within the casings from mudline to tip elevation in the Troutdale Formation.

- geotechnical borings,
- temporary cofferdams,
- permanent steel casings for bridge supports, and
- permanent pier caps.

Fill below the OHW level in North Portland Harbor consists of the following structures:

- geotechnical borings, and
- permanent steel casings and columns for bridge supports.

Removal of structures below the OHW level on the mainstem Columbia River consists of the following structures:

- existing bridge piers.

No removal of USACE-defined structures below the OHW level in North Portland Harbor is proposed.

The project will have a net areal increase of permanent structure below the OHW level (0.9819 acres) and a slight increase in volume (approximately 6,558 cy) after the existing bridge piers are removed.

Table 3-1. Project Fill (Approximate Values)

	Temporary Fill Totals		Permanent Fill Totals	
Element Type/Location	Area (ac)	Volume (cy)	Area (ac)	Volume (cy)
Mainstem Columbia River - ICP	0.9471	60,348	1.5554	46,375
North Portland Harbor - ICP	0		0.0505	3,444
Hayden Island to I-5 South Bridge	0		0.0144	667
Geotechnical Borings	0.0006	60	0	0
Total Fill	**0.9477**	**60,408**	**1.6204**	**50,486**

Table 3-2. Project Removal

Sum of Affected Area (ac) Element Type	Temporary Removal Totals		Permanent Removal Totals	
	Total Area	Total Volume	Total Area	Total Volume
Mainstem Columbia River - ICP	0	0	0.6384	43,868
North Portland Harbor - ICP	0	0	0	0
Hayden Island to I-5 South Bridge	0	0	0	0
Geotechnical Borings	0	0	0.0001	60
Total Removal	**0**	**0**	**0.6385**	**43,928**

Other project elements will be placed below ordinary high water but are not considered fill by the USACE. For the purposes of this Section 404 CWA and Section 10 RHA application, the following elements are not considered structure or fill below the OHW level:

- Mainstem Columbia Rive
    - temporary steel piles for work platforms and barge moorings, and

- barges.

- North Portland Harbor
  - temporary steel piles for work platforms and work bridges.

For the purposes of this Section 404 CWA and Section 10 RHA application, the following elements are not considered removed structure or removed fill below the OHW level:

- Mainstem Columbia River
  - portions of the wharf for the Red Lion at the Quay hotel, and
  - a dock and ship on the southern shore near the former Thunderbird Hotel.
- North Portland Harbor
  - floating homes at Jantzen Beach moorage, and
  - docks and boathouses immediately upstream and downstream of the existing bridge.

Temporary piles for work platforms and barge moorings in the mainstem and North Portland Harbor will encompass approximately 0.27 acres of area over the life of the project. Work barges will cover approximately 0.69 acres of water surface (proposed exclusively in the mainstem Columbia River). Removal of the wharf at the Red Lion at the Quay encompasses approximately 0.8 acre and removal of floating homes, boathouses, and docks encompass another 3.1 acres of area at the water surface. With the removal of these on-water elements (i.e, floating homes, docks, and quay) less water surface will be impacted after the project this is currently impacted.

4. PROJECT PURPOSE AND DESCRIPTION

4.1 PURPOSE AND NEED

4.1.1 Project Purpose

The purpose of the proposed action is to improve I-5 corridor mobility by addressing present and future travel demand and mobility needs in the CRC Bridge Influence Area (BIA). The BIA extends from approximately Columbia Boulevard in Portland, Oregon to SR 500 in Vancouver, Washington. Relative to the No-Build Alternative, the proposed action is intended to achieve the following objectives:

- Improve travel safety and traffic operations on the I-5 crossing's bridges and associated interchanges;
- Improve connectivity, reliability, travel times and operations of public transportation modal alternatives in the BIA;
- Improve highway freight mobility and address interstate travel and commerce needs in the BIA; and
- Improve the I-5 river crossing's structural integrity (seismic stability).

4.1.2 Project Need

The specific needs to be addressed by the proposed action include:

- **Growing travel demand and congestion:** Existing travel demand exceeds capacity in the I-5 crossing and associated interchanges. This corridor experiences heavy congestion and delay lasting 4 to 6 hours during the morning and afternoon peak travel periods and when traffic accidents, vehicle breakdowns, or bridge lifts occur. Due to excess travel demand and congestion in the I-5 bridge corridor, many trips take the longer, alternative I-205 route across the river. Spillover traffic from I-5 onto parallel arterials such as Martin Luther King Jr. Boulevard and Interstate Avenue increases local congestion. The two crossings currently carry over 280,000 trips across the Columbia River daily. Daily traffic demand over the I-5 crossing is projected to increase by more than 35 percent during the next 20 years, with stop-and-go conditions increasing to approximately 15 hours each day if no improvements are made.

- **Impaired freight movement:** I-5 is part of the National Truck Network, and the most important freight highway on the West Coast, linking international, national, and regional markets in Canada, Mexico, and the Pacific Rim with destinations throughout the western United States. In the center of the project area, I-5 intersects with the Columbia River's deep water shipping and barging as well as two river-level, transcontinental rail lines. The I-5 crossing provides direct and important highway connections to the Port of Vancouver and Port of Portland facilities located on the Columbia River as well as the majority of the area's freight consolidation facilities and distribution terminals. Freight volumes moved by truck to and from the area are projected to more than double over the next 25 years. Vehicle-hours of delay on truck routes in the Portland-Vancouver metropolitan area are projected to increase by more than 90 percent over the next 20 years. Growing demand and congestion will result in increasing delay, costs, and uncertainty for all businesses that rely on this corridor for freight movement.
- **Limited public transportation operation, connectivity, and reliability:** Due to limited public transportation options, a number of transportation markets are not well served. The key transit markets include trips between central Portland and Vancouver and Clark County, trips between north/northeast Portland and Vancouver and Clark County, and trips connecting Vancouver and Clark County with the regional transit system in Oregon. Current congestion in the corridor adversely impacts public transportation service reliability and travel speed. Southbound bus travel times across the bridge are currently up to three times longer during parts of the a.m. peak compared to off-peak. Travel times for public transit using general purpose lanes on I-5 in the BIA are expected to increase substantially by 2030.
- **Safety and vulnerability to incidents:** The I-5 river crossing and its approach sections experience crash rates more than 2 times higher than statewide averages for comparable facilities. Incident evaluations generally attribute these crashes to traffic congestion and weaving movements associated with closely spaced interchanges and short merge distances. Without breakdown lanes or shoulders, even minor traffic accidents or stalls cause severe delay or more serious accidents.
- **Substandard bicycle and pedestrian facilities:** The bike/pedestrian lanes on the existing I-5 bridges are about 3.5 to 4 feet wide, narrower than the 10-foot standard, and are located extremely close to traffic lanes, thus impacting safety for bicyclists and pedestrians. Direct pedestrian and bicycle connectivity are poor in the BIA.
- **Seismic vulnerability:** The existing I-5 bridges are located in a seismically active zone. They do not meet current seismic standards and are vulnerable to failure in an earthquake.

4.2 PROJECT DESCRIPTION

4.2.1 Project Area

The project area is defined as all areas that will be directly impacted by the project, including the footprint of the permanent and temporary structures, widened highway segments, new interchanges, city street realignments, associated road shoulder excavation and fill areas, stormwater facilities, areas contributing runoff to the stormwater facilities, wetland mitigation areas, and staging and access areas, including areas in the Columbia River and North Portland Harbor where work will occur from barges and temporary structures.

Along the I-5 corridor, the main portion of the ICP project area extends 3.5 miles from north to south, beginning at the I-5/Fourth Plain Boulevard interchange in Vancouver, Washington, and extending to the I-5/Victory Boulevard in Portland, Oregon. At its northern end, the project area extends west into downtown Vancouver and east to near Clark College to include high-capacity transit alignments, transit stations, park and ride locations, and city road improvements included as part of this project. Heading south along the existing over-water bridge alignments, the project area extends 0.25 mile on either side of the bridges to include the new Columbia River and North Portland Harbor bridges, as well as the adjacent areas where construction and demolition activities will occur. At its southern end, the project area extends east and includes city road improvements along Victory Boulevard. The signing and traffic control limits extend beyond the 3.5 miles as described above, but will cause minor impacts.

The project area includes potential construction staging and casting yards at the Port of Vancouver, Alcoa/Evergreen, Sundial, Red Lion at the Quay, and Thunderbird Hotel staging sites. Along the Sandy River in Oregon and along the Lewis River in Washington, the project area includes compensatory mitigation sites, though the Lewis River site will be covered under a separate permitting process.

The project area described here includes all associated cut and fill slopes and stormwater treatment facilities.

4.2.2 Timeline and Sequencing

Construction of the Columbia River and North Portland Harbor bridges sets the sequencing for other project components. The Columbia River bridges and immediately adjacent highway improvements will require the longest construction timelines. In-water construction will begin with the Columbia River bridges, though other elements of the project will be started well before these bridges are finished.

The estimated start date for construction is 2014; the estimated end date is 2022. Funding availability will be a large factor in determining the overall sequencing and construction duration. Contractor schedules, weather, materials, and equipment could also influence construction duration. Table 4-1 ummarizes the estimated interchange construction schedule timelines.

Table 4-1. Estimated Interchange Construction Schedule Timelines

Interchange	Years: Partial Interchange Including Southbound Approaches	Years: Full Interchange	Total Years Interchange Completion
SR 14	2	2.5	**4.5**
Hayden Island	1.5	1	**2.5**
Marine Drive	N/A	3	**3**
Fourth Plain Boulevard	N/A	2.7	**2.7**

The following provides a brief overview of the major construction sequencing issues. To the extent practicable, the timing of in-water work has been tailored to minimize impacts to aquatic species.

Columbia River Bridges Construction. The project will build two new spans over the Columbia River. The general sequence of bridge construction includes the following steps:

- Initial preparation: Mobilize construction materials, heavy equipment, and crews; prepare staging areas.
- Installation of temporary in-water work structures: Install cofferdams and temporary piles for work bridges and work platforms that will support construction equipment.
- Installation of foundation shafts: Drill and install shafts to support columns and superstructure.
- Shaft caps: Construct and anchor concrete foundations on top of the shafts to support pier columns.
- Pier columns: Construct or install pier columns on the shaft caps.
- Bridge superstructure: Build or install the horizontal structure of the bridge spans across the piers. The superstructure will be steel or reinforced concrete. Concrete will be cast-in-place or precast off site and assembled on site.

North Portland Harbor Bridges Construction. The project will build three new spans over North Portland Harbor during the ICP. A fourth bridge (part of the LPA) is proposed to be constructed when funding for it becomes available, likely after the ICP is constructed. The general sequence of bridge construction includes the following steps:

- **Initial preparation:** Mobilize construction materials, heavy equipment, and crews; prepare staging areas.
- **Installation of temporary in-water work structures:** Install temporary piles for work bridges and work platforms that will support construction equipment.
- **Installation of foundation shafts:** Drill and install shafts to support structures.
- **Bent columns:** Construct or install bent columns on the drilled shafts.
- **Bridge superstructure:** Build or install the horizontal structure of the bridge spans across the bents. The superstructure will be steel or reinforced concrete. Concrete will be cast-in-place or precast off site and assembled on site.

SR 14 and Hayden Island Interchange Construction. Proper sequencing of interchange construction, particularly construction of the SR 14 and Hayden Island interchanges, is critical to maintain traffic flow across the river during the entire project. Interchanges on each side of the bridge must be partially constructed before any traffic can be transferred onto the new structure. For the SR 14 interchange, it will take approximately 2 years to complete the southbound approaches and ramps and to allow traffic onto the new southbound Columbia River bridge (Table 4-1). Completion of the rest of the interchange will require approximately 2.5 additional years. For the Hayden Island interchange, it will require approximately 1.5 years to complete the southbound approaches needed to allow traffic onto the new southbound Columbia River bridge and approximately another 1 year to complete the full interchange.

Marine Drive Interchange Construction. Like the SR 14 and Hayden Island interchanges, construction of the Marine Drive interchange will require coordination with construction of the Columbia River bridge southbound lanes. Specifically, the use of the southbound braided ramps requires the work to occur in the same period. Without improvements to Marine Drive, the light rail system cannot be completed as currently designed. The Marine Drive interchange is expected to take 3 years to construct, including work at the Victory Boulevard interchange.

Fourth Plain Boulevard Interchange Construction. These interchange improvements will be constructed concurrently with the improvements at SR14 and the main river crossing to allow for the operation of the Central park and ride.

Demolition of Existing Bridges. Demolition of the existing river crossing structures is expected to take approximately 1.5 years. It can begin after all traffic is rerouted to the new Columbia River bridges. However, work must be completed at the SR 14 and Hayden Island interchanges before the existing bridge can be demolished. The new northbound bridge and the northbound off-ramp to SR 14 must be completed and opened before traffic can be routed to the new bridges.

Light Rail Construction. Light rail construction will require about 4 years for completion. LRT will use the southbound bridge across the Columbia River, and will be on a new, separate multi-modal structure over North Portland Harbor. Any bridge structure work will be separate from the actual light rail construction activities and must be completed first. As noted above, there are some staging considerations for the Marine Drive interchange construction.

4.2.3 In-Water and Over-Water Bridge Construction

New bridges will be constructed over the Columbia River and North Portland Harbor, a side channel of the Columbia River. See Section 5.2 for a discussion of existing conditions.

4.2.3.1 Overview

Columbia River Bridges

The existing I-5 structures over the Columbia River consist of two separate, parallel bridges that are functionally obsolete (i.e., the existing configuration does not meet current bridge standards and traffic demand). The existing structures include lift spans that must be raised for certain river traffic and maintenance, and that causes automobile and bicycle/pedestrian traffic delays when lifted. Each has three lanes, substandard shoulders, and a bicycle and pedestrian (bike/ped) sidewalk that does not meet current Americans with Disabilities Act (ADA) accessibility standards.

The new Columbia River crossing will carry traffic on two separate bridges and include a new LRT line and improved bike/ped facilities. Each new bridge will carry three through-travel lanes and two auxiliary lanes for traffic entering and exiting the highway in each direction, as well as full standard safety shoulders. The eastern structure will carry northbound traffic on its upper deck, with bike/ped traffic below; the western structure will carry southbound traffic on its upper deck, with LRT below. Both existing bridges will be removed after the new bridges are constructed and all traffic is routed to the new bridges.

The new bridges will be subject to multiple clearance constraints. Vertical clearances underneath the bridges must accommodate river traffic below. The project team, in consultation with the USCG, USACE, and industry representatives, will establish a minimum vertical clearance so that the new structure could be built without a lift span. In addition, the bridges must not be so high as to interfere with flights from Portland International Airport (PDX) and Pearson Field, a historic airport just to the east of the project area. Because of these elevation restrictions and the need to construct curved structures to match existing on-land infrastructure, suspension or cable-stay bridge designs are not practicable.

The new structures over the Columbia River are not proposed to include lift spans, allowing more free-flowing automobile and river traffic. In addition, grades on the proposed structure will meet current ADA standards for pedestrian accessibility.

North Portland Harbor Bridges

The project will modify the existing I-5 southbound bridge over North Portland Harbor and will add three new bridges adjacent to the existing bridge as part of the ICP. Starting from the east, these structures will carry:

- A two-lane northbound ramp carrying Marine Drive traffic to I-5 north.
- Northbound and southbound I-5 on the re-purposed existing bridge across the North Portland Harbor with three through lanes and two auxiliary lanes for southbound traffic and three through lanes and one auxiliary lane for northbound traffic.
- A two-lane southbound ramp carrying southbound I-5 traffic to Marine Drive.
- A multimodal local bridge carrying LRT and a two lane roadway with bike lanes and a sidewalk.

The structures over North Portland Harbor will not include lift spans.

Summary of Bridge Construction Timing

The ODFW- and WDFW-published in-water work window guidelines. For this portion of the Columbia River and North Portland Harbor that window is November 1 through February 28. Because of the large amount of in-water work involved, this project will not be able to complete the in-water work during this time period. Therefore, the project will request a variance to the published in-water work window guidelines. Some in-water construction activities are proposed to occur year-round, as shown in Table 4-2. Activities taking place outside of the normal in-water work will occur in coordination with ODFW, WDFW, NMFS, and USFWS and in compliance with the terms and conditions of all regulatory permits obtained for this project. Table 4-3 shows the proposed timing of activities that are *not* considered in-water work activities.

Table 4-2. Proposed Timing of In-Water Work in the Columbia River and North Portland Harbor

Activity	Description	Activity Duration (2014-2022)	Timing
1. Install small-diameter piles (≤48”) with impact methods.[a]	Small-diameter piles will be used in the construction of temporary work bridges/platforms, tower cranes, and oscillator support platforms.	Up to 1 hour/day (impact hammer operation). Approximately 138 days in CR and 134 days in NPH.	Only within approved extended in-water work window of September 15 through April 15 each year.
2. Install small-diameter piles (≤48”) with non-impact methods.	Small-diameter piles will be used in the construction of temporary work bridges/platforms, barge moorings, tower cranes, and oscillator support platforms.	Length of work day is subject to local noise ordinances, however could be up to 24 hours/day. Approximately 138 days in CR and 134 days in NPH.	Year-round provided work does not violate water quality standards.
3. Extract small-diameter piles (≤48”) (not including cofferdams).	Removal of small-diameter piles will be done using vibratory equipment or direct pull.	Length of work day is subject to local noise ordinances, however could be up to 24 hours/day.	Year-round provided work does not violate water quality standards.
4. Install/remove cofferdam for construction of Columbia River bridges.	Used to construct piers nearest to shore in the Columbia River (pier complexes 2 and 7). Steel sheet pile sections to be installed by non-impact means to form a cofferdam. Sheet pile removal can be direct pull or use a vibratory hammer.	Cofferdams could be in place for a maximum of 250 work days each. Installation and dewatering of each cofferdam will not take more than 65 workdays; cofferdam removal will not take more than 25 workdays. Length of work day is subject to local noise ordinances.	Year-round provided work does not violate water quality standards.
5a. Install large-diameter drilled shaft casings (≥72”) using vibratory hammer, rotator, or oscillator outside of a cofferdam.	Used to construct piers and bents not immediately adjacent to shore in the Columbia River and North Portland Harbor.	CR: 110 – 120 days / pier complex NPH: ~8 days/shaft	Year-round provided work does not violate water quality standards.

Activity	Description	Activity Duration (2014-2022)	Timing
5b. Install large-diameter drilled shaft casings (≥72”) using vibratory hammer, rotator, or oscillator inside of a water- or sand-filled cofferdam.	Used to construct piers and bents nearest to shore in the Columbia River and North Portland Harbor.	CR PC 2 and PC 7: ~84 days each NPH: ~ 8 days/shaft	Year-round provided work does not violate water quality standards.
6. Clean out shafts and place reinforcing, concrete inside steel casings.	Applies to all piers and shafts. All activities/materials will be contained within the casings and have no contact with the water.	CR: 110 – 120 days / pier complex NPH: ~8 days/shaft	Year-round provided work does not violate water quality standards.
7a. Perform placement of reinforcement and concrete for a cast-in-place pile cap.	Possible construction method for shaft cap at pier complexes 2 and 7. All activities and materials will be contained within forms and will have no contact with the water. The bottom of the pier caps may sit below the mud line.	Estimate 95 work days per pier.	Year-round. For pier caps nearest shore: year-round if work occurs within a dewatered cofferdam.
7b. Place a prefabricated pile cap, form, pile template, or similar element into the water.	At CR pier complexes 3 - 6. Potentially at pier complexes 2 and 7. Assume contact with the water surface, but not with the riverbed.	100 work days per pier.	For deep water piers: year-round provided work does not violate water quality standards. For piers nearest shore: year-round if work occurs within a dewatered cofferdam.
8a. Perform wire saw/diamond wire cutting outside of a cofferdam at or below the water surface.	Used throughout for demolition of existing bridges to cut concrete piers into manageable pieces. These pieces could then be loaded onto barges and transported off site.	Pier cutting and removal to take approximately 7 work days per pier.	Year-round provided work does not violate water quality standards.
8b. Perform wire saw/diamond wire cutting or a hydraulic breaker inside of a cofferdam.	Used for demolition of the existing Columbia River bridges. Used in water to cut concrete piers into manageable pieces. Cofferdam may not be dewatered.	Pier cutting and removal to take approximately 7 work days per pier.	Year-round provided work does not violate water quality standards.

Activity	Description	Activity Duration (2014-2022)	Timing
9. Remove material from river bed.	Old pier/bent foundations or riprap from North Portland Crossing may be removed. Will use bucket dredge.	Less than 7 work days during the published standard IWWW per pier.	No variance requested. 11/1 to 2/28.
9a. Spot remove debris and riprap from river bed	Guided removal (likely underwater diver assisted) of specific pieces of debris or large riprap only in the location where the shaft will be drilled. In North Portland Harbor only. Will use bucket dredge.	Up to 2 hrs/day. Less than 7 work days.	Year-round provided work does not violate water quality standards.

Note: Proposed timing is contingent upon obtaining an in-water work variance from all relevant regulatory agencies.

a As a minimization measure, temporary piles that are load-bearing will be vibrated to refusal, then driven and proofed with an impact hammer to confirm load-bearing capacity.

Table 4-3. Proposed Timing for Activities Not Considered In-Water Work (Columbia River and North Portland Harbor)

Activity	Description	Activity Duration (2014-2020)	Proposed Timing
1. Construction activity above the water surface (not superstructure).	Constructing the pier and pier table includes forming, reinforcing, and placing concrete above the water surface in the Columbia River and North Portland Harbor.	Constructing the pier, pier table, and cantilevers to take approximately 160 work days per pier complex in the Columbia River. In North Portland Harbor, ~57 to 142 days/bridge.	Year-round
2. Superstructure construction – form construction, placement of reinforcing, and concrete placement.	Concrete to be transported to the over-water work sites via barge or work bridges in the Columbia River and North Portland Harbor. Numerous barge trips may be required; alternatively, concrete could be pumped to the work site via temporary work/utility bridges.	In Columbia River: 750 work days. In North Portland Harbor: ~640 work days.	Year-round
3. Superstructure construction – precast or prefabricated element assembly.	In CR and NPH. Installation of bridge superstructure (pier tables, cantilevers, decking, etc.). Precast or prefabricated elements will be transported to the over-water work sites via barge or work platform. Numerous barge trips may be required.	CR: approximately 500 days per pier complex. NPH: 100 to 190 days per bridge.	Year-round

Activity	Description	Activity Duration (2014-2020)	Proposed Timing
4. Use of equipment and facilities already installed in the water.	This will include use of in-water structures (work bridges/platforms, tower cranes, cofferdams, oscillator support platforms) previously installed in the water.	In Columbia River ~750 work days, In North Portland Harbor: ~ 640 work days.	Year-round
5. Work on the bridge over the water.	Work on the bridge will cover many activities, including striping, overlays, lighting systems, etc.	In Columbia River ~750 work days, In North Portland Harbor: ~ 640 work days.	Year-round
6. Demolition of concrete over water in the Columbia River.	After installation of containment measures, concrete sections (existing bridge deck or piers) will be cut and removed from the existing structures. Cut sections could be loaded onto barges and transported off-site or trucked off the bridge.	Demolition of concrete bridge deck and piers to take approximately 255 work days.	Year-round
7. Cut off/remove existing timber piles or concrete pier inside of a cofferdam.	Exposed piles will be cut off several feet below the mud line from beneath the existing Columbia River bridge piers.	If applicable, cutting and removal of pile to take approximately 7 work days per pier.	Year-round
8. Remove existing Columbia River superstructure over water.	Lifting partitioned truss sections off their piers and loading them onto barges for transport to a dismantling site.	Demolition of bridge deck, towers, and all 10 spans to take approximately 255 work days.	Year-round

Notes:

1 The determination of activities that are not considered in-water work was made in consultation with ODFW, WDFW, NMFS, and USFWS biologists.

2 The in-water work window is a guideline established by ODFW. The guideline was created to assist the public in minimizing potential impacts to important fish, wildlife, and habitat resources. The guidelines are based on ODFW district fish biologist's recommendations. The IWWW can apply to any activity that is subject to the regulatory requirements of the Clean Water Act Section 404 and the State of Oregon's Removal-Fill Law. WDFW administers Chapter 77.55 RCW (Construction projects in state waters). Chapter 77.55 RCW requires anyone wishing to use, divert, obstruct, or change the natural flow or bed of any river or stream to first obtain a Hydraulic Project Approval (HPA) so that potential harm to fish and fish habitat can be avoided or corrected. WDFW has the "Gold and Fish" guide that was written as a guide when gold placer mining can occur during the calendar year, but it can be applied to other projects requiring an HPA. There are some circumstances where it may be appropriate to perform in-water work outside of the preferred work period indicated in the guidelines (i.e., an in-water work window variance). ODFW and WDFW may consider variations in climate, location, and category of work that will allow more specific in-water work timing recommendations on a project by project basis.

4.2.3.2 Columbia River Bridges

The project will construct two new bridges across the Columbia River downstream (to the west) of the existing interstate bridges. Each of the structures will range from approximately 91 to 136 feet wide, with a gap of approximately 15 feet between them. The over-water length of each new mainstem bridge will be approximately 2,700 feet (Table 4-4).

Table 4-4. Columbia River Bridges Over-Water Dimensions

Bridge	Approximate Length Over Water	Approximate Width
I-5 Northbound	2,700 feet	Varies: 91 to 130 feet
I-5 Southbound (with LRT)	2,650 feet	Varies: 91 to 130 feet

The Columbia River bridges will consist of six in-water pier complexes of two piers each, for a total of 12 in-water piers. Each pier will consist of up to six 10-foot-diameter drilled shafts topped by a shaft cap. In-water pier complexes are labeled Pier 2 through Pier 7 (noted as P-2 through P-7 in and elsewhere in this document), beginning on the Oregon side. Pier complex 1 is on land in Oregon and pier complex 8 is on land in Washington. Portions of pier complex 7 occur in shallow water (less than 20 feet deep). Piers are designed to withstand the design scour without armor-type scour protection (e.g., riprap).

Drawings in Attachment C show the basic configuration of these bridges, the span lengths, and the layout of the bridges relative to the Columbia River shoreline and navigation channels.

Columbia River Bridge Design

The proposed Columbia River mainstem crossing design uses two dual-level bridge structures. The western structure will carry southbound I-5 traffic on the top deck, with LRT on the lower deck. The eastern structure will carry northbound I-5 traffic on the top deck, with bike/ped traffic on the lower deck.

Each bridge will consist of a dual-level superstructure constructed on top of a series of six in-water piers complexes. Each in-water pier will be constructed on a column, which will in turn be constructed on a shaft cap supported by up to six 10-foot-diameter drilled shafts.

At each pier complex, sequencing will occur as listed below. Details of each activity are presented in the following sections.

- Install temporary cofferdam (applies to pier complexes 2 and 7 only).
- Install temporary piles to moor barges and to support temporary work platforms (at pier complex 3 through 6) and work bridges (at pier complex 2 and 7).
- Install drilled shafts for each pier complex.
- Remove work platform or work bridge and associated piles.
- Install shaft caps at the water level.
- Remove cofferdam (applies to pier complexes 2 and 7 only).
- Construct columns on the shaft caps.
- Build bridge superstructure spanning the columns.
- Remove barge moorings.

All the activities listed above may occur at more than one pier complex at a time as shown in Attachment C.

All activities will require the use of artificial lights for safety. Temporary over-water lighting sources will include the barges, work platforms/bridges, oscillator platforms, and cranes. The project will implement measures that minimize the effects of lighting on fish. Measures may include using directional lighting with shielded luminaries to control glare and direct light onto work areas, instead of surface waters.

Columbia River Bridge Construction Sequencing

A conceptual construction sequence was developed for building the new Columbia River bridges and demolishing the existing structures. The sequence was developed to prove constructability of the proposed design and is a viable sequence for construction of the river bridges. Once a construction contract is awarded, the contractor may sequence the construction in a way that may not conform exactly to the proposed schedule but that best utilizes the materials, equipment, and personnel available to perform the work. However, the amount of in-water work that can be conducted at any one time is limited, and is based on three factors:

1. The amount of equipment available to build the project will likely be limited. Based on equipment availability, the CRC engineering team estimated that only two drilled shaft operations would likely occur at a given time.
2. The physical space the equipment requires at each pier will be substantial. The estimated sizes of the work platforms/bridges and associated barges are shown in Appendix A. (This is a conceptual design developed by the CRC project team to provide a maximum area of impact. The actual work platforms will be designed by the contractor; therefore, actual sizes will be determined at a later date). The overlap of work platforms/bridges and barge space limits the amount and type of equipment that can operate at a pier complex at one time.
3. It is likely that one navigation channel shall be open at all times during construction, to the extent feasible.

The multi-phase sequence is shown graphically in Appendix A.

Columbia River Bridge Construction Timeline

Construction is currently estimated to occur between 2014 and 2018.

Temporary Structures

Temporary Cofferdams

Pier complexes 2 and 7 will each require one temporary cofferdam. Cofferdams will consist of interlocking sections of sheet piles to be installed with a vibratory hammer or with press-in methods. Table 4-5 provides an estimate of the dimensions of the cofferdams and Table 4-6 estimates the duration that they will be present in the water. Cofferdams will be removed using a vibratory hammer or direct pull.

Table 4-5. Potential Dimensions of Temporary Cofferdams Used in Columbia River Bridge Construction

Length (ft)	Width (ft)	Height (ft)t	Area per Cofferdam (sq. ft.)	Total Cofferdams	Total Area of Cofferdams (sq. ft.)
275	75	30	20,625	2	41,250

Table 4-6. Construction Summary for Cofferdams in Columbia River

Location	Duration to Install (Days)	Duration of Construction (Days)	Duration to Remove (Days)
Pier Complex 2	20	250[a]	15
Pier complex 7	20	250[a]	15

a Days represent approximate number of calendar days, cofferdam are in place. This duration represents approximately 175 working days.

Cofferdams will be installed in a manner that minimizes fish entrapment. Sheet piles will be installed from upstream to downstream, lowering the sheet piles slowly until contact with the substrate. When cofferdams are used, fish salvage must be conducted according to protocol approved by ODFW, WDFW, and NMFS. Cofferdams will not be dewatered.

Temporary In-Water Work Structures

The project will include numerous temporary in-water structures to support equipment during the course of construction. These structures will include work platforms and work bridges. They will be designed by the contractor after a contract is awarded, but prior to construction.

Temporary bents will be built near the upland piers 1 and 8 to facilitate construction of the spans between piers 1 and 2 and piers 7 and 8. These temporary bents will require approximately 16 48-inch piles per bent within the water column, encompassing approximately 202 square feet and 300 cy per bent.

Work platforms will be constructed at pier complexes 3 through 6. Work platforms are each estimated to be approximately 29,000 sq. ft. in area and will surround the future location of each shaft cap. Work bridges will be installed at pier complexes 2 and 7 so that equipment can access these pier complexes directly from land. Temporary work bridges will be placed only on the landward side of these pier complexes. The bottom of the temporary work platforms and bridges will be a few feet above the water surface. The decks of the temporary work structures will likely be constructed of large, untreated wood beams to accommodate large equipment, such as cranes. After drilled shafts and shaft caps have been constructed, the temporary work platforms and their support piles will be removed.

Both battered and vertical steel pipe piles will be used to support the structures. In addition, four temporary piles could surround each of the drilled shafts. Due to the heavy equipment and stresses placed on the support structures, all of these temporary piles will need to be load-bearing. Load-bearing piles will be installed using a vibratory hammer and then proofed with an impact hammer to ensure that they meet project specifications demonstrating load-bearing capacity. The number and size of temporary piles for these structures is listed in Table 4-7.

Table 4-7. Summary of Steel Pipe Piles Required for Temporary Overwater Structures During Construction of Columbia River Bridges

Type of Structure	Number of Structures	Pile Diameter	Pile Length	Piles per Structure	Total Number of Piles
Work platforms/bridges	6	24″	70′–90′	90 to 132	720
		48″	120′	48	288
Barge moorings	N/A	24″	70′–90′	Varies	160
Total	**6**	**---**	**---**	**---**	**1168**

Not all of these structures will be in place at the same time. It is estimated that only 150 to 500 steel piles, representing up to 6,300 square feet of temporary piles, will be in the mainstem Columbia River at any one time.

Barges

Barges will be used as platforms to conduct work activities and to haul materials and equipment to and from the work site. Barges will be moored to non-load-bearing steel pipe piles and adjacent to temporary work structures. The approximate dimensions of mooring piles are listed in Table 4-7.

Several types and sizes of barges will be used for bridge construction. The type and size of a barge will depend on how the barge is used. No more than 12 barges are estimated to be moored or moving equipment for Columbia River bridge construction at any one time throughout the construction period. The number and the area of the barges are estimated in Table 4-8.

Area and Duration of Temporary Structures

Table 4-8 summarizes the area of temporary structures required for construction in the Columbia River as well as their duration in the water. The number of temporary platforms or bridges in the Columbia River will vary between zero and four during construction. Up to four work platforms and two work bridges will be required to install drilled shafts and construct shaft caps. Each work platform/bridge will require approximately 20 to 30 work days to install. Each work platform/bridge will be in place for approximately 130 to 300 work days.

Barges will be moored around each pier complex. Approximately 160 mooring piles will be installed over the life of the project, each in place for approximately 120 work days. Up to 12 barges at one time would be on the site over the life of the project. Barges vary in size, but can be up to 30,000 sq. ft. in area. With several barges on the site, the over-water footprint could be up to 120,000 sq. ft. at any one time (estimate based on worst case scenario of 12 barges).

Table 4-8. Summary of Temporary Structures Required for Construction in the Columbia River

			sq. ft.			
Type of Structure	**Structures**	**Total Piles (all sizes)**	**Total In-Water Area for Piles**	**Total Over-Water Area/ Footprint**	**Approx. Time to Install (Days/Platform)[a]**	**Duration Present in Water (Days-Each)**
Work platforms/ bridges	6	1033	6,261	161,370	30-50	150-500
Barge moorings	N/A	160	503	N/A	N/A	120/mooring
Barges (cumulative, at a single time)	Up to 12	N/A	N/A	Up to 100,000[b]	N/A	Varies
Total	**6 to 18**	**1193**	**6,764**	**Up to 261,370**	**---**	**---**

a Assumes two crews.
b Assumes more than one barge.

Installation of Temporary Piles

Temporary piles will be used for mooring barges and to support in-water work structures. Mooring piles will be vibrated into the sediment until refusal. Vibratory installation will take between 15 and 60 minutes per pile.

Load-bearing piles (used for work platforms/bridges and tower cranes) will be vibrated to refusal (approximately 15 to 60 minutes per pile), then driven and proofed with an impact hammer to confirm load-bearing capacity. An average of six temporary piles could be installed per day using vibratory installation to set the piles, and up to two impact drivers to proof them. Rates of installation will be determined by the type of installation equipment, substrate, and required load-bearing capacity of each pile. Temporary piles will be installed and removed throughout the construction process. No more than two impact pile drivers will operate at one time. Generally, use of two impact pile drivers will occur at only one pier complex at a time.

In general, temporary piles will extend only into the alluvium to an approximate depth of 70 to 120 feet. Standard pipe lengths are 80 to 90 feet, so some piles may need to be spliced to achieve these depths.

Estimated pile installation specifications[3] are provided in Table 4-9. The number of pile strikes was estimated by WSDOT Geotechnical and CRC project engineers based on

[3] Number of piles driven per day, strikes per pile, total strikes per day, and duration of driving per day are estimates rather than maximums. The size and extent of this project requires contractor flexibility while minimizing effects to listed species. The CRC project is proposing performance measures that use these variables, in addition to the amount of attenuation, to calculate "exposure factors" on a weekly basis. The exposure factor uses the variables for daily piles strikes, timing and duration of piles strikes, days of pile driving within a week, size of pile (initial sound levels), fish speed, and fish mass to estimate the potential exposure to fish that are within or pass through the project area. Different combinations of any of these elements (such as pile strikes, duration or timing of pile strikes, and initial sound levels) will yield different exposure factors. For example, a higher number

information from past projects and knowledge of site sediment conditions. The actual number of pile strikes will vary depending on the type of hammer, the hammer energy used, and substrate composition. The strike interval of 1.5 seconds (40 strikes per minute) is also estimated from past projects and is based on use of a diesel hammer. This estimate is within the typical range of 35–52 strikes per minute for diesel hammers (HammerSteel 2009). It is worth noting that for any one 12-hour daily pile driving period, less than one hour of impact driving is anticipated.

Table 4-9. Pile-Strike Summary for Construction in Columbia River

Pile Size	Estimated Piles Installed per Day	Estimated Strikes per Pile	Estimated Maximum Strikes per Day	Hours of Pile Driving/12-hr Work Day
18–24″	3	300	600	0.25
42–48″	3	300	1,200	0.50
Total	**6**	**--**	**1,800**	**0.75**[a]

a This scenario assumes just one pile being driven at a time. During construction, up to two piles may be driven at the same time in the Columbia River. If this were to occur, the strike numbers would stay the same, but the actual driving time would decrease.

Impact pile driving could potentially occur any day between September 15 and April 15; however, impact pile driving is more likely to occur in the first 18 months of construction as pier complexes are started. After the first 18 months, most of the pier complexes will be well underway, leaving only the work required to finish a couple of pier complexes and provide bases for superstructure construction.

In accordance with an approved hydroacoustic monitoring plan (see Section 5.2) a noise attenuation device will be used during all impact pile driving, with the exception of during hydroacoustic monitoring when the noise attenuation device will be turned off to measure its effectiveness. A period of up to 7.5 minutes per week with no attenuation device has been allocated in the analyses and hydroacoustic minimization measure (see Section 5.2) to allow for monitoring and for time to shut-down activities should an attenuation device fail. If the attenuation device fails, pile driving activities will cease as soon as practicable and resolution of the problem will occur. By incorporating this time into the analysis, the project may still proceed in event of an equipment failure without exceeding the thresholds listed in the hydroacoustic minimization measure. With the exception of hydroacoustic monitoring, intentional impact pile driving without a noise attenuation device is not proposed nor will it be allowed. In addition, to limit hydroacoustic effects, there will be a consecutive 12-hour period of no impact pile driving for every 24-hour day.

Construction of Permanent Piers

In-water drilled shaft construction consists of installing large diameter steel casing to a specified depth to the top of the competent geological layer known as the Troutdale Formation. The top layer of river substrate is composed of loose to very dense alluvium (primarily sand and some fines), beneath which is approximately 20 feet of dense gravel, underlain by the Troutdale Formation.

of pile strikes in a given time period may result in the same exposure factor as a lower number of pile strikes conducted on a pile that has higher initial sound levels. During construction, the contractor will calculate the weekly, maximum yearly, average yearly, and total project exposure factor to ensure that exposure to listed fish are not exceeded in accordance with Section 5.2 of this document.

A vibratory hammer, oscillator, or rotator will be used to advance a steel casing. If casings are installed by a vibratory hammer, installation is estimated to be two work days per casing, not including welding of casings. If casings need to be welded together, one work day is estimated for each weld. Soil will be removed from inside the casing and transferred onto a barge as the casing is advanced. The soil will be deposited at an approved upland site. Drilling will continue below the casing approximately 10 feet into the Troutdale Formation to a specified tip elevation. After excavating soil from inside the casing, reinforcing steel will be installed into the shaft and then the shaft will be filled with concrete.

During construction of the drilled shafts, concrete will be poured into water-filled steel casings, creating a mix of concrete and water. As the concrete is poured into the casing, it will displace this highly alkaline mixture. The project will implement BMPs to contain the mixture and ensure that it does not enter any surface water body. Once contained, the water will be treated to meet state water quality standards and either released to a wastewater treatment facility or discharged to a surface water body. The steel casing may or may not be removed, depending on the installation method.

No contaminated sediments have been documented within the installation areas. Adherence to the terms of water quality certifications and implementation of impact minimization measures will ensure that, should contaminated sediments be encountered, that they will be dealt with properly.

Duration of Installation of Permanent Shafts

The total duration of the permanent shaft installation could vary considerably depending on the type of installation equipment used, the quantity of available installation equipment, and actual soil conditions. Installation of each drilled shaft is estimated to take approximately 10 days. With the limited in-water work window for impact pile driving and construction phasing constraints, the total duration of drilled shaft installation will be approximately 30 months.

Quantity of Permanent Shafts

Table 4-10 summarizes the permanent shafts to be constructed for each bridge over the Columbia River.

Table 4-10. Summary of Permanent Shafts in the Columbia River

Location	Shafts per Pier	Total Shafts	Total Plan Area of Shafts (sq. ft.)	Approx. Depth from Observed Lowest Water (0' CRD)
SB Bridge	6	36	2,827	Varies: 20 to 30
NB Bridge	6	36	2,827	Varies: 20 to 30
Total	**12**	**72**	**5,654**	**---**

Note: CRD = Columbia River datum.

Shaft Caps

Pre-cast shaft caps will be placed on top of the drilled shafts. The shaft caps will be fabricated off-site at a casting yard and then transported to the site. Installation of the shaft caps will require cranes, work barges, and material barges. Table 4-11 summarizes the dimensions of each shaft cap.

Table 4-11. Summary of Shaft Caps in the Columbia River

Type	Number	Width	Length	Total Area (sq. ft.)
SB Bridge	6	115	45	31,050
NB Bridge	6	115	45	31,050
Total	**12**	**---**	**---**	**62,100**

Column Construction

Columns will likely be constructed of cast-in-place reinforced concrete. Column construction is estimated to take 120 days for each pier complex. Construction columns will require cranes, work barges, and material barges in the river year-round.

Superstructure

The superstructure will be constructed of structural steel, cast-in-place concrete, or precast concrete. If used, precast elements will be fabricated at a casting yard (Section 4.2.9). Construction will require cranes, work barges, and material barges in the river year-round.

4.2.3.3 Maintenance of Land and Waterborne Traffic during Construction Activities

The new Columbia River bridges will be built downstream of the existing bridges. All vehicular traffic will continue to use the existing bridges while the new bridges are constructed (for more information on vehicular traffic, see Section 2.3 and 3.1 of the CRC FEIS). Short-term closures for vehicular traffic will occur when the approach roadways are tied into the new bridge.

Current river traffic uses three navigation channels to pass under the existing I-5 bridges as shown in Figure 4-1. They include the existing Interstate Lift Bridge channel (Primary Channel), the Barge Channel (Wide Span Channel) and the Alternate Barge Channel (High Span Channel). During construction, at least one of these channels will remain open at all times, although navigation clearances may be constrained. During construction, should there be occasion that the one open channel has height/width clearance constraints, these periods would be coordinated closely with the USCG District 13 through the weekly Local Notice to Mariners (LNM). The contractor will be required to provide the LNM no less than 2 weeks prior to the week of the event.

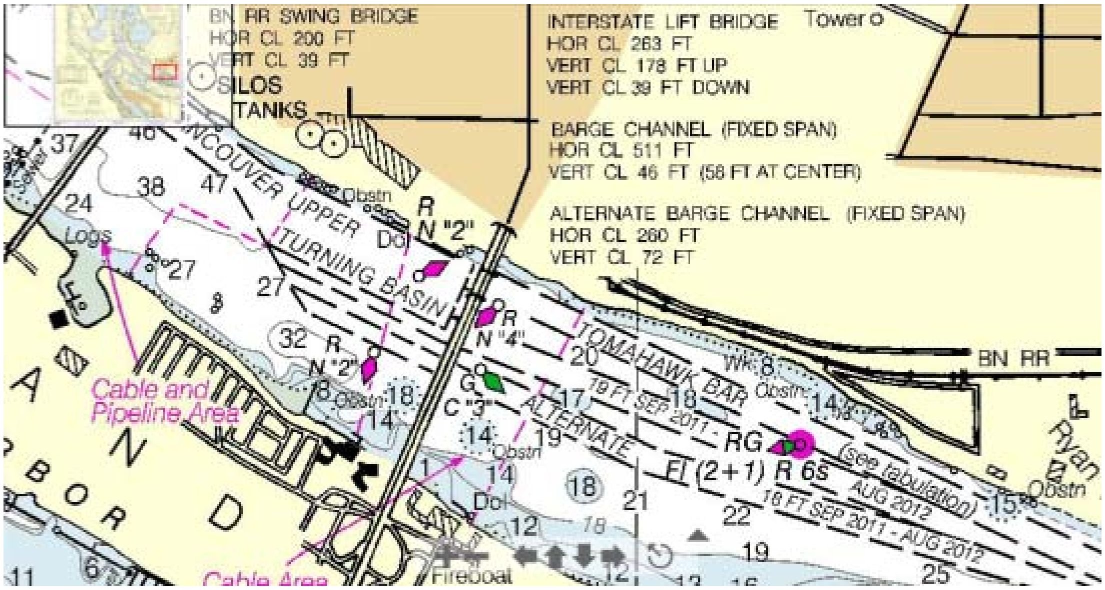


Figure 4-1. Existing Navigation Channels

Source: NOAA Nautical Chart 18525

Existing Interstate Lift Bridge (Primary) Channel

The existing Interstate Lift Bridge Channel (Primary Channel) is located between piers 6 and 7 of the new Columbia River bridges. It will remain open during most of the construction. The exception will be when the center portion of the steel truss in span 6 of each bridge is lifted into place and a work platform is constructed below the bottom soffit of the bridge to protect the navigation channel from falling objects, and during deconstruction of the existing bridges.

It is estimated that the each new bridge structure will require about a 2 to 3 week closure of the Primary Channel to erect the overhead truss. Once the overhead truss is erected the primary channel will be re-opened. Based on the conceptual schedule developed the closures would occur approximately 2 years after construction begins.

In addition, the width of the Primary Channel will be restricted to 150 feet during construction of the adjacent piers (piers 6 and 7). It is estimated that the 150-foot width will begin in the second year and run through the sixth year of construction. (The horizontal clearance of the downstream BNSF railroad bridge is 200 feet.)

Before the steel trusses of the new bridges are erected, the vertical clearance will be controlled by the existing bridges' vertical lift spans (178 feet above 0 CRD). Once the steel trusses are erected the vertical clearance will be reduced temporarily to approximately 98 feet above 0 CRD until the existing bridges are removed and the proposed new I-5 navigation channel is open at its final vertical clearance of 116 feet above 0 CRD.

During deconstruction of the existing bridges, a closure of the Primary Channel will be necessary for approximately 2 to 3 weeks. Based on the conceptual schedule, this closure would occur approximately 5 years after construction begins.

These closure periods, and periods of horizontal or vertical restriction, would be coordinated closely with the USCG District 13 through the weekly LNM. The contractor will be required to provide the LNM no less than 2 weeks prior to the week of the event. During closures vessels needing to transit under the bridge will use the Temporary Alternate Barge Channel (see Attachment C for drawing and definition of Temporary Alternate Barge Channel).

Existing Barge Channel (Wide Span Channel)

Pier 5 of the new Columbia River bridges will be located directly in the middle of the existing Barge Channel (Wide Span Channel). Once construction begins on pier 5 the existing Barge Channel (Wide Span Channel) will be closed to all ship traffic and the existing Alternate Barge Channel (High Span Channel) will be used. Based on the conceptual construction schedule the Existing Barge Channel (Wide Span Channel) will be closed during the first year of construction. This closure will be identified in the weekly LNM. The contractor will be required to provide the LNM no less than 2 weeks prior to the event and will remain on the LNM for the duration of the bridge construction. After the new bridges are completed and the existing bridges are removed, the location of the Existing Barge Channel (Wide Span Channel) will be modified (subject to approval USACE through the Section 408 authorization) to be located under span 6 of the new bridges.

Existing Alternate Barge Channel (High Span Channel)

The existing Alternate Barge Channel (High Span Channel) will remain open for most the construction except during the construction at pier 4. When the foundations (shafts and shaft cap) for pier 4 are being constructed, the existing Alternate Barge Channel (High Span Channel) will be closed. It is estimated that this closure period would be for less than two years, beginning in the first year of construction. This closure period would be coordinated closely with the USCG District 13 through the weekly LNM. The contractor will be required to provide the LNM no less than 2 weeks prior to the week of the event. Upon completion of the foundations a Temporary Alternate Barge Channel will be re-opened. However, the alignment and width of the Temporary Alternate Barge Channel will need to be adjusted to clear pier 4. The channel will be shifted slightly to the north and narrowed to 200 feet from its existing 260 feet. For the duration of construction, the height of the Temporary Alternate Barge Channel will be controlled by the existing bridges' vertical clearance which is 72 feet above 0 CRD.

Proposed Primary I-5 Navigation Channel

The Proposed Primary I-5 Navigation Channel will be located under span 6 of the new bridges. It will open once the existing bridges are removed. The new channel will be 300 feet wide and have a minimum vertical clearance of 116 feet above 0 CRD. At OHW (OHW is 16 feet above 0 CRD), the minimum vertical clearance will be 100 feet. The minimum clearance point will be the northwest corner of the navigation channel.

4.2.3.4 North Portland Harbor Bridges for ICP

The existing North Portland Harbor bridge will be repurposed to accommodate an additional lane for southbound I-5. The seismic retrofit activities will consist solely of minor modifications to the bent caps and girders that will not require in-water work. In addition, three new bridges will be constructed across North Portland Harbor. Starting from the east, these structures will carry a ramp for northbound I-5, a ramp for southbound I-5, and a multimodal local bridge carrying LRT and a two lane roadway with bike lanes and a sidewalk. A fourth bridge, called the Hayden Island to I-5 South structure, would be designed and constructed after the ICP has finished.

North Portland Harbor Bridge Design

The existing North Portland Harbor bridge was constructed in the early 1980s of precast concrete girders and cast-in-place concrete bents. The bents are supported by footings on driven steel piling. Two previous bridges, constructed in 1917 and 1958, were built at the same location as the current bridge, the foundation of these bridges may not been fully removed during subsequent replacement efforts. These bridges had reinforced concrete bents supported on timber piles.

Table 4-12 gives the approximate dimensions of the new bridges over the North Portland Harbor and the approximate water depth at each bent location. Bridge widths will vary due to merging of lanes on some structures. The three new bridge structures will consist of spans of varying lengths.

Table 4-12. Dimensions of North Portland Harbor Bridges

Bridge		Multimodal local bridge	I-5 Southbound Ramp	I-5 Northbound Ramp
Width Over Water		Varies 90-95 ft	Varies 45-50 ft	Varies 45-60 ft
Length Over Water		Approx. 890 ft	Approx. 950 ft	Approx. 1,040 ft
Approximate Depth from Observed Lowest Water (0' CRD) (ft)	Bent 2	13		---
	Bent 3	15		---
	Bent 4	20	12	-13--
	Bent 5	14	12	-13--
	Bent 6	-4	-19--	17
	Bent 7	---	-14--	12

Note: CRD = Columbia River datum.

Each bridge will have four to five in-water bents, consisting of two to three 10-foot-diameter drilled shafts. Unlike the Columbia River piers, shafts are not anticipated to be topped by a shaft cap. Current designs place all of the bents in shallow water (less than 20 feet deep). Bents are designed to withstand the design scour without armor-type scour protection (e.g., riprap).

North Portland Harbor Bridge Construction Sequencing

Construction is expected to be sequential, beginning with either of the most nearshore bents of a given bridge and proceeding to the adjacent bent. The actual sequencing will be determined by the contractor once a construction contract is awarded. All three of the bridges could have in-water work occurring simultaneously.

All bent construction is anticipated to occur from work bridges and oscillator support platforms.[4] Table 4-14 summarizes the areas of these structures located both in and over the water. The actual method of bent construction and girder erection will be determined by the contractor.

General construction activities to build the bents and superstructure are similar to those for the Columbia River bridges, except that shaft caps will not be used and bridge decks will be placed on girders instead of deck trusses. General sequencing of the construction of a single bridge appears below.

- Construct oscillator support platforms and work bridges using vibratory and impact pile drivers.
- Extract large pieces of debris as needed to allow casings to advance.
- Install drilled shafts at each bent.
- Construct columns on the drilled shafts.

[4] Oscillator support platforms are used to support the oscillators used to install the steel casing for drilled shafts. Although this document uses the term oscillator support platform throughout, the platform may support equipment for vibratory or rotator installation of steel casings.

- Construct a bent cap or crossbeam on top of the columns at a bent location.
- Erect bridge girders or girder sections on the bent caps or crossbeams, or temporary support towers.
- Place the bridge deck on the girders.
- Remove temporary work bridges, oscillator support platforms, and support towers.

Some of these activities will occur simultaneously at separate bents.

North Portland Harbor Bridge Construction Timeline

Construction is currently estimated to occur between 2015 and 2020.

Temporary In-Water Work Structures

For the eight bents in the Harbor, six temporary work bridges will be constructed to support equipment for the girder erections and drilled shafts construction. In addition, at each of the 28 bent locations, one oscillator support platform will be constructed for each drilled shaft, each consisting of four load-bearing piles, and 17 support towers will be constructed for the girder splices for all three bridges. The work bridges, oscillator support platforms and support towers will be designed by the contractor after a contract is awarded, but prior to construction. The bottom of the temporary work structures will be between 0 and 5 feet above the water line. Due to the heavy equipment and stresses placed on these structures, the supporting piles will need to be load bearing. All of them will be installed first with a vibratory hammer and then proofed with an impact hammer to ensure that they meet specifications for load-bearing capacity. The number and size of piles for temporary in-water work structures are listed in Table 4-13.

Table 4-13. Approximate Number of Steel Pipe Piles Required for Construction of North Portland Harbor Bridges

Type of Structure	Structures	Pile Diameter (inches)	Pile Length (feet)	Average Piles per Structures	Total Piles
Work bridges	6	24	70–120	126	758
Oscillator support platforms	28	24	120	4	112
Support towers	17	24	120	24	408
Total	**51**	**–**	**–**	**52**	**1,278**

Following installation of the drilled shafts, the oscillator support platforms and their support piles will be removed through vibratory methods.

Other temporary piles will be installed for the support towers to support the girder splices adjacent to the new bents (Table 4-13).

The need for steel pipe piles will be staged over the construction period. Steel piles will be installed and removed during the multi-year construction of the temporary support structures. Although the project will use over 1200 piles in North Portland Harbor, only 300 to 800 piles are estimated to be in the water at any one time, representing approximately 2,600 square feet of impact.

Number, Area, and Duration of Temporary Structures

The number, area, and duration of the work bridges, oscillator support platforms, and support towers are summarized in Table 4-14.

Table 4-14. Summary of Temporary Overwater Structures in North Portland Harbor

Type of Structure	Structures	Total Area in Water (piles) (sq. ft.)	Total Area Over Water (sq. ft.)	Duration to Install (days/platform)[a]	Duration Present in Water (days)
Work bridges	6	2,381	134,100	42	Up to 850
Oscillator support platforms	28	352	19,800	2	Up to 730
Support towers	17	1,282	N/A	8	Up to 730
Total	**Up to 51**	**4,015**	**153,900**	**---**	**---**

a Assumes one crew.

Installation of Temporary Piles

As with the mainstem Columbia River bridges, temporary piles will be required to support in-water work bridges or support towers during construction of the North Portland Harbor bridges. Unlike the Columbia River Bridges, cofferdams are not necessary.

Piles used for the temporary work bridges and the oscillator support platforms must be load bearing. They will first be vibrated to refusal, and then proofed with an impact hammer to confirm load-bearing capacity. An average of 3 load-bearing piles could be installed per day using vibratory installation to set the piles, with one impact driver to proof. Rates of installation will be determined by the type of installation equipment, substrate, and required load-bearing capacity of each pile.

In general, temporary piles will extend only into the alluvium to an estimated depth of 70 to 120 feet. Standard pipe lengths are 80 to 90 feet, so some piles may need to be welded to achieve the lengths required to drive them to these depths.

Estimated pile installation specifications are provided in Table 4-15. Estimates of required number of strikes per pile and total strikes are the same as for the Columbia River. However, only one impact driver will likely be used.

Impact pile driving is proposed to occur only during a 31-week period from approximately September 15 to April 15 or other period approved by NMFS, ODFW, and WDFW. No impact pile driving will occur outside of the approved dates.

Table 4-15. Pile-Strike Summary for Construction in North Portland Harbor

Pile Size	Estimated Piles Installed per Day	Estimated Strikes per Pile	Estimated Maximum Strikes per Day	Hours of Pile Driving/12-hr Daily Pile Driving Work Period
Temporary Work Bridge				
24”	3	300	900	0.165
Oscillator Support Platforms				
24”	3	300	900	0.165

As in the Columbia River mainstem, a noise attenuation device will be for all impact pile strikes, with the exception of a period of up to 5 minutes per week. This period allows time to test the effectiveness of the attenuation system and to shut down impact pile driving in the event of an attenuation device failure. Single strike and cumulative sound exposure levels will be monitored to ensure they do not exceed thresholds detailed in the hydroacoustic minimization measure (Section 5.2). In addition, each 24-hour day will include 12 consecutive hours of no impact pile driving to allow for migrating fish to pass through the area of effect and to allow non-migrating fish time to recover from hydroacoustic impacts.

Bent Construction

In-water drilled shaft construction for the North Portland Harbor is described previously in this section.

Duration of Permanent Shaft Installation

Installation of each drilled shaft is estimated to take approximately 10 days. However, the total duration of this activity could vary considerably depending on the type of equipment used, the quantity of available equipment, and on-site soil conditions. The total duration of drilled shaft installation will be approximately 18 months.

Quantity of Permanent Shafts

The number and area of permanent shafts are summarized in Table 4-16 for bridges over North Portland Harbor. The approximate water depth at the location of each bent is also listed. Each bridge will have five to six spans, each approximately 255 feet long.

Table 4-16. Number and Area of Permanent Shafts Required for North Portland Harbor Bridges in the ICP

Bridge Type	Number of Bents	Number of Shafts/Bent	New Shafts /Bridge	Total Area of New Shafts (sq. ft.)[a]
Northbound CD	4	2	8	628
Southbound CD	4	2	8	628
LRT Bridge	4	3	12	943
Total	**14**	**--**		**2,199**

a 10-foot-diameter shafts.

Shaft Caps

No shaft caps are proposed for the North Portland Harbor bridges.

Column Construction

Columns will be constructed of cast-in-place reinforced concrete, and will require cranes, work barges, and material barges continuously throughout this period.

Superstructure

The superstructure will consist of concrete deck on girders. Girders will be constructed of precast concrete girders or structural steel (plate) girders. Precast girders may be fabricated at a casting yard. A cast-in-place concrete deck will be placed on the girders. This element of project construction will require work bridges and cranes on the work bridges.

4.2.3.5 Hayden Island to I-5 South Bridge in Later Program

A fourth bridge to convey an on-ramp from Hayden Island to I-5 southbound over the North Portland Harbor is proposed for design and construction after the ICP is completed. Design details are not available at this time, however it is proposed that this bridge will require the same number of shafts and temporary work as the CD bridges described above in the ICP. The Hayden Island to I-5 South bridge will consist of eight drilled shafts, representing approximately 628 sq. ft. of impact, and temporary work bridges consisting of approximately 400 temporary 24-inch piles, representing approximately 1,260 sq. ft. of impact.

4.2.3.6 Removal of Floating Structures

Acquisition and removal of an existing dock, a docked ship, and wharf within the footprint of the mainstem Columbia River structure will occur prior to completion of construction. An existing dock and long-term docked ship, representing approximately 0.1 acre of floating structure and approximately 38 sq. ft. (0.0008 acres) and 25 cy, near the former Thunderbird Hotel will be removed prior to construction of Pier 2. Portions of the wharf associated with the Red Lion at the Quay, representing approximately 600 sq. ft. (0.0138 acres) and 880 cy of piles and 0.8 acres of overwater structure, will be removed prior to construction of Pier 7.

Acquisition and relocation of existing floating homes, commercial docks, and boathouses from moorages in North Portland Harbor will occur prior to construction of the North Portland Harbor Bridges. Up to 32 floating homes in the Portland Harbor will be displaced. Floating homes will be treated as real property unless it is determined there are sufficient replacement sites to which the floating homes can be economically relocated. If a sufficient number of replacement sites are not available, the floating homes will be purchased at fair market value and the occupants will be provided relocation assistance that may include payments, if necessary, to acquire decent, safe and sanitary replacement housing. The acquired floating homes will be sold on the condition that they are moved to other locations. The locations could be within North Portland Harbor, but may be in other portions of the lower Columbia River subbasin. Approximately 60 piles, representing approximately 188 sq. f.t (0.0043 acres) and 217 cy of material, associated with the floating homes, docks, and other structures will be removed. The floating structures total approximately 3.0 acres of floating structure.

4.2.4 Demolition of Existing Columbia River Bridges

The existing Columbia River bridges will be demolished after the new Columbia River bridges have been constructed and after associated interchanges are operating.

4.2.4.1 Proposed Bridge Demolition Methods

The existing Columbia River bridges will be demolished in two stages: 1) superstructure deconstruction and 2) substructure deconstruction.

Columbia River Bridges Superstructure Removal

Demolition of the superstructure will begin with removal of the counterweights. The lift span will be locked into place and the counterweights will be cut into pieces and transferred off-site via truck or barge. Next, the lift towers will be cut into manageable pieces and loaded onto barges by a crane. Prior to removal of the trusses, the deck will be removed by cutting it into manageable pieces; these pieces will be transported by barge or truck or by using a breaker, in which case debris will be caught on a barge or other containment system below the work area. After demolition of the concrete deck, trusses will be lifted off of their bearings and onto barges and transferred to a shoreline dismantling site.

The existing Columbia River bridge structures comprise 11 pairs of steel through-truss spans with reinforced concrete decks, including one pair of movable spans over the primary navigation channel and one pair of 531-foot long span trusses. The remaining nine pairs of trusses range from 265 feet to 275 feet in length. In addition to the trusses, there are reinforced concrete approach spans (over land) on either end of the bridges.

Table 4-17 describes the approximate area of the overwater portions of the existing bridges.

Table 4-17. Approximate Area of Existing Columbia River Bridges[a]

	Northbound	Southbound
Steel Trusses	168,096	176,943
Reinforced Concrete Approach Structure	18,250	18,950
Total Structure Area	**186,346**	**195,893**

a Measurements in square feet.

Columbia River Bridge Pier Removal

Nine sets of the 11 existing Columbia River bridge piers are below the OHW level and are supported on a total of approximately 1,800 driven timber piles. Each pier is approximately 3,090 sq. ft. in area and 4,854 cy in volume. Demolition methods have not been finalized; however, the final design will consider factors such as pier depth, safety, phasing constraints, and impacts to aquatic species. Demolition of the concrete piers and timber piling foundations is proposed to use the following method:

1. A diamond wire/wire saw will be used to cut the piers into manageable chunks that will be transported offsite. Cofferdams will not be used. Timber piles that pose a navigation hazard will then be extracted or cut off below the mud line. The pieces of the piers will be removed via barge.

Although ODOT maintenance personnel regularly inspect the existing bridge, the timber piles located underneath the existing piers are inaccessible and have not been inspected. Therefore, it is unknown whether these timber piles have been treated with creosote, but given their age and intended purpose, it is assumed that they have been so treated. Only piles that could pose a navigation hazard will be removed or cut off below mud line. These piles include those that are present in the proposed navigation channels and any that extend above the surface of the river bed. Piles will either be removed (using a vibratory extractor, direct pull, or clam shell dredge) or cut off below the mud line using an underwater saw. The exact number of piles to be removed is unknown and the likely area and volume of removal cannot be calculated at this time.

Columbia River Bridge Demolition Sequencing

A conceptual demolition sequence was determined based on the amount of equipment likely available to build the project and the physical space the equipment requires at each pier. The sequence is provided in Section 3.1. The actual construction sequence will be determined by the contractor once a construction contract is awarded.

Columbia River Bridge Demolition Timeline

Demolition will occur after the new Columbia River replacement bridges are built. Demolition activities will take approximately 18 months.

Barges

Barges will be used as platforms to perform the demolition and to haul materials and equipment to and from the work site.

Several types and sizes of barges are anticipated to be used for bridge demolition. The type and size of each barge will depend on how the barge is used. Up to six stationary or moving barges are expected to be present at any one time during bridge demolition. Number of barges and barge area for each phase of demolition are summarized in Table 4-18.

Temporary Pipe Piles

Demolition is currently anticipated to occur from barges. Over 300 18- to 24-inch steel pipe piles (each approximately 70 feet long) will be used to anchor and support the work and material barges necessary for demolition. Table 4-18 summarizes temporary pile use during bridge demolition.

Table 4-18. Summary of Barges and Temporary Piles Used in Bridge Demolition

Application	Locations	Barges/ Location	Area of Barges (sq ft)	Piles/ Barge	Piles	Area of Piles (sq. ft.)	Duration in Water (days/ location)
Span Removal	9	4-6	18,000	4	160	503	30
Pier Demolition	9	4	10,500	4	144	452	30
Total	**---**	**---**	**28,500**	**---**	**304**	**995**	**---**

a Cumulative at any one time.

Installation and Removal of Temporary Pipe Piles

All temporary piles will be installed using a vibratory hammer or push-in method. They will be extracted using vibratory methods or direct pull. Piles will be installed and removed continuously throughout the demolition process.

4.2.4.2 Equipment Necessary for Bridge Demolition

Equipment required for bridge demolition includes barge-mounted cranes/hammers or hydraulic rams. Vibratory hammers may be used to install and remove sheet piles for cofferdams and pipe piles for barge moorings. New permanent piles will not be required for demolition of the Columbia River bridges.

4.2.4.3 Proposed Bridge Construction and Demolition Minimization Measures

Throughout construction of the bridges over the Columbia River and North Portland Harbor and demolition of the existing Columbia River bridges, impact minimization measures will be used in accordance with regulations, permits, and state department of transportation specifications. These measures include methods to prevent pollutants from entering the water, salvage fish during isolation activities, utilize a noise attenuation device during impact pile driving, and monitor in-water noise, as well as monitoring and shutdown procedures to prevent injury to Steller sea lions during impact pile driving. Section 5.2 of this document presents detailed measures to avoid and/or minimize impacts from bridge construction and demolition activities.

4.2.5 Geotechnical Borings

Prior to final design of the Columbia River and North Portland Harbor bridges, approximately six geotechnical boring test events will be conducted. It is assumed that a total of six events will occur starting in 2014 in both the mainstem Columbia River and North Portland Harbor. Borings will extend to a minimum depth of 50 feet into the Troutdale Formation. Before performing the explorations, preparatory work will be required. The geotechnical team will prepare a Field Exploration Work Plan including drilling procedures and material containment, testing, and disposal methods as well as BMPs to be used.

The exploration program will involve the use of 2 barges, each with a truck-mounted drill rig secured to the deck. One barge will likely be approximately 30 feet wide by 115 feet long and the other will likely be approximately 25 feet wide by 75 feet long. The barges will be equipped with loading ramps which can be raised and lowered. The barges will be pushed to local boat ramps, and the loading ramps lowered to allow the truck rigs to drive aboard. Each barge has a hole in the deck (“moon pool”) through which the boreholes are drilled. In confined areas of North Portland Harbor, borings may also be drilled through a hole in the loading ramp at the front of the barge. The barges will be maneuvered to the borehole locations using a tugboat. A hand-held GPS receiver (correctable to 1 to 3 meters accuracy) will be used to determine location. Once over a drill site, a barge will be secured by spuds (long steel pipe piles which are dropped through holes in the deck and into the river bottom) and an anchor for increased stability. The anchor may or may not be used in North Portland Harbor, where the waters are typically calmer.

Borings will be drilled using mud-rotary drilling techniques. Before the drill hole is started, a 5-inch diameter steel circulation casing is pushed and driven below the mud line to create a seal between the circulating drilling fluids and the river. The casing is pushed using the drill rig hydraulic system. Once the casing is in place the soil inside of the casing is drilled out and the borehole is advanced with a 4- to 5-inch diameter tri-cone drill bit. The drill bit is attached to a string of hollow steel rods which are turned by the drill. Drill fluids, consisting of bentonite-water slurry are pumped down the drill rod, through the bit, back up the hole and into a “mud tub” where cuttings settle out. The fluids are then re-circulated back down the hole. The drill fluids help to keep the hole open, cool the drill bit, and flush cuttings from the bottom of the hole. The dense consistency of the drill fluid as well as the positive pressure from the hydraulic head prevents the hole from caving and prevents adjacent soil loss or flow of groundwater into the open boring. At regular intervals, the drill bit is pulled out of the hole and the bit is exchanged for a sampling tube. The sampler is lowered to the bottom of the hole and a soil sample is collected.

Disturbed soil samples will be collected in the borings. The disturbed samples will be collected using a 2-inch outside diameter split-barrel sampler in conjunction with in situ Standard Penetration Testing (SPT) following the procedures prescribed for the Standard

Penetration Test (ASTM D1586). If appropriate soils are encountered, a few undisturbed soil samples may also be collected using a 3-inch outside diameter thin-walled Shelby tube sampler. This sampler will be hydraulically pushed into the undisturbed soil at the bottom the boring in general accordance with ASTM D1587. Larger-diameter sampling equipment will be available for use if conventional SPT and thin-walled sampling methods are ineffective. Lithologic characteristics of the samples will be recorded on the boring log by our field representative.

Borehole drilling, sample collection, and the preparation of descriptive geologic logs of the soil and rock materials encountered will be performed by a Field Geologist. The boring logs will present an interpretation of soil and rock materials encountered in each bore hole, the depths of material changes and sample collection points.

Pressuremeter tests will be conducted. These tests consist of placing of placing an inflatable cylindrical probe in a predrilled hole and expanding this probe while measuring the changes in volume and pressure in the probe. No material will be removed. The displacement of soils is temporary. The probe is inflated under equal pressure increments (Procedure A) or equal volume increments (Procedure B) and the test is terminated when yielding in the soil becomes disproportionately large. Several pressuremeter tests (PMTs) will be performed during boring events. The PMTs will alternate with geotechnical sampling as the borehole is advanced. PMT depths will depend on the materials encountered in the boring.

OYO shear wave velocity profiling logging techniques will be used to measure shear wave and compression wave velocities in several borings. Shear wave velocity data will be collected at 1.5-foot depth intervals, from a depth of about 15 feet above the bottom of the borehole up to the bottom of the circulation casing. (The tail end of the instrument must occupy 15 feet of the borehole below where the logging may begin and the circulation casing, which prevents suspension logging, will extend 10 feet or less below the mudline.) At each measurement depth, the recorded data is reviewed and recorded on digital media before moving to the next depth.

As drilling, sampling and in-situ testing of the boreholes are completed, the hole will be abandoned by filling the hole with a high solids sodium bentonite grout. A tremie pipe will be placed in the borehole and the grout, which will be mixed on the barge deck, will be pumped through the tremie pipe to the bottom of the borehole. The tremie pipe will be pulled back out of the hole in stages as the borehole is filled with grout. Borehole and grout volumes will be calculated to avoid over-filling the borehole. As the borehole is backfilled, the grout will displace drilling mud remaining in the hole. The drilling mud will rise up the circulation casing and into the mud tub where it will then be pumped into 55-gallon drums for disposal. The level of the bentonite backfill will be left a couple of feet more or less below the mud line so that when the casing is pulled the hole will cave closed over the backfill and prevent the bentonite from coming in contact with the river. When backfilling of the hole is complete, the drilling mud remaining in the circulation casing will be pumped out and into 55-gal drums before the circulation casing is removed.

During each event, it is proposed that no more than 5 sq. ft. and 10 cubic yards of sediment is impacted, for a total of no more than 30 sq. ft. and 60 cubic yards over the life of the project.

4.2.6 Roadway Improvements

The proposed project includes improvements to four interchanges along a 3.5-mile segment of I-5 between Victory Boulevard in Portland and Fourth Plain Boulevard in Vancouver. Improvements will be made at the following interchanges: Victory Boulevard, Marine Drive, Hayden Island, SR14, and Fourth Plain. These improvements include some reconfiguration of adjacent local streets to complement the new interchange designs, as well as new facilities for bicyclists and pedestrians.

In addition to interchange improvements, highway safety and mobility will be improved with a series of auxiliary (add/drop) lanes that will be sequentially added and then dropped at strategic locations through the corridor. The add/drop lanes will allow vehicles to travel between given points without merging into mainline interstate traffic, and will allow vehicles exiting or entering to minimize conflicts with through traffic. From the south end of the project area, I-5 northbound will add one auxiliary lane starting where the Victory Boulevard on-ramp enters I-5. Another auxiliary lane will be added where the Marine Drive on-ramp enters I-5. An optional third auxiliary lane will be added where Hayden Island traffic enters I-5 over the river. One of these lanes will be dropped at the SR 14 off-ramp, and a second will be dropped at the Mill Plain off-ramp. North of the Mill Plain off-ramp, the improvements will match into the existing facility. Southbound I-5 and the associated interchanges and ramps will have a similar series of add/drop lanes.

Highway and surface roadway construction activities adjacent to each of the four interchanges that will be improved have been integrated into the construction design for each of these interchanges. Each interchange has a proposed construction description and sequence as described in more detail below; however, the general interchange and roadway construction activities are described here.

Typical reconstruction of roadway in the corridor involves a sequence of activities that will be repeated several times at any one particular interchange or roadway section depending on the amount of room a contractor has to work and where traffic must be accommodated.

In most cases, an area to detour mainline traffic will be constructed to clear the area for permanent work. Temporary earthwork, drainage, surfacing, and paving activities will take place to build these features. Prior to this, utilities may need to be relocated, drainage appurtenances put in place, and access to and from the freeway rerouted to accommodate the new mainline location. Once traffic is moved and an area is cleared, or in areas where it is already cleared, permanent work will proceed.

Earthwork equipment will build embankments or excavate earth to a subgrade elevation (the bottom of the eventual pavement section that traffic will drive on). Because of the tight areas, large earthmoving equipment is not envisioned for use in this work. Wheel loaders, back hoes, and similar equipment will be used. Dump trucks will be used to transport material to and from the project as the subgrades are constructed. Embankments must be built in layers with thorough compaction to ensure its stability. Large rollers will be used for this compaction. Once completed, rock will be placed on the subgrade with several lifts of asphalt or concrete pavement following. Rock will be placed by dump trucks and compacted with rollers. Asphalt will be placed with a paving machine that is fed by dump trucks then compacted by rollers. Final drainage fixtures will be placed either before or after the final surfacing operation. Illumination, Intelligent Transportation Systems (ITSs), and signal conduits will generally be placed prior to surfacing. Foundations and the appurtenances will precede or follow the surfacing work. Concrete barriers, guardrails, and other safety devices will follow the surfacing work, as will landscaping of the exposed earthen slopes. Temporary barriers may be used until roadways are fully completed. If deemed necessary through noise analyses, permanent stand-alone sound walls may be constructed before or after any of this work depending on available room and access to the work sites.

As the various stages are completed, the new roadways will be striped to accommodate the shifting of traffic to allow areas to be cleared for future stages of work. Once all traffic can be placed in its permanent position, a final level of asphalt will be placed and permanent striping and signing installed. This may be preceded by illumination and concrete median barrier being installed between adjacent roadways.

4.2.6.1 Victory Boulevard Interchange

The southern extent of the CRC highway improvements is the Victory Boulevard interchange. Improvements at this interchange will be limited to two of the ramps and widening of the I-5 structure over Victory Boulevard. The I-5 southbound ramp will be reconstructed as a result of the widening on I-5. Similar improvements will be made in the northbound direction. Currently, the existing Denver Avenue on-ramp merges with I-5 mainline northbound traffic; the proposed improvement will bring this ramp on as an add lane, acting as an auxiliary lane within the project limits to provide additional capacity and a safer roadway.

4.2.6.2 Marine Drive Interchange

All movements within this interchange will be reconfigured to reduce congestion and improve safety for trucks and other motorists entering and exiting I-5. The proposed configuration is a single-point urban interchange (SPUI). With this configuration, the four legs of the interchange will converge at a point on Marine Drive over the I-5 mainline and will provide for more efficient traffic operations than the existing configuration.

Travel safety and mobility between the Marine Drive interchange and Hayden Island will be improved by providing grade separated crossing connections which eliminate the weaving maneuver from the I-5 mainline. The separated connections will allow traffic entering and/or exiting the freeway at either Marine Drive or Hayden Island to travel on parallel structures over North Portland Harbor. Separating this traffic will prevent potential collisions and reduce congestion that can occur from a high number of conflicting traffic movements.

The new interchange configuration changes the westbound Marine Drive and westbound Vancouver Way connections to Martin Luther King Jr. Boulevard and to northbound I-5. Rather than merging onto Martin Luther King Jr. Boulevard, which then loops to the west side and back to the east side of I-5 before entering northbound I-5, these two streets will instead access westbound Martin Luther King Jr. Boulevard farther east. Martin Luther King Jr. Boulevard will have a new direct connection to I-5 northbound.

In the new configuration, the connections from Vancouver Way and Marine Drive will be served by improving the existing connection to Martin Luther King Jr. Boulevard east of the interchange. The improvements to this ramp will allow traffic to turn right from Vancouver Way, and the acceleration distance will be extended to allow for a safer merge. On the south side of Martin Luther King Jr. Boulevard, the existing loop connection will be replaced with a new connection farther east, touching down to Union Court at the intersection with Hayden Meadows Drive. A new undercrossing of Martin Luther King Jr. Boulevard will replace the existing one at Marine Way.

4.2.6.3 Hayden Island Interchange

The Hayden Island interchange ramps will be reconstructed to improve merging speeds by building longer ramps in a form similar to the existing interchange. The current Hayden Island interchange off of I-5 contains substandard features, including short on- and off-ramps. The existing short ramps do not provide ample distance for some vehicles, especially trucks, to reach mainline speed before merging onto the mainline lanes, which results in a safety hazard. The combination of short ramps and lack of add/drop lanes requires traffic entering and exiting the highway to accelerate quickly when entering and decelerate quickly when exiting, or to back up along the ramps and mainline. These conditions result in congestion and higher crash rates on the highway and local streets (CRC 2008).

Improvements to N Hayden Island Drive will include additional through, left-turn, and right-turn lanes.

4.2.6.4 SR 14 Interchange

The basic functions of this interchange will remain largely the same as the existing interchange, but safety will be improved and congestion will be reduced. Direct connections between I-5 and SR 14 will be rebuilt. Access to and from downtown will be provided as it is today, but the connection points will be relocated.

Specific changes to traffic movements at this interchange include:

- Access to I-5 southbound from downtown Vancouver will be made on C Street rather than on Washington Street.
- Downtown connections to and from SR 14 will be made by way of Columbia Street at 4th Street.
- The distance between the northbound I-5 exit to SR 14 and the exit to City Center will be increased to improve safety.
- With the reconfiguration of the SR 14 westbound movement, the lane-drop that occurs between I-5 northbound and SR 14 to C Street will be eliminated.
- The southbound I-5 connection to SR 14 will be made with a structure under I-5 and SR 14.
- The northbound I-5 connection to SR 14 will be a larger radius curve, allowing traffic to travel at a higher speed than on the existing ramp.
- Both north and southbound movements between the Mill Plain interchange and the SR 14 interchange will occur separate from the highway on CD roads, eliminating the substandard weave distances on the I-5 mainline.
- For all connections, acceleration and deceleration distances will adhere to highway design standards to improve safety.
- Raising I-5 at this interchange.
- Extending Main Street from 5th Street south to Columbia Way.

4.2.6.5 Fourth Plain Interchange

The improvements to this interchange are to accommodate access to the park and ride at Clark College. Northbound I-5 traffic exiting to Fourth Plain Boulevard will continue to use the off-ramp near the Mill Plain interchange.

Specific changes to traffic movements at this interchange include:

- The southbound I-5 exit to Fourth Plain will have an additional left turn lane at the intersection.
- The intersection at the east ramp terminal will be modified to accommodate a southbound road which will be added to provide access to the Clark College park and ride from the north. This is for traffic exiting I-5 at Fourth Plain or already on Fourth Plain. Access from the park and ride will also be added to the existing northbound exit ramp.

4.2.6.6 Ground Disturbance, Vegetation, and Landscaping

The roadway improvements described in this section will occur on land and above OHW. Retaining walls will be constructed; the number, height, location, and materials (concrete or steel) are still undetermined. The project will also require upland activities, including pile driving, installation of drilled shafts, seismic ground improvements, and staging. Other work items that will cause ground disturbance include relocation, removal, and replacement of utilities; lighting/illumination structures; signals; signing; and intelligent transportation system (ITS) improvements (e.g., installation of variable message signs, traffic sensors and cameras, radio and telecommunications).

In North Portland Harbor and the Columbia River, effects to riparian habitat will be negligible, as there is very little functioning riparian vegetation in the project area. Approximately 12 mature trees will be removed within the riparian zone of the Columbia River and North Portland Harbor. There will be no excavation or removal of trees from the Columbia Slough.

Ground disturbance, clearing, and grubbing related to roadway and transit improvements will permanently impact approximately 0.87 acres of existing vegetation in the Columbia River crossing area. The disturbed vegetation consists mainly of grasses and ground cover, with small portions of shrubs and trees. In addition, approximately 345 acres of total ground disturbance is anticipated as part of the project. Table 4-19 provides a summary of these impacts by watershed.

Table 4-19. Summary of Ground Disturbance by Watershed

Watershed Name	Vegetated Acres	Vegetated and Non-Vegetated Acres
Columbia River	0.56	240
Columbia Slough	0.23	105
Total	**0.79**	**345**

Temporarily disturbed areas within DOT rights-of-way will be replanted according to the Roadside Classification Plan (WSDOT 2006) on WSDOT right-of-way, and according to the Roadside Development Design Manual (ODOT 2006) on ODOT right-of-way. Site-specific assessments may result in permanent replanting that differs from these roadside classifications plans; this will be determined by a landscape architect. Disturbed areas within transit or local rights-of-way would be replanted to local regulation standards.

4.2.7 Park and Ride Facilities

Three new park and ride facilities are proposed as part of this project. They are identified by their general locations at the SR 14 interchange, the Mill District, and Central. The park and ride structures will be built of precast or cast-in-place concrete and will be constructed using nearby staging areas. Construction of the structures will generate concentrated truck traffic that may impact local traffic. These traffic issues will be addressed in the Traffic Management Plan. During excavation and foundation construction, dust and noise will be generated. These will be minimized through implementation of the Spill Prevention, Control, and Countermeasures (SPCC) plan. A Temporary Erosion and Sediment Control (TESC) plan will be implemented during construction to prevent turbid discharges to surface waters.

4.2.8 Light Rail Construction and Operation

LRT generally refers to electric-powered train systems operating on city streets or on separate rail systems. LRT differs from heavy rail in that it carries fewer passengers, operates at slower speeds, is more flexible, and is therefore better able to access more locations in urban centers. Conversely, in comparison to street cars or trams, LRT carries a higher number of passengers and operates at higher speeds.

The proposed project includes construction of LRT guideways, both at-grade and elevated, park and ride facilities, and transit stations; and expansion of TriMet's Ruby Junction Maintenance Facility in Gresham. These components are described below.

4.2.8.1 Portland Expo Center to Vancouver

The new high-capacity LRT project component will be an extension of the existing MAX Yellow Line. New tracks will be constructed starting just north of the existing platform at the Portland Expo Center Station.

Construction elements include:

- Grading and excavation
- Demolition of the north platform access
- Placement of underground utilities
- Placement and tie-in of signal and Thermal Energy Storage (TES) duct bank
- Construction of systems foundations
- Installation of overhead catenaries
- Concrete surface work
- Landscaping

The track from the Expo Center to north of Marine Drive will be pervious tie and ballast construction. North of Marine Drive, the trackway will be located on an impervious structure to cross over North Portland Harbor and onto Hayden Island. On Hayden Island, the guideway will be located on an impervious surface and constructed on engineered fill. Leaving the island, the transit alignment will be located on structure and will then enter the lower deck of the stacked southbound replacement bridge over the Columbia. The track will then be placed on the bridge structure without ballast. These structures are also considered impervious surfaces. Upon leaving the northern portal of the stacked bridge, the light rail alignment will travel on impervious structure to a touch down at 5th Street in downtown Vancouver. Total trackway pervious and impervious surfaces from the Expo Center to the touchdown in Vancouver (not including the stacked highway structure) are approximately 25,000 and 160,000 sq. ft., respectively. The light rail structure across North Portland Harbor will also carry a two lane roadway with bike lanes and a sidewalk. The construction of elevated guideways over existing streets may impact traffic because of temporary road closures. This and other traffic issues will be addressed in a traffic management plan prepared and approved by the project before construction begins. Clearing and grading activities and demolition of other structures for newly acquired right-of-way will occur where the elevated guideway transitions to at-grade track.

Elevated guideways and stations for light rail will be constructed of steel, reinforced concrete, or combinations of both. Construction will begin with preparation to build foundations that may consist of shallow spread footings, deep driven or augered piles, or drilled shafts. Once foundations are in place, concrete columns and crossbeams will be constructed.

The superstructure of each elevated structure may be built of steel, cast-in-place concrete, or precast concrete. If steel or precast concrete is used, sections can be transported to the site and lifted into place from the street. If cast-in-place concrete is used, then temporary structures will be required to support the superstructure until the cast concrete has gained enough strength (through curing) to support itself.

4.2.8.2 In-Street Construction in Vancouver

The new light rail guideway will be located within existing streets in Vancouver and will not contribute to a net increase in existing impervious surface. Final design of the LRT alignment and integration of automobile, pedestrian, and bicycle traffic facilities will occur in the future. Drawings showing proposed spacing of automobile, bus, and LRT on surface streets are presented in Attachment C.

Roadway construction for the light rail alignment will include restriping or rebuilding the road surface, rebuilding sidewalks, and constructing station platforms. Streetscape improvements will include removing, replacing, or adding vegetation, curb extensions, new signs and signals, and other measures to improve access to, and use of, the transit stations. Stations, park and rides, and new structures could require land-based pile driving and earthwork for clearing and grading these sites.

The roadway along the light rail alignment will need to be rebuilt to support the weight of a two-car train. This will generally require relocation of utilities. At-grade LRT tracks will require clearing, grading, and typically shallow excavations. Clearing may include demolition and removal of pavement, vegetation, and other surface features, and implementation of a TESC plan with BMPs, and a Pollution Control Plan. During the grading phase, the contractors will install culverts or other permanent drainage structures and below-grade light rail infrastructure. This may require temporary steel plates in the roadway and temporary lane closures. Where in-street track is proposed within existing or expanded street right-of-way, grading will generally be minimal, but extensive reconstruction of streets, sidewalks, and other facilities may occur. Shallow, near-surface excavations will be required to construct the subgrade and track and station platform slabs for at-grade segments.

Light rail will also require construction of an OCS over the guideway to provide electrical power to the trains. Additionally, it will be necessary to seek temporary construction easements or small permanent easements on some properties adjacent to the light rail alignment to allow construction workers to encroach on several feet of a property while rebuilding the sidewalk in front of the property or to place specific elements.

Transit construction will also require staging areas adjacent to or within the guideway to store construction equipment and materials. Many of the staging activities will take advantage of land that is already in the public right-of-way or in public ownership and that is not being used for other purposes, such as vacant lots.

4.2.9 Staging and Casting Areas

Construction will require staging areas to store construction material, load and unload trucks, and conduct other construction support activities. Multiple staging areas will be needed, given the linear nature of the project and that much of it could be under construction at the same time. The existing I-5 right-of-way will accommodate most of the common construction staging requirements. Interchange areas at Marine Drive, SR 14, and Fourth Plain Boulevard have enough room for staging most typical earthwork, drainage, utility, and structure activities. However, some construction staging may be needed outside the existing right-of-way, requiring temporary easements on nearby properties. The equipment will include, but may not be limited to paving equipment, hauling trucks, pile drivers, rotators/oscillators, concrete trucks, bulldozers, track excavators, backhoes, graders, scrapers, dump trucks, cranes, compactors, general use vehicles, and wheel loaders.

In addition, at least one large site will be required to stage larger equipment and materials such as rebar and aggregate, to accommodate construction offices, and possibly to use as a casting yard for fabricating segments of the bridges. Suitable site characteristics for such a staging area include a large, previously developed site suitable for heavy machinery and material storage, proximity to the construction zone, roadway or rail access for landside transportation of materials, and waterfront access for barges (either an existing slip or dock capable of handling heavy equipment and material). The following three previously developed sites are identified as possible major staging areas:

- The Port of Vancouver site: This 52-acre site is located along SR 501 near the Port of Vancouver's Terminal 3 North facility. This site is without river frontage, so materials would be transported over land to the construction site. Most of the property has an asphalt concrete surface, and any improvements will most likely be on top of this surface. Activities will consist of material storage, material fabrication (e.g., concrete and asphalt plants), equipment storage and repair, and temporary buildings. This site is currently used as a staging area for windmill components.
- The Red Lion at the Quay Hotel: This is a 2.6-acre site on the north shore of the Columbia River, immediately downstream of the existing bridge alignment. A portion of this site will be acquired as right-of-way for the new bridge. Construction will require demolition of most of the buildings on the site. It could make an ideal staging area due to its proximity to bridge construction, large size, and access to the river, and because the project may already need to acquire the entire parcel. This site could be used for staging materials and equipment and for fabrication of smaller bridge and roadway components. Temporary buildings, such as trailers or other mobile units, will be built on the site for construction offices.
- Thunderbird Hotel Site: This is a 5.6-acre site on Hayden Island on the south shore of the Columbia River, immediately downstream of the existing bridge alignment. A large portion of the parcel will be acquired as new right-of-way for the new bridge alignment. The site is relatively large and it is adjacent to the river and the construction zone. The same types of activities could occur on this site as on the Red Lion Hotel site.

If a precast concrete is used, a casting yard will likely be required for construction of the structure elements. The superstructure segments will be cast, shipped to the bridge construction site, and set in place. A casting yard will require access to the river for barges (either a slip or a dock capable of handling heavy equipment and material), a large area suitable for a concrete batch plant and associated heavy machinery and equipment, and access to a highway and/or railway for delivery of materials over land. All work to prepare the casting yard will occur in upland areas and will be required to follow the BMPs in a TESC and SPCC plan and will meet all conditions of the site use permits and Biological Opinion. No riparian vegetation will be impacted at these sites.

Two sites have been identified as major casting/staging yard areas:

- Alcoa/Evergreen site: This 94.5-acre site on the north shore of the Columbia River at approximately RM 102 (RKm 164) was previously used as an aluminum smelter and is currently undergoing environmental remediation, which should be completed before the anticipated 2013 start date. The western portion of this site, which is best suited for a casting yard, currently contains two large settling ponds that will have to be worked around. In addition, the property will require grading, drainage, and surfacing work to support the materials and equipment needed for a casting yard.

- Sundial site: This 56-acre site lies on the south shore of the Columbia River near RM 120.2 (RKm 193), between Fairview and Troutdale, and just north of the Troutdale Airport, and has direct access to the Columbia River. Currently owned by Knife River, approximately one-third of the property is being used for aggregate storage, stockpile, crushing, and sifting, as well as asphalt recycling. A recently improved landing and barge slip is located on the site.

4.2.10 Stormwater

The CRC Project is a bi-state initiative and it is important to note that the implementation of stormwater management goals differs significantly between Oregon and Washington States. The primary differences involve how areas that require pollutant reduction are calculated. These differences, which are described in the following paragraphs, can have an impact on the size of water quality facilities required. This impact is notable for projects like the CRC, which involve large areas of impervious pavement.

Oregon requires runoff from the entire contributing impervious area (CIA) be treated to reduce pollutants regardless of degree to which the surfaces would contribute pollutants to runoff. Using this approach, runoff from highways would be required to be treated in the same manner as runoff from bike-pedestrian paths. In contrast, Washington State focuses on requiring treatment for runoff from the pollutant-generating impervious surfaces (PGIS).

ODOT defines CIA as consisting of all impervious surfaces within the strict project limits, plus impervious surface owned or operated by ODOT outside the project limits that drain to the project via direct flow or discrete conveyance (ODOT 2011). NMFS has expanded this definition to also include impervious areas that are not owned by ODOT but drain onto the project footprint.

WSDOT and Ecology define PGIS as surfaces that are considered a significant source of pollutants in stormwater runoff including:

- Highways, ramps, and non-vegetated shoulders
- LRT guideway subject to vehicular traffic
- Streets, alleys, and driveways
- Bus layover facilities, surface parking lots, and the top floor of parking structures

The following types of impervious area are considered non-PGIS:

- LRT guideway not subject to vehicular traffic except the occasional use by emergency or maintenance vehicles (referred to as an exclusive guideway)
- LRT stations
- Bicycle and pedestrian paths

Exclusive LRT guideway is considered non-PGIS because LRVs are electric, and other potential sources of pollution such as bearings and gears are sealed to prevent the loss of lubricants. In addition, LRV braking is almost exclusively accomplished via (power) regenerative braking, which avoids any friction or wear on the vehicle brake pads and resulting generation of pollutants such as particulate copper. In Washington State, NMFS and USFWS concurred with Sound Transit’s conclusion that this type of guideway was non-polluting and, as such, the runoff did not require treatment before being discharged to the receiving waterbody (Sound Transit 1999). In Oregon, runoff from this area would require treatment before being released.

Finally, Washington State differentiates between stormwater runoff treatment requirements for new and rebuilt versus resurfaced pavement while state and local jurisdictions in Oregon do not. In Washington State, water quality treatment is only required for runoff from new and rebuilt PGIS while Oregon does not differentiate; requiring treatment for all impervious surfaces. However, this approach is not consistently applied within Oregon. For example, SLOPES IV (NMFS 2008), a programmatic biological opinion and incidental take statement for projects undertaken in Oregon by the USACE, states that "actions that merely resurface pavement by placing a new surface, or overlay, directly on top of existing pavement with no intervening base course and no change in the subgrade shoulder points, are not subject to these [pollution reduction and flow control] requirements." Regardless, NMFS has determined that resurfaced pavement within a project cannot be handled differently from rebuilt pavement unless the resurfacing is conducted within a "hydrologically isolated basin" even though the potential impediments to retrofitting water quality facilities for resurfaced pavement are the same whether the resurfacing is a stand-alone undertaking or within a larger project. These impediments include very limited or non-existent ability to change existing conveyance systems and possible lack of physical space to install a water quality facility.

Since the early stages of development, the overall permanent stormwater management goals for the CRC project are:

1. Provide flow control for new and replaced impervious areas in accordance with state and local requirements. It should be noted that discharges to the Columbia Slough, North Portland Harbor, and Columbia River are exempt from flow control.
2. Select and provide water quality facilities for new and rebuilt existing PGIS in accordance with the most restrictive requirements of the agencies that have authority over the drainage area being considered.
3. Where practical and cost-effective, provide water quality facilities for resurfaced and existing PGIS.

For goals 2 and 3, the CRC project has agreed to adopt the requirements of NMFS for permanent water quality facilities. These requirements are that the project treats runoff from the entire CIA in both Oregon and Washington regardless of whether it is considered pollutant-generating or whether it is new, rebuilt, resurfaced, or existing.

See **Attachment E** for the Stormwater Design Report.

4.3 SITE RESTORATION

In North Portland Harbor and the Columbia River, effects to riparian habitat would be negligible, as there is very little functioning riparian vegetation in the project area. The project would revegetate disturbed shoreline areas, resulting in a net benefit to riparian habitat in the long term.

It has not yet been determined exactly where replanting would take place. However, it is anticipated that replanting would occur on or adjacent to the current sites of the trees where practicable. In any case, the number, type, and size of the replanted trees would be selected to comply with standards outlined in the City of Portland and City of Vancouver tree ordinances.

In Oregon, the project would remove three deciduous trees, all with trunks less than 1 foot in diameter, from the riparian zone on the south bank of the Columbia River. The project would also remove two deciduous ornamental trees from the riparian zone adjacent to North Portland Harbor. These trees are located in a landscaped setting and have trunks of approximately 1 foot in diameter. In Washington, 10 trees with trunks less than 1 foot in diameter would be removed from the riparian zone on the north shore of the Columbia River.

There would be no excavation, vegetation clearing, or removal of trees from the Columbia Slough riparian area. Therefore, the project would have no effect on Columbia Slough riparian habitat.

Site restoration will also consist of removal of non-native plants such as reed canarygrass (*Phalaris arundinacea*), English ivy (*Hedera helix*), and Himalayan blackberry (*Rubus armeniacus*), and the planting of native vegetation. The goal of the restoration is to use a combination of native grass seed and herbaceous and woody plant material to revegetate and stabilize newly graded areas within riparian habitat and those areas disturbed during construction. New plant material will provide shade and physical characteristics that should allow them to establish quickly and improve plant diversity. Mature, certified compost will be used as a slope stabilizer, nutrient source, and to improve moisture retention for new plants and existing soil. Site restoration and rehabilitation will follow ODOT Standard Specifications (2008) for Seeding (01030) and Planting (01040).

See Attachment D for the Preliminary Conceptual Restoration Plan.

5. PROJECT IMPACTS AND ALTERNATIVES

5.1 ALTERNATIVES ANALYSIS

The project presented in this permit application is a result of efforts to minimize impact to aquatic species and their habitats through multiple design refinements. The major design changes incorporated into the project description are listed below.

Throughout the development process, the project has made a number of major design changes to minimize environmental impacts including the following:

1. The permanent in-water piers of the Columbia River and North Portland Harbor crossings will be constructed using drilled shafts, rather than with impact pile driving. Originally, the project proposed to drive numerous 96-inch steel piles, involving over 200 days of in water impact pile driving. Construction of the replacement bridge would have taken 30 months to complete. Analysis found that this would have created noise levels that would far exceed injury thresholds for listed fish throughout large portions of the Columbia River and North Portland Harbor within the action area. The current design significantly reduces the amount of impact pile driving, the size of the piles, and the amount of in water noise. Drilled shafts have been minimized from 16 shafts per pier in the original design to a maximum of six shafts per pier in the current design.
2. Earlier alternatives considered three bridges across the Columbia River: one for I-5 northbound traffic, one for I-5 southbound traffic, and one for LRT and bike/ped traffic. The current design proposes a stacked alignment, with LRT conveyed under the deck of the southbound structure and a bike/ped path beneath the northbound structure. This design reduces the number of in-water piers in the Columbia River by approximately one-third, and greatly reduces both the temporary construction impacts and the permanent effects of in water piers.

3. The project proposes six in water pier complexes for a total of 12 piers for the Columbia River bridges. Earlier designs considered up to 21 in water piers, but the design has been refined to the minimum number necessary for a safe structure. Piers have been designed to withstand the design scour without armor type scour protection (e.g., riprap).

4. The project provides a high level of stormwater treatment. The project area intersects several jurisdictions, each of which has different standards for stormwater treatment. The CRC project team will employ the most restrictive water quality requirements project-wide, meaning that in many cases, the level of stormwater treatment exceeds that of the local jurisdiction. In addition to treating the new impervious surfaces created by the project, the project has identified approximately 188 acres of existing impervious surfaces that will be retrofitted to meet current stormwater treatment standards. Together, these measures are expected to reduce impacts to the environmental baseline to a greater degree than by using the standards of the individual jurisdictions.

5.2 MINIMIZATION MEASURES

5.2.1 General Measures and Conditions

- A biologist shall re-evaluate the project for changes in design and evaluation methods not previously employed in the original ESA consultation to assess potential impacts associated with those changes, as well as the status and location of listed species, every 6 months until project construction is completed. Re-initiation of consultation with the NMFS and USFWS is required if new information reveals project effects that may affect listed species or critical habitat in a manner or to an extent not previously considered. Re-initiation of consultation is also required if the identified action is modified in a manner that causes an effect to species that was not considered in the original BA or if a new species is listed or critical habitat is designated that may be affected by the action.

- All work shall be performed according to the requirements and conditions of the regulatory permits issued by federal, state, and local governments. Seasonal restrictions, e.g., work windows, will be applied to the project to avoid or minimize potential impacts to listed or proposed species based on agreement with, and the regulatory permits issued by DSL, WDFW, and USACE in consultation with ODFW, USFWS, and NMFS.

- Drilled shafts will be installed while water is still in the cofferdam. The drilled shaft casing will function to contain and isolate the work. Cofferdams will be installed to minimize fish entrapment. Sheet piles will be installed from upstream to downstream, lowering the sheet piles slowly until contact with the substrate. When cofferdams are used, fish salvage must be conducted according to protocol approved by ODFW, WDFW, and NMFS (see Appendix E).

- The contractor shall provide a qualified fishery biologist to conduct and supervise fish capture and release activity as to minimize risk of injury to fish, in accordance with ODOT Standard Specification 00290.31(i) or its equivalent; and/or the 2009 WSDOT Fish Exclusion Protocols and Standards, or its equivalent.

- The contractor shall prepare a Water Quality Sampling Plan for conducting water quality monitoring for all projects occurring in-water in accordance with the specific conditions issued in the Oregon and Washington 401 Water Quality Certifications.

The Plan shall identify a sampling methodology as well as method of implementation to be reviewed and approved by the engineer. If, in the future, a standard water quality monitoring plan is adopted by ODOT and/or WSDOT, this plan, with the agreement of NMFS and USFWS, may replace the contractor plan.

- The role of the Project Engineer is to ensure contract and permit requirements are met. ODOT/WSDOT environmental staff will provide guidance and instructions to the onsite inspector to ensure the inspector is aware of permit requirements.
- If in-water dredging is required outside of a cofferdam, a clamshell bucket shall be used. Dredged material shall be disposed of in accordance with relevant permits and approvals.
- Piles that are not in an active construction area and are in place 6 months or longer will have cones or other anti-perchings devices installed to discourage perching by piscivorous birds.
- All pumps must employ a fish screen that meets the following specifications:
    - An automated cleaning device with a minimum effective surface area of 2.5 sq. ft. per cubic foot per second, and a nominal maximum approach velocity of 0.4 foot per second, or no automated cleaning device, a minimum effective surface area of 1 square foot per cubic foot per second, and a nominal maximum approach rate of 0.2 foot per second; and
    - a round or square screen mesh that is no larger than 2.38 millimeters (mm) (0.094”) in the narrow dimension, or any other shape that is no larger than 1.75 mm (0.069”) in the narrow dimension; and
    - Each fish screen must be installed, operated, and maintained according to NMFS fish screen criteria.

5.2.2 Spill Prevention/Pollution Control

- The contractor shall prepare a Spill Prevention, Control, and Countermeasures (SPCC) Plan prior to beginning construction. The SPCC Plan shall identify the appropriate spill containment materials; as well as the method of implementation. All elements of the SPCC Plan will be available at the project site at all times. For additional detail, consult ODOT Standard Specification 00290.00 to 00290.90 and/or WSDOT Standard Specification 1-07.15(1). For transit construction in Oregon, consult TriMet Standard Specification 01450{1.04}).
- The contractor will designate at least one employee as the erosion and spill control (ESC) lead. The ESC lead will be responsible for the implementation of the SPCC Plan. The contractor shall meet the requirements of and follow the process described in ODOT Standard Specifications 00290.00 through 00290.30 and/or WSDOT Standard Specification 8-01.3(1)B. The ESC lead shall be listed on the Emergency Contact List as part of ODOT Standard Specification 00290.20(g) and/or WSDOT Standard Specification 1-07.15(1).
- All equipment to be used for construction activities shall be cleaned and inspected prior to arriving at the project site, to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly. Identify equipment that will be used below OHW. Outline daily inspection and cleanup procedures that will insure that identified equipment is free of all external petroleum-based products. Should a leak be detected on heavy equipment used for the project, the equipment shall be immediately removed from the area and not used again until adequately repaired. Where off-site repair is not practicable, the implemented SPCC

Plan will prevent and/or contain accidental spills in the work/repair area to insure no contaminants escape containment to surface waters and cause a violation of applicable water quality standards.

- Operation of construction equipment used for project activities shall occur from on top of floating barge or work decks, existing roads or the streambank (above OHW). Any equipment operating in the water shall use only vegetable based oils in hydraulic lines.
- All stationary power equipment or storage facilities shall have suitable containment measures outlined in the SPCC Plan to prevent and/or contain accidental spills to insure no contaminants escape containment to surface waters and cause a violation of applicable water quality standards.
- Process water generated on site from construction, demolition or washing activities will be contained and treated to meet applicable water quality standards before entering or re-entering surface waters.
- No paving, chip sealing, or stripe painting will occur during periods of rain or wet weather.
- For projects involving concrete, the implemented SPCC Plan shall establish a concrete truck chute cleanout area to properly contain wet concrete as part of ODOT Standard Specification 00290.30(a)1 and/or WSDOT Standard Specification 1-07.15(1).
- For demolition activities, the followings standards will apply;
    - Make fewer cuts and use larger cranes to haul our larger segments to reduce the amount of cutting/concrete disturbed.
    - Use a diamond wire saw to precisely cut the concrete piling underwater to avoid incidental fallback (or spalling) to ensure whole segments can be lifted out of the water and noting is left behind.
    - Pile segments shall be removed immediately from the water and placed on barges. The pile segments shall not be shaken, hosed off, left hanging to drip, or any other action intended to clean or remove adhering material from the pile.
    - Sampling will occur during saw cutting to ensure the project is in-compliance with State surface water quality standards WAC 173-201A (Washington) and OAR 340-041 (Oregon) for pH and turbidity.
    - Ecology and DEQ will be immediately notified and the saw cutting will stop if state water quality standards are exceeded.

5.2.3 Site Erosion/Sediment Control

- The contractor shall prepare a Temporary Erosion and Sediment Control (TESC) Plan and a Source Control Plan and implemented for the project requiring clearing, vegetation removal, grading, ditching, filling, embankment compaction, or excavation. The BMPs in the plans will be used to control sediments from all vegetation removal or ground-disturbing activities. The engineer may require additional temporary control measures beyond the approved TESC Plan if it appears pollution or erosion may result from weather, nature of the materials or progress on the work. For additional detail, consult ODOT Standard Specifications 00280.00 to 00280.90 and/or WSDOT Standard Specification 1-07.15. For transit construction, consult TriMet Standard Specification 02276.

- As part of the TESC Plan, contractor shall delineate clearing limits with orange barrier fencing wherever clearing is proposed in or adjacent to a stream/wetland or its buffer and install perimeter protection/silt fence as needed to protect surface waters and other critical areas. Location will be specified in the field, based upon site conditions and the TESC Plan. For additional silt fence detail, consult ODOT Standard Specification 00280.16(c) and/or WSDOT Standard Specification 8-01.3(9)A.
- The contractor shall identify at least one employee as the ESC lead at preconstruction discussions and the TESC Plan. The contractor shall meet the requirements of and follow the process described in ODOT Standard Specifications Section 00280.30 and/or WSDOT Standard Specification 8-01.3(1)B. The ESC lead shall be listed on the Emergency Contact List as part of ODOT Standard Specification 00290.20(g) and/or WSDOT Standard Specification 1-05.13(1). The ESC lead will also be responsible for ensuring compliance with all local, state, and federal erosion and sediment control requirements.
- All TESC measures shall be inspected on a weekly basis. Contractor shall follow maintenance and repair as described in ODOT Standard Specifications 00280.60 to 00280.70 and/or WSDOT Standard Specification 8-01.3(15). Inspect erosion control measures immediately after each rainfall, and at least daily during for precipitation events of more than 0.5 inches in a 24-hour period.
- For landward construction and demolition, project staging and material storage areas shall be located a minimum of 150 feet from surface waters, in currently developed areas such as parking lots or managed fields, unless a site visit by an ODOT/WSDOT biologist determines the topographic features or other site characteristics allow for site use closer to the edge of surface waters. Excavation activities (dredging not included) shall be accomplished in the dry. All surface water flowing towards the excavation shall be diverted through utilization of cofferdams and/or berms. Cofferdams and berms must be constructed of sandbags, clean rock, steel sheeting, or other non-erodible material.
- Bank shaping shall be limited to the extent as shown on the approved grading plans. Minor adjustments made in the field will occur only after engineer's review and approval. Bio-degradable erosion control blankets will be installed on areas of ground-disturbing activities on steep slopes (1V:3H or steeper) that are susceptible to erosion and within 150 feet of surface waters. Areas of ground-disturbing activities that do not fit the above criteria shall implement erosion control measures as identified in the approved TESC Plan. For additional erosion control blanket detail, consult ODOT Standard Specification 00280.14(e) and/or WSDOT Standard Specification 9-14.5(2)A.
- Erodible materials (material capable of being displaced and transported by rain, wind or surface water runoff) that are temporarily stored or stockpiled for use in project activities shall be covered to prevent sediments from being washed from the storage area to surface waters. Temporary storage or stockpiles must follow measures as described in ODOT Standard Specification 00280.42 and/or WSDOT Standard Specification 8-01.3(1).
- All exposed soils will be stabilized as directed in measures prescribed in the TESC Plan. Hydro-seed all bare soil areas following grading activities, and re-vegetate all temporarily disturbed areas with native vegetation indigenous to the location. For additional detail, consult ODOT Standard Specifications 01030.00 to 01030.90 and/or WSDOT Standard Specification 8-01.3(1).

- Where site conditions support vegetative growth, native vegetation indigenous to the location will be planted in areas disturbed by construction activities. Re-vegetation of construction easements and other areas will occur after the project is completed. All disturbed riparian vegetation will be replanted. Trees will be planted when consistent with highway safety standards. Riparian vegetation will be replanted with species native to geographic region. Planted vegetation will be maintained and monitored to meet regulatory permit requirements. For additional detail, consult ODOT Standard Specifications 01040.00 to 01040.90 and/or WSDOT Standard Specification 8-01.3(2)F.

5.2.4 Work Zone Lighting

- Site work shall follow local, state and federal permit restrictions for allowable work hours. If work occurs at night, temporary lighting should be used in the night work zones. The work area and its approaches shall be lighted to provide better visibility for drivers to travel safely travel through the work zone, and illumination shall be provided wherever workers are present to make them visible.
- During overwater construction, contractor will use directional lighting with shielded luminaries to control glare and direct light onto work area; not surface waters.

5.2.5 Hydroacoustics

5.2.5.1 Minimization Measure 1 – Drilled Shafts for Foundations

Permanent foundations for each in-water pier will be installed by means of drilled shafts. This approach significantly reduces the amount of impact pile driving, the size of piles, and amount of in-water noise.

5.2.5.2 Minimization Measure 2 – Piling Installation with Impact Hammers

Installation of piles using impact driving may only occur between September 15 and April 15 of the following year. On an average work day, six piles could be installed using vibratory installation to set the piles; then impact driving to drive the piles to refusal per project specifications to meet load-bearing capacity requirements. This method reduces the number of daily pile strikes over 90 percent. No more than two impact pile drivers may be operated simultaneously within the same waterbody channel.

In waters with depths more than 0.67 meter (2 feet), a bubble curtain or other sound attenuation measure will be implemented for impact driving of pilings. If a bubble curtain or similar measure is used, it will distribute small air bubbles around 100 percent of the piling perimeter for the full depth of the water column. Any other attenuation measure (e.g., temporary noise attenuation pile) must provide 100 percent coverage in the water column for the full depth of the pile.

A performance test of the noise attenuation device in accordance with the approved hydroacoustic monitoring plan shall be conducted prior to any impact pile driving. If a bubble curtain or similar measure is utilized, the performance test shall confirm the calculated pressures and flow rates at each manifold ring.

5.2.5.3 Minimization Measure 3 – Impact Pile Installation Hydroacoustic Performance Measure

Sound pressure levels from an impact hammer will be measured in accordance with the hydroacoustic monitoring plan. Recording and calculation of accumulated sound exposure levels shall be performed. Analysis of the data shall be used to calculate exposure factors as defined in Appendix K of the CRC BA. Exposure factors shall be calculated using the moving fish model, based on a fish of over 2 grams with a movement rate of 0.1 meter per second. Exposure factors shall account for all attenuated and un-attenuated impact pile driving in both the mainstem Columbia River and North Portland Harbor. The accumulated SEL shall be recorded.

The following thresholds must not be exceeded:

1. The maximum weekly exposure factor shall not exceed 0.18649, based on one calendar week. The weekly exposure factor is defined as the proportion of channel affected by impact pile driving as measured by accumulated sound exposure level multiplied by the proportion of a 24-hr day affected multiplied by the proportion of calendar week affected.

2. The maximum yearly (calendar year) total exposure factor shall not exceed 0.202181. The maximum yearly exposure factor is the sum of all weekly exposure factors in one calendar year.

3. The average yearly exposure factor must not exceed 0.120090 per calendar year of construction. The average yearly exposure factor is the mean value of all yearly total exposure factors.

4. A total exposure factor of 0.480359 shall not be exceeded throughout the construction period of the project. The total exposure factor equals the sum of all weekly exposure factors throughout the project.

One 12-hour rest period will occur each work day in which no impact pile driving will occur. In addition, to limit the exposure of migrating fish that may be present in the behavioral disturbance zone, impact striking of piles that produce hydroacoustic levels over 150 dB RMS will not occur for more than 12 hours per work day. Unattenuated pile striking may occur to meet the requirements of the hydroacoustic monitoring plan or account for malfunction of the sound attenuation device, but will not occur for more than 300 impact pile strikes per week in the mainstem Columbia River and no more than 150 impact pile strikes per week in North Portland Harbor. To ensure that this measure is not being exceeded, an approved hydroacoustic monitoring plan will be in place to test a representative number of piles installed during the project (see Minimization Measure 5).

If the predicted accumulated sound exposure level exceeds the levels described above, then the Services will be contacted within 24 hours to determine a course of action, so that incidental take estimates are not exceeded. Necessary steps may include modifications to the noise attenuation system or method of implementation.

5.2.5.4 Minimization Measure 4 – Hydroacoustic Monitoring

The project will conduct underwater noise monitoring to test the effectiveness of noise attenuation devices. Testing will occur based on an underwater noise monitoring plan based on the most recent version of the Underwater Noise Monitoring Plan Template. This template has been developed in cooperation with the NMFS, USFWS, and WSDOT, and has been approved by NMFS and USFWS for use in Section 7 consultation for transportation projects in Washington.

Testing will occur according to protocols outlined in an Underwater Noise Monitoring Plan (WSDOT 2008). Underwater noise monitoring will occur as follows:

- Hydroacoustic monitoring will occur for a representative number of piles per structure (minimum of five piles installed with an impact hammer).

- Monitoring will occur for piles driven in water depths that are representative of typical water depths found in the areas where piles will be driven.
- Ambient noise will be measured as outlined in the template in the absence of pile driving.

A report that analyzes the results of the monitoring effort will be submitted to the Services as outlined in the monitoring plan template.

Unattenuated impact pile driving for obtaining baseline sound measurements will be limited to the number of piles necessary to obtain an adequate sample size for the project, as defined in the final Hydroacoustic Monitoring Plan.

5.2.5.5 Minimization Measure 5 – Biological Monitoring

A qualified biologist will be present during all impact pile driving operations to observe and report any indications of dead, injured, or distressed fishes, including direct observations of these fishes or increases in bird foraging activity.

5.2.5.6 Minimization Measure 6 – Temporary Pile Removal

Temporary piles shall be removed with a vibratory hammer and shall never be intentionally broken by twisting or bending. Except when piles are hollow and were placed in clean, sand-dominated substrate, the holes left by the removed pile shall be filled with clean native sediments immediately following removal. No filling of holes shall be required when hollow piles are removed from clean, sand-dominated substrates. At locations where hazardous materials are present or adjacent to utilities, temporary piles may be cut off at the mud line with underwater torches.

5.3 DESCRIPTION OF RESOURCES IN PROJECT AREA

5.3.1 Waterways

The project area contains portions of the following water bodies: the lower Columbia River and North Portland Harbor. The Columbia Slough is not within the project area but will receive stormwater runoff from the project area and was investigated as part of the API for the LPA.

5.3.1.1 Columbia Slough

The Columbia Slough (also known as the Slough) is a slow-moving, low-gradient drainage canal running nearly 19 miles from Fairview Lake in the east to the Willamette River in the west (see site photos in Attachment B). Running roughly parallel to the Columbia River, the Slough is a remnant of the historic system of lakes, wetlands, and channels that dominated the south floodplain of the mainstem Columbia.

Hydrology

The Columbia Slough has undergone profound hydrologic alteration from its original condition. Originally, the Slough was a side channel of the Columbia River. Today, the original inlet is blocked at the upstream end, and it no longer receives flows from the Columbia. The Slough is now intensively managed to provide drainage and flood control with dikes, pumps, weirs, and levees (CH2M Hill 2005). The Columbia Slough Watershed drains approximately 37,741 acres of land in portions of Portland, Troutdale, Fairview, Gresham, Maywood Park, Wood Village, and unincorporated Multnomah County.

The Upper and Middle Sloughs receive water inputs from Fairview Lake, as well as groundwater and stormwater from PDX and other industrial, commercial, and residential sites in the surrounding area. Water levels in the Upper and Middle Sloughs are managed to provide adequate flows for pollution reduction (PDX de-icing) and surface water withdrawals, flood control, and recreation (COP 2009).

The project area crosses the Lower Slough at Slough RM 6.5 (RKm 10.5) (CH2M Hill 2005). The Lower Slough extends from the Peninsula Drainage Canal to the Willamette River, less than 1 mile south of its confluence with the Columbia River. It experiences from 1 to 3 feet of tidal fluctuation in its water surface daily. Water levels are generally unmanaged, but are affected by the management of the dams on the Columbia and Willamette Rivers. The Lower Slough ranges from 2.0 to 4.5 feet NGVD and is generally between 100 and 200 feet wide. The Lower Slough receives water inputs from combined sewer overflows, stormwater, Smith and Bybee Lakes, leachate from the St John's Landfill, and the Upper Columbia Slough (COP 2009).

I-5 crosses the Slough at RM 6.5 (RKm 10.5) in a highly urbanized area. The predominant land use around the Slough in the project vicinity is light industrial, with some residential. The Slough connects to the Willamette River approximately 6.5 miles west of the project area, within 1 mile of the confluence of the Columbia and Willamette Rivers (COP 2009).

Anadromous fish can access the Lower Columbia Slough up to an impassable levee located near NE 18th Avenue (RM 8.3 [RKm 13.3]). At Smith and Bybee Lakes, a water control structure allows fish passage.

Substrate

Benthic habitat in the Lower Slough is dominated by sand, is extremely low in dissolved oxygen, and contains toxic pollutants. Generally, the benthic community, including 36 taxa, increases in abundance from the Lower to the Upper Slough. This increase in species abundance is correlated to an increase in silt dominance, which increases with the distance upstream in the Slough. Most of the species are adapted to low dissolved oxygen levels and still water conditions. The benthic community in the Slough appears to be similar in species richness and density to similar aquatic habitats in the region (COP 2009).

Physical Habitat Features

Riparian habitat along the Slough has been largely replaced by buildings and pavement. Remaining areas of vegetation generally occur in a narrow band along Slough banks and are dominated by black cottonwood (*Populus trichocarpa*), Oregon ash (*Fraxinus latifolia*), willows (*Salix* spp.), red osier dogwood (*Cornus stolonifera*), Himalayan blackberry (*Rubus discolor*), common snowberry (*Symphoricarpos albus*), and reed canarygrass (*Phalaris arundinacea*). Both Himalayan blackberry and reed canarygrass are aggressive non-native species. The Slough's riparian area functions are highly impaired; these functions include microclimate and shade, bank stabilization and sediment control, pollution control, stream flow moderation, organic matter input, large woody debris, and contiguous wildlife travel corridors.

Habitat elements that typically support the life stages of listed fish are generally lacking in Columbia Slough. Large woody debris is scarce and because the riparian area is largely devoid of trees, the potential for future large woody debris recruitment is limited. Because the Slough has been intensely managed through dredging and channelization, habitat complexity is limited and habitat structures such as boulders and undercut banks are largely absent. Overbank flow occurs very infrequently and the stream is severed from its original floodplain. Likewise, low energy off channel areas (such as backwaters, ponds, and oxbows) are also scarce. However, remnant wetlands and restored wetlands do exist in the Slough watershed and provide habitat for wildlife, thermoregulation, nutrient removal, and other important ecosystem functions. Smith and Bybee Lakes, a 2,000-acre complex of wetlands, are the dominant wetland features of the Lower Slough. This wetland complex borders the Lower Slough and connects to the Lower Slough via the North Slough, a mile-long channel running between the St John's Landfill and the south side of Bybee Lake (COP 2009).

Several restoration efforts are ongoing in the Columbia Slough area. The City of Portland's Watershed Revegetation Program and its community partners are conducting non-native species removal and native plantings in many areas along the Slough. MCDD now uses in-channel equipment to perform repairs and maintenance of channel and bank areas. Formerly, MCDD cleared vegetation to access these areas from the shore. Both vegetation enhancement and MCDD's alteration of maintenance practices have resulted in an increase in native plant diversity and cover in the Slough watershed. The City of Portland Bureau of Environmental Services has been involved in revegetation efforts in the Slough watershed since 1996 and has successfully re-established native vegetation along many parts of the Slough (COP 2009).

5.3.1.2 Columbia River and North Portland Harbor

The Columbia River and North Portland Harbor portions of the action areas are part of the Columbia River estuary. The Columbia River estuary is the portion of the Columbia River from the mouth upstream to all tidally influenced areas (that is, to Bonneville Dam). The I-5 bridges are located at RM 106 (RKm 171) of the Columbia River. The portion of the action area that occurs within the Columbia River extends from RM 101 to 118 (RKm 163 to 190). This area is highly altered by human disturbance, and urbanization extends up to the shoreline. There has been extensive removal of streamside forests and wetlands throughout this portion of the action area. Riparian areas have been further degraded by the construction of dikes and levees and the placement of streambank armoring. For several decades, industrial, residential, and upstream agricultural sources have contributed to water quality degradation in the river. Additionally, existing levels of disturbance are high due to heavy barge traffic.

The North Portland Harbor is a large side channel of the Columbia River that flows between the south side of Hayden Island and the Oregon mainland. The channel branches off the Columbia River approximately 2 RMs upstream (east) of the existing bridge site, and flows approximately 5 RMs downstream (west) before rejoining the mainstem Columbia River.

The existing I-5 crossing consists of two separate bridges. Each bridge is approximately 3,500 feet long by 45 feet wide with approximately 284,000 sq. ft. of total deck area located directly above the water surface. The bottom of each deck ranges from 25 to 60 feet above the water surface. Together, these bridges have 11 pairs of bridge piers, nine of which are located below the ordinary high water line (OHW) of the Columbia River. Two pairs (piers 10 and 11) are located in shallow water (that is, less than 20 feet deep). Each pier measures approximately 32 feet wide by 50 feet long at the footing. In total, the in water piers occupy approximately 27,800 sq. ft. of substrate and represent approximately 44,000 cubic yards of fill below OHW. At the existing structures, maximum water depth is about 40 to 45 feet. At present, all stormwater runoff drains directly from the bridge deck through scuppers into the Columbia River without undergoing water quality treatment. Together, these structures convey approximately 135,000 vehicles per day.

The existing North Portland Harbor bridge conveys I-5 from Hayden Island to the mainland. The structure is approximately 1,325 feet long by 150 feet wide with approximately 144,000 sq. ft. of total deck area located directly above the water surface. The bottom of the deck ranges from 25 to 30 feet above the water surface. This bridge has a total of 10 bents, six of which occur below OHW. Each bent consists of three piers, each measuring approximately

24 by 24 feet at the mudline. In total, the piers occupy 10,368 sq. ft. of substrate below OHW. Water depths at the crossing range from 0 to 20 feet, meaning that all of the piers occur in shallow water. At present, all stormwater runoff drains directly from the bridge deck through scuppers into North Portland Harbor without undergoing water quality treatment. This bridge conveys approximately 137,950 trips per day.

Hydrology

The 12 major dams located in the Columbia Basin are the primary factors affecting flow conditions in the action area. Consequently, the Columbia River, including the action area, is a highly managed waterbody that resembles a series of slack water lakes rather than its original free-flowing state. Development of the hydropower system on the Columbia River has significantly influenced peak seasonal discharges and the velocity and timing of flows in the river. The Columbia River estuary historically received annual spring freshet flows that were on average 75 to 100 percent higher than current flows (ISAB 2000). Historical winter flows (October through March) also were approximately 35 to 50 percent lower than current flows (ISAB 2000). The second major contributor to stream flow conditions in the action area is tidal influence from the Pacific Ocean. Although the saltwater wedge does not extend into the action area, high tide events affect flow and stage in the Columbia up to Bonneville Dam.

Hydrology in the action area has been profoundly altered from historical conditions. In the action area, natural landforms and constructed landforms (e.g., dikes and levees) are the dominant floodplain constrictions, while bridge footings are the subdominant floodplain constrictions. Nine bridge pier pairs are located below OHW in the mainstem Columbia River, and one bridge pier is located below OHW in North Portland Harbor. A flood control levee runs along the south bank of North Portland Harbor, forming a boundary between the adjacent neighborhoods and the harbor. Numerous upstream dams, levees located along shorelines, and channel modifications (e.g., armoring, reshaping) have restricted habitat forming processes such as sediment transport and deposition, erosion, and natural flooding. Therefore, habitat complexity is significantly reduced from historic conditions. Shoreline erosion rates are likely slower than they were historically due to flow regulation. The river channel is deeper and narrower than under historical conditions (Bottom et al. 2005).

Reduced flow poses particularly high risks for juvenile anadromous fish. Dramatic reductions in flow compared to the historical spring freshet have increased the travel time of juvenile outmigrants. This increases potential exposure to predation, elevated temperatures, disease, and other environmental stressors (NMFS 2008e, Bottom et al. 2005).

Substrate

In the Columbia River and North Portland Harbor, substrate consists mainly of sand with relatively small percentages of fine sediments and organic material (NMFS 2002; DEA 2006). Little to no gravel or cobble is present in the substrate within the action area. A bathymetric study completed in 2006 found significant scouring on the upstream side of each Columbia River bridge pier and scour channels on the downstream side (DEA 2006). The scouring ranged from approximately 10 to 15 feet deep. Bedload transport patterns were evident in the form of sand waves, a continuously shifting natural feature of the river bottom that indicates the influence of the currents. The sand waves observed in this study were especially distinct on the downstream side of the Columbia River bridges. The sand waves in the middle of the river were regular, while the sand waves on the northern downstream side were larger and more irregular. The northern upstream side of the bridge was relatively smooth and had few to no sand waves, while the southern upstream side had irregular sand waves. Average river depth was approximately 27 feet. Shallow-water habitat (defined as 20 feet deep or less) is present along both banks of the Columbia River, but is more abundant along the Oregon bank.

The substrate in North Portland Harbor within the project area is predominantly composed of sand with relatively small percentages of fine sediments and organic material. A bathymetric study completed in 2006 found deep scouring near the ends of the downstream piers of the existing North Portland Harbor bridge on the north bank, with scour holes approximately 8 to 10 feet deep (DEA 2006). Scouring around the upstream piers was approximately 3 to 7 feet deep. Scouring was more pronounced around the northern piers than the southern piers. A particularly deep area (approximately 21 feet deep) on the south side of the channel downstream of the existing bridge is indicative of a fast-moving current through the harbor. The average depth of the harbor was approximately 14 feet. Shallow-water habitat (defined as 20 feet deep or less) is present throughout the project area in North Portland Harbor.

Dredging and sand and gravel mining regulated by DSL occur in some areas of the Columbia River portion of the action area. For example, the Rose City Yacht Club (approximately 3 miles upstream of the existing I-5 bridges) holds a DSL permit for maintenance dredging of their marina, with subsequent sale of the dredged sand. This work is done in relatively shallow water (less than 20 feet in depth) and therefore may temporarily degrade on-site habitat for migrating salmonids. Columbia River Sand and Gravel and Northwest Aggregates each hold permits for dredging within the navigation channel within the action area between RM 102–106 (RKm 164–171) and RM 117–118 (RKm 188–190), respectively. Such in-channel activity is likely to temporarily and locally elevate turbidity and suspended sediment.

Physical Habitat Features

Within the project area, the Columbia River and North Portland Harbor contain few to no backwaters, ponds, oxbows, and other low-energy off-channel areas. Historic off-channel areas have been filled, rechanneled, diverted, and otherwise developed over the past 150 years. As a result, there is a severe reduction in connectivity between the Columbia River and North Portland Harbor and their historic floodplains. Overbank flows occur only very occasionally. Wetland extent is drastically reduced, and the succession of riparian vegetation has been significantly altered. As a result, the action area provides few refugia for salmonids. North Portland Harbor may provide some of the only off-channel habitat functions (lower energy flows relative to the Columbia River).

The remaining tidal marsh and wetland habitats in the estuary are restricted to a narrow band along the Columbia River and its lower tributaries (NMFS 2004). Some high-quality backwater and side channel habitats have persisted along the lower Columbia River banks and near undeveloped islands (USACE 2001) downstream of the action area, and to some extent, within the action area at Government Island. These habitats contain high-quality wetlands and riparian vegetation, such as emergent plants and low herbaceous shrubs.

The riparian area within the action area is relatively degraded. Tree canopy is generally absent or sparse. As a result, shallow-water habitat has only sparse vegetative cover. Because riparian areas are limited in size and are unlikely to expand in this urban setting, there is little potential for future large wood recruitment. Fish cover elements are generally sparse to absent in the action area, although some boulders and artificial structures (for example, docks and pilings) are present.

Shallow water and nearshore habitat is present in the action area on both the Oregon and Washington sides of the river and is influenced by flow and sediment input from tributaries and the mainstem river that eventually settles to form shoals and shallow flats. This shallow water habitat is used extensively by juvenile and adult salmonids for migrating, feeding, and holding. Phytoplankton, microdetritus, and macroinvertebrates are present in shallow areas and serve as the prey base for salmonids (USACE 2001). Overall, shallow water habitat has been greatly reduced from historical levels throughout the estuary and in the project area. As river stage has declined with the operation of the hydropower system, shallow water habitat has decreased concurrently (Bottom et al. 2005). Dredging, diking, armoring, and other shoreline alterations have exacerbated the problem, such that shallow water habitat is rare in the project area. What little shallow water and nearshore habitat that remains is of low quality. Shoreline armoring has reduced the quality of shallow water habitat areas by providing habitat for predaceous fish, increasing water temperatures, removing resting and holding areas for juvenile fish, and reducing primary productivity. Numerous overwater structures in shallow water habitat areas likely provide habitat for predaceous fish and birds and may cause interference with juvenile migration. North Portland Harbor, in particular, contains a high density of permanently moored floating homes and docks.

5.3.2 Wetlands

Where possible, wetland surveys were conducted on all unpaved areas within the API for the LPA. However, right of entry permission was not granted for many locations. In these cases, recent aerial photography, soils data, NWI maps, and a visual survey from accessible locations were used to determine the likely presence or absence of wetlands. Parametrix conducted on-site wetland delineations on July 20, August 1, and August 28, August 30, September 22, and September 26, 2006. In addition, three wetlands were previously delineated within the project area by David Evans and Associates.

Two wetlands were delineated by Parametrix within the ICP project area within Oregon (see Figure 2 of Appendix A of this Attachment). Wetland D is a PFO/SS/EMHx, depressional wetland approximately 2.668 acres in size. Wetland System L/M is a PFOC, Flats wetland approximately 0.339 acres in size. Potentially Jurisdictional Water Area O has been identified by Parametrix staff as an area that needs further investigation. Further investigation of this area will occur during the early growing season, once property access permission is obtained.

The Vanport Wetlands, a Port of Portland mitigation site, is located within the project area. Information on this area can be obtained through the Port of Portland or the Oregon Department of State Lands. In addition, David Evans Associates has completed a wetland delineation for three wetlands just south of the project area (Wetlands C, J, and K).

Wetland areas were identified within the LAP API within Washington (see Figure 3 of Appendix A of this attachment). Potentially Jurisdictional Water Area I is at the convergence of two steep topographic grades; one associated with the I-5 roadway prism and the other with a natural grade starting at the edge of the school grounds. Further coordination with the USACE and/or Ecology for this area is required to determine if it is a jurisdictional feature. Wetland H is a palustrine emergent, temporarily flooded (PEMA) wetland and is approximately 0.122 acre in size. Wetland H is northwest of Leverich Park, on the west side of Burnt Bridge Creek, east of I-5. Wetland B is east of Burnt Bridge Creek in the northeast portion of the project area and is a palustrine, scrub-shrub/emergent, seasonally flooded (PSS/EMC) wetland approximately 0.33 acre.

Additional information on wetlands is available in Attachment H of this application. Concurrence on the delineation from DSL was obtained in 2008 (see Attachment H). No impacts to jurisdictional wetlands are proposed as part of this project.

5.3.3 Threatened and Endangered Species

Table 5-1 lists the federally threatened and endangered species and critical habitat that may occur within or adjacent to the project area.

Table 5-1. Federally Threatened and Endangered Species Potentially Occurring within the Project Area

ESU/DPS (Where Appropriate)[a] Species Common Name *Species Scientific Name*	Federal Status[b]	OR Status[c]	WA Status[d]	Critical Habitat Present	EFH Present in Project Area[e]	ESH Present in Project Area[f]	Presence Documented in Project Area[g]	Habitat Use within Project Area[h]
Lower Columbia River ESU **Chinook salmon** *Oncorhynchus tshawytscha*	LT	SC	SC	Yes	Yes	No	Yes	M/R/H
Upper Columbia River-Spring Run Chinook salmon *Oncorhynchus tshawytscha*	LE	N/A	SC	Yes	Yes	No	Yes	M/R/H
Snake River Fall-Run Chinook salmon *Oncorhynchus tshawytscha*	LT	LT	SC	Yes	Yes	No	Yes	M/R/H
Snake River Spring/Summer-Run Chinook salmon *Oncorhynchus tshawytscha*	LT	LT	SC	Yes	Yes	No	Yes	M/R/H
Lower Columbia River DPS Steelhead trout *Oncorhynchus mykiss*	LT	SC	SC	Yes	No	No	Yes	M/R/H
Middle Columbia River Steelhead trout *Oncorhynchus mykiss*	LT	SC	SC	Yes	No	No	Yes	M/R/H
Upper Columbia River Steelhead trout *Oncorhynchus mykiss*	LE	N/A	SC	Yes	No	No	Yes	M/R/H
Snake River Basin Steelhead trout *Oncorhynchus mykiss*	LT	SV	SC	Yes	No	No	Yes	M/R/H

ESU/DPS (Where Appropriate)[a] Species Common Name *Species Scientific Name*	Federal Status[b]	OR Status[c]	WA Status[d]	Critical Habitat Present	EFH Present in Project Area[e]	ESH Present in Project Area[f]	Presence Documented in Project Area[g]	Habitat Use within Project Area[h]
Snake River Sockeye salmon *Oncorhynchus nerka*	LE	None	SC	Yes	No	No	Yes	M/R/H
Lower Columbia River Coho salmon *Oncorhynchus kisutch*	LT	LE	None	N/A	Yes	No	Yes	M/R/H
Columbia River ESU Chum salmon *Oncorhynchus keta*	LT	SC	SC	Yes	No	No	Yes	M/R/H
Columbia River DPS Bull trout *Salvelinus confluentus*	LT	SC	SC	Yes	N/A	No	Yes	Unknown; potentially overwintering and feeding
Southern DPS Eulachon *Thaleichthys pacificus*	LT	None	SC	Yes	N/A	N/A	Yes	M,S
Southern DPS Green sturgeon *Acipenser medirostris*	LT	None	None	No	N/A	N/A	Unlikely	Unknown
Steller sea lion *Eumetopias jubatus*	LT; Proposed for delisting	LT	LT	No	N/A	N/A	Yes	Transiting, Foraging

Source: Columbia River Crossing Biological Assessment 2010 (CRC 2010).

a ESU = Evolutionarily Significant Unit; DPS = Distinct Population Segment.

b Federal status: LT = Listed Threatened, LE = Listed Endangered, P = Proposed, C = Candidate, SOC = Species of Concern, N/A = Not Applicable (USFWS 2012).

c OR State status: LT = Listed Threatened, SC = Sensitive Critical, SV = Sensitive Vulnerable, None = No status designated, N/A = Not Applicable (Oregon Threatened and Endangered Species List).

d WA state status: SC=state candidate, N/A = Not Applicable (WDFW-PHS).

e EFH = Essential Fish Habitat, per the MSFCMA.

f ESH = Essential Salmonid Habitat, per DSL and ODFW.

g Source = StreamNet (2012).

h Habitat uses: S = Spawning, M/R/H = Migration/Limited Rearing/Holding (StreamNet 2012, NMFS 2009).

In addition to species protected by federal and state endangered species regulations, species of interest (SOI) (species which are defined as locally rare or with special habitat requirements) are associated with habitat types in the project area. These include migratory birds, marine mammals, certain terrestrial mammals (e.g., bats), and other species requiring special consideration for habitat and management, but which may not be protected under federal or state statutes. Migratory birds protected under the MBTA use habitat components (e.g., bridge structures, vegetation, riparian habitat) in the project area for nesting, roosting, foraging, and/or dispersing. Table 5-2 lists examples of SOI that may occur in the project area. This list is not meant to be comprehensive but rather presents species groups that require special consideration in the course of the CRC project.

Table 5-2. Examples of Species of Interest Associated with Habitat Types within the Project Area

	Federal Status[a]	OR State Status[b]	WA State Status[c]
Migratory Birds[d]			
Peregrine falcon *(Falco peregrinus anatum)*	Delisted	SV	SS
Purple martin *(Progne subis)*	SOC	SC	C
Streaked horned lark *(Eremophila alpestris strigata)*	C	SC	LE
Osprey *(Pandion haliaetus)*	N/A	N/A	M
Barn owl *(Tyto alba)*	N/A	N/A	N/A
Belted kingfisher *(Ceryle alcyon)*	N/A	N/A	N/A
Cliff swallow *(Petrochelidon pyrrhonota)*	N/A	N/A	N/A
Barn swallow *(Hirundo rustica)*	N/A	N/A	N/A
Willow flycatcher *(Empidonax traillii)*	SOC	SU	N/A
Bullock's oriole *(Icterus bullockii)*	N/A	N/A	N/A
Yellow warbler *(Dendroica petechia)*	N/A	N/A	N/A
White-breasted nuthatch *(Sitta carolinensis)*	N/A	N/A	N/A
Great blue heron *(Ardea herodias)*	N/A	N/A	SM
Loons *(Gavia* spp.*)*	N/A	N/A	SS (Gavia immer)
Mergansers (*Mergus* spp.*)*	N/A	N/A	N/A
Geese *(Branta* spp.*)*	N/A	N/A	N/A
Grebes (*Aechmophorus* spp.)	N/A	N/A	N/A
Mammals			
Long-legged myotis *(Myotis volans)*	SOC	SU	M
Fringed myotis *(Myotis thysanodes)*	SOC	SV	M
Long-eared myotis *(Myotis evotis)*	SOC	SU	M
Townsend's big-eared bat *(Corynorhinus townsendii)*	SOC	SC	C
Silver-haired bat *(Lasionycteris noctivagans)*	SOC	SU	N/A
Harbor seal *(Phoca vitulina)*	Protected under MMPA	N/A	M

	Federal Status[a]	OR State Status[b]	WA State Status[c]
California sea lion *(Zalophus californianus)*	Protected under MMPA	N/A	N/A
California myotis *(Myotis californicus)*	N/A	N/A	N/A
Yuma myotis *(Myotis yumanensis)*	N/A	N/A	N/A
Little brown myotis *(Myotis lucifugus)*	N/A	N/A	N/A
Big brown bat *(Eptesicus fuscus)*	N/A	N/A	N/A
Bushy-tailed woodrat *(Neotoma cinerea)*	N/A	N/A	N/A
Reptiles and Amphibians			
Western Pond turtle *(Emys marmorata)*	SOC	SC	LE
Painted turtles *(Chrysemys picta)*	N/A	SC	N/A
Northern red-legged frog *(Rana aurora aurora)*	SOC	SV/SU	N/A
Fish			
Southwestern Washington/Columbia River Coastal cutthroat trout *(Oncorhynchus clarki clarki)*	SOC	SV	N/A
Pacific lamprey *(Lampetra tridentata)*	SOC	SV	N/A
River lamprey *(Lampetra ayresi)*	SOC	N/A	C
Northern DPS Green sturgeon *(Acipenser medirostris)*	SOC	N/A	N/A

a Federal status: C = Candidate, SOC = Species of Concern, N/A = Not Applicable, MMPA = Marine Mammal Protection Act (OBIC 2010a; USFWS 2012).

b Oregon status: LT = Threatened, LE = Endangered, SC = Sensitive Critical, SV = Sensitive Vulnerable, SU = Sensitive Undetermined Status, N/A = Not Applicable (OBIC 2010a; USFWS 2012).

c Washington status: LT = Listed Threatened, LE = Listed Endangered, C = Candidate, SS = State Sensitive, M = State Monitor (WDFW 2008).

d All migratory birds are protected by the Migratory Bird Treaty Act.

Listed plant species, including threatened, endangered, proposed, and candidate species, are not known to occur in the project area (ORBIC 2010b; WDNR-NHP 2005). Field visits were conducted on September 1 and September 16, 2005, to survey for potential habitat in the project area. Field surveys for special-status plants (i.e., those not listed but with state designations such as sensitive or vulnerable) occurred between May and September 2006. No listed plants were found (Parametrix 2005, 2006).

Wapato (*Sagittaria latifolia*) and cattail (*Typha latifolia*), herbaceous wetland plants with important cultural significance as traditional food, craft, and medicinal sources for several Native American tribes, occur in wetland areas in the project area, including Schmeer Slough (a J-shaped slough that extends under I-5 and adjacent to North Whitaker Road and Schmeer Road).

Additional information on threatened, endangered, or candidate species can be found in the CRC BA (CRC 2010) and the FEIS (CRC 2011). In addition, the NMFS Biological Opinion and USFWS Concurrence Letter are included in Attachment I. Reinitiation of Section 7 ESA consultation will occur in December 2012 to address project changes from the original BA and formal designation of critical habitat for eulachon after the original consultation was completed.

5.3.4 Archaeological, Cultural, and Historical Resources

The Oregon shore of the project area contains no historic sites from Euroamerican settlement, and no evidence of prehistoric Native American activity. The Washington shore of the project area includes several historic sites: the Hudson's Bay Company's (HBC) Fort Vancouver and Kanaka Village, and the U.S. Army's Vancouver Barracks, are situated directly east of the I-5 corridor in the Vancouver National Historic Reserve (VNHR). Kanaka Village was a multicultural settlement and included Euroamericans as well as Native Americans. The VNHR encompasses properties owned by the National Park Service (NPS), U.S. Army, and the City of Vancouver. The Historic City of Vancouver, containing the core blocks first platted in the city, lies directly west of the I-5 corridor. No prehistoric archaeological sites have been formally recorded on the north shore of the Columbia River within the CRC project area; however, there is some evidence (e.g., stone tools) to indicate prehistoric activity in the area of the future site of HBC Fort Vancouver, Kanaka Village, and the U.S. Army's Vancouver Barracks.

Eleven Tribes were consulted in the NEPA process and the Section 106 consultation. A tribal observer may be present during any ground disturbing activities during project construction, if they choose.

The Section 106 MOA is included in Attachment G. A detailed description of archaeological, cultural, and historical resources is available in the Archaeology Technical Report for the FEIS (CRC 2011).

5.4 EXISTING NAVIGATION, FISHING, AND RECREATIONAL USE OF WATERWAYS

5.4.1 Columbia Slough

The Slough and surrounding area were historically used by Native Americans for fishing, hunting, and gathering food (BES 2006).

Water levels in the Upper and Middle Sloughs are managed to provide adequate flows for pollution reduction (PDX de-icing) and surface water withdrawals, flood control, and recreation (COP 2009). DEQ has listed irrigation, domestic and industrial water supply, livestock watering, anadromous fish passage, salmonid fish rearing, salmonid fish spawning, resident fish and aquatic life, wildlife and hunting, fishing, boating, water contact recreation, aesthetic quality, and hydropower as beneficial uses of the Columbia Slough (COP 2009).

5.4.2 Columbia River and North Portland Harbor

Since the 1800s, USACE has performed dredging throughout the Columbia River estuary in order to maintain the navigation channel (NMFS 2004). Downstream of the CRC project area at RM 106.5, the navigation channel between the mouth and approximately RM 106 is authorized to be dredged to a depth of -43 feet CRD (NMFS 2008). Within the project area, the navigation channel is authorized to be dredged to a depth of -27 feet CRD. Upstream of the project area, the barge channel is authorized to -17 feet CRD and the alternate barge channel is authorized to -15 feet CRD. The USACE does not dredge the channels at or upstream of the project area because the river is normally 30 to 45 feet deep in these channels. USACE has also realigned the navigation channel and installed hydraulic control structures, such as in water fills, channel constrictions, and pile dikes (NMFS 2004). The DEQ has listed Wildlife and Hunting, Fishing, Boating, Water Contact Recreation, Aesthetic Quality, and Commercial Navigation & Transportation as beneficial uses of the Columbia River Mainstem from River Mile 86 to 309.

5.5 MITIGATION

The project is anticipated to permanently fill approximately 1.6204 acres and temporarily fill up to 0.9477 acre of in-water habitat in the Columbia River and North Portland Harbor in Oregon and Washington. Approximately 0.64 acres of fill associated with existing structures (i.e., the mainstem Columbia River structure) will be removed. No jurisdictional wetlands will be impacted in Oregon or Washington during construction or operation of the project, with the possible exception of impacts related to restoration activities at the Sandy River and Lewis River mitigation sites. Additional required mitigation for these types of impacts is not anticipated.

The project is anticipated to permanently impact approximately 0.80 acre and temporarily impact 0.48 acre of the Columbia River in Washington, while removing approximately 0.21 acres of existing structure. A mitigation site has been identified west of the project on the east bank of the Lewis River at the confluence with the Columbia River. Mitigation activities at this site are described in detail in Attachment F. No jurisdictional wetlands will be impacted in Washington during construction or operation of the CRC project, however approximately 7.4 acres of wetland impacts related to enhancement or restoration activities at the Lewis River mitigation site might occur. Additional required mitigation for these types of impacts is not anticipated. Mitigation activities at the Lewis River site will be funded by the CRC project and be constructed by a third party. The Washington mitigation site will go through its own permitting process separate from the CRC permit process.

The project is anticipated to permanently impact approximately 0.82 acre and temporarily impact 0.47 acres of the Columbia River in Oregon, while removing approximately 0.42 acres of existing structure. A mitigation site has been identified along the Sandy River and within Dabney State Recreation Area. Mitigation activities at this site are described in detail in Attachment F. No jurisdictional wetlands will be impacted in Oregon during construction or operation of the CRC project, however approximately 3,600 cy of impacts related to enhancement or restoration activities at the Dabney State Recreation Area mitigation site will occur. Additional required mitigation for these types of impacts is not anticipated. Mitigation activities at the Dabney State Recreation Area site will be funded by the CRC project and be constructed under contract by ODOT. The activities associated with this mitigation site are addressed in this permit application.

Conditions of regulatory permits issued by USACE and the States of Oregon and Washington will require compliance monitoring for a minimum of 5 years after completion of the mitigation projects.

In addition, removal of the wharf at the Red Lion at the Quay encompasses approximately 0.8 acre and removal of floating homes, boathouses, and docks encompass another 3.1 acres of area at the water surface. With the removal of these on-water elements (i.e, floating homes, docks, and quay) less water surface will be impacted after the project this is currently impacted. Site restoration will occur as described in Attachment D. Stormwater treatment of existing and new impervious surfaces will also occur as described in Attachment J. These on-site and near-project area enhancement and restoration activities should result in an increased value for habitats and function in the project area compared to the existing condition.

5.5.1 Washington Compensatory Mitigation: Lewis River Confluence Side Channel Restoration

CRC is proposing off-site compensatory mitigation on the east bank of the Lewis River at its confluence with the Columbia River. The 40.5-acre Mitigation Area is located in the lower Columbia River basin in Clark County, Washington and is located approximately one-half mile east of the City of Saint Helens in Columbia County, Oregon and 1 mile north of Ridgefield in Clark County, Washington. The City of Vancouver is 10 miles south of the site and the City of Portland is approximately 13 miles south.

This Mitigation Area is part of a larger approximately 699.7-acre Columbia-Lewis Salmon Recovery Project that includes the 40.5-acre Mitigation Area as well as the proposed 659.2-acre Columbia-Lewis Conservation Bank. The Columbia-Lewis Salmon Recovery Project is a salmonid habitat restoration, enhancement, and preservation project.

Restoration and enhancement actions specific to the Mitigation Area will include discontinuing current livestock grazing, invasive species control, establishing and enhancing floodplain forest habitat, and the restoration of historic side channel habitat. Once completed, the Mitigation Area will consist of 27.2 acres of enhanced floodplain forest, 3.8 acres of proposed floodplain forest, 9.4 acres of restored side channel, 6 habitat complexity structures, and 3,000 linear feet of preserved and enhanced Lewis River bank.

The main goal of the Mitigation Area is to restore, enhance, preserve, and protect the aquatic and riparian habitats onsite to benefit the numerous salmonid species occurring in the Columbia Basin as well as other native fish including Pacific lamprey and Pacific eulachon. Proposed restoration actions and their benefits include:

- Reconstructing and re-connecting 9.4 acres of Lewis River side channels currently blocked with dredge spoil material in order to provide year-round connectivity to the Lewis River, provide salmon rearing habitat, and reconnect floodplain wetlands
- Installing approximately 6 habitat complexity structures to provide additional salmon rearing habitat, improve habitat complexity, and re-direct flow into the newly excavated channel inlets and outlets
- Excluding livestock grazing activities from sensitive areas to encourage native riparian species establishment and improve water quality.
- Planting native riparian species and removal of invasive species in order to establish floodplain forest habitat and enhance existing floodplain forested areas.
- Providing legal and financial protection and stewardship so the restored and enhanced habitats are preserved in perpetuity.

The restoration actions described above will restore, enhance, and preserve a variety of aquatic and riparian habitats important to Columbia Basin salmon and steelhead and other native fish including Pacific lamprey and Pacific eulachon. Benefits will be attained through on-site usage by juvenile and adult and through off-site dispersal of salmonid prey items such as insects. The Mitigation Area will be preserved and protected with a conservation easement and managed with funds from a non-wasting, third-party-held endowment. The restored habitats will be held to performance standards, monitoring requirements, and management standards, all of which are described in this Plan.

Wildlands of Washington, Inc. (Wildlands) will be obtaining permits from USACE, providing a nexus for an independent Section 7 consultation. Wildlands will prepare a separate BA or use an existing programmatic BO for the Conservation Bank.

Construction will entail 7.4 acres of wetland impact but will result in 10.9 acres of wetland creation, restoration, and/or enhancement. During construction, standard BMPs (such as site isolation, fish exclusion, and TESC and SPCC plans) will be implemented to minimize the amount of sediment entering the Lewis or Columbia Rivers during earthwork.

Monitoring of the mitigation site during the establishment period will occur for 5 years after construction to ensure the project has met performance standards for wetland enhancement and stream restoration. Also, long-term monitoring will occur at 10 years after construction and every 10 years following in perpetuity to assess the Mitigation Area's condition, which includes degree of erosion, invasive plant species colonization and/or other aspects that may warrant management actions.

5.5.2 Oregon Compensatory Mitigation: Dabney State Recreation Area Habitat Restoration

The intent of the Dabney Habitat Restoration project is to create habitat credits and provide habitat uplift, in combination with the Columbia-Lewis Mitigation project, to offset unavoidable impacts to jurisdictional waters from construction and operation of the Columbia River Crossing (CRC) project, as part of CRC's conservation measures.

The habitat restoration project area is located entirely within the boundary of Dabney State Recreation Area, which is located on the northern (river right) shoreline of the Sandy River at River Mile 8.0. The Sandy River flows northwest from the piedmont of Mt. Hood to the Columbia River near Troutdale, Oregon about 14 miles upstream of CRC. The Sandy River supports coho, spring and fall Chinook, winter steelhead, and eulachon, all of which are federally listed as threatened. In addition, it supports non-listed native fishes such as Pacific lamprey. The Sandy River is a designated National Wild and Scenic River and an Oregon State Scenic Waterway within the project area.

The shoreline of the Sandy River supports two point bars located upstream and downstream of the recreation area's boat ramp. Seasonal side channels formed by the upstream (Primary Side Channel) and downstream (Secondary) features have less than ideal functions for fish habitat due to low- or no-flow conditions during drier portions of the year. Both channels have sediment substrates that would be suitable for spawning and rearing if flow through these features could be increased and sustained for a longer period through the year.

The primary tributary is a perennial stream that emerges from a waterfall on the eastern portion of Dabney then flows west-southwest roughly parallel to the Sandy River for a few thousand feet. At the upper end near the waterfall the channel splits, which results in low flows through two separate channels. The lesser of the two channels flows a short distance south to the Sandy via a seasonal channel. The channel substrate is a mix of fine sands and gravels, with coarse rock and an impermeable subsurface at the waterfall. The Primary tributary lacks in-stream wood structures and channel complexity. The channel, however, appears to have access to its floodplain along most of its length. The primary tributary flows through a mixed, early seral, deciduous and evergreen forest to the downstream end of the Primary Side Channel. Riparian vegetation is a mix of native tree, shrub and herbaceous, and non-native invasive species, the latter of which is primarily represented by English Ivy (*Hedera helix*).

Bonnie Brook is a perennial stream that flows northeast to west-southwest through Dabney State Recreation Area. The channel location and dimensions have been modified by roadway crossings and artificial impoundments; riparian vegetation has been altered by landscaping typical to park settings. The downstream-most roadway crossing is via a culvert that acts as a fish barrier during all but major flood events. Two sets of structures intentionally block flow to form relatively small, open-water impoundments. Substrate in Bonnie Brook is a mix of gravels and fines; overstory is dense in some reaches and is absent in others. Floodplain connectivity appears present in upper reaches, but appears limited near its confluence with the Primary Tributary. As many as four unnamed, seasonal or ephemeral tributaries flow from north to south to contribute flow to Bonnie Brook. These, and Bonnie Brook itself are likely to provide rearing and potentially spawning opportunities for salmonids and other fish species.

Proposed enhancements to fish and riparian habitat at Dabney State Recreation Area feature the following measures:

1. Engineered Log Jam – Primary Side Channel bar
2. Large Wood Placement – Primary Side Channel
3. Engineered Log Jam – lower channel bar
4. Large Wood Placement – Secondary Side Channel
5. Large Wood Placement – Primary Tributary
6. Primary Tributary Low Flow Augmentation
7. Culvert Replacement/Removal – lower Bonnie Brook (Proposed Culvert 1)
8. Culvert Replacement/Removal – mid-reach Bonnie Brook, lower pond (Proposed Culvert 2)
9. Riparian Wetland Development/Pond Modification – lower pond
10. Culvert Replacement/Removal – mid-reach Bonnie Brook, upper pond (Proposed Culvert 3)
11. Riparian Wetland Development/Pond Modification, upper pond
12. Culvert Replacements/Removals – upper Bonnie Brook (Proposed Culverts 4 and 5)
13. Large Wood Placement – lower Bonnie Brook
14. Large Wood Placement – upper Bonnie Brook
15. Stormwater Runoff Water Quality Treatment – Dabney State Recreation Area
16. Interpretive Signage – Dabney State Recreation Area

Anticipated benefits from these actions include salmon and eulachon recovery and riparian habitat uplift. Salmon recovery will be achieved through increases in channel rearing, spawning, and refugia opportunities. Salmon and eulachon recovery will be aided further through improved water quality, increases in invertebrate and other ecosystem habitat components, and through greater public awareness of salmon recovery efforts provided by interpretive signage describing the enhancement project.

Approximately 14,000 linear feet of side channel and tributary habitat will be restored or enhanced, with approximately 60 large wood structures placed instream and two engineered log jams. Seven culverts along Bonnie Brook will be replaced with those that will allow fish passage.

Proposed restoration activities will involve excavation and fill placement to replace existing culverts, and excavation and fill to allow installation of large wood pieces and key boulders. Final dimensions of large wood pieces and boulders will be determined by availability at the time of construction. Estimates of removal/fill of soils for large wood and boulder installation are expected to be approximately 5 cubic yards per large woody debris structure, and approximately 15 cubic yards for the two ELJs. Total temporary work will entail approximately 365 cy of fill and 3,075 cy of removal. Total permanent work will entail 0 cy of fill and approximately 184 cy of removal.

APPENDIX A

Figures

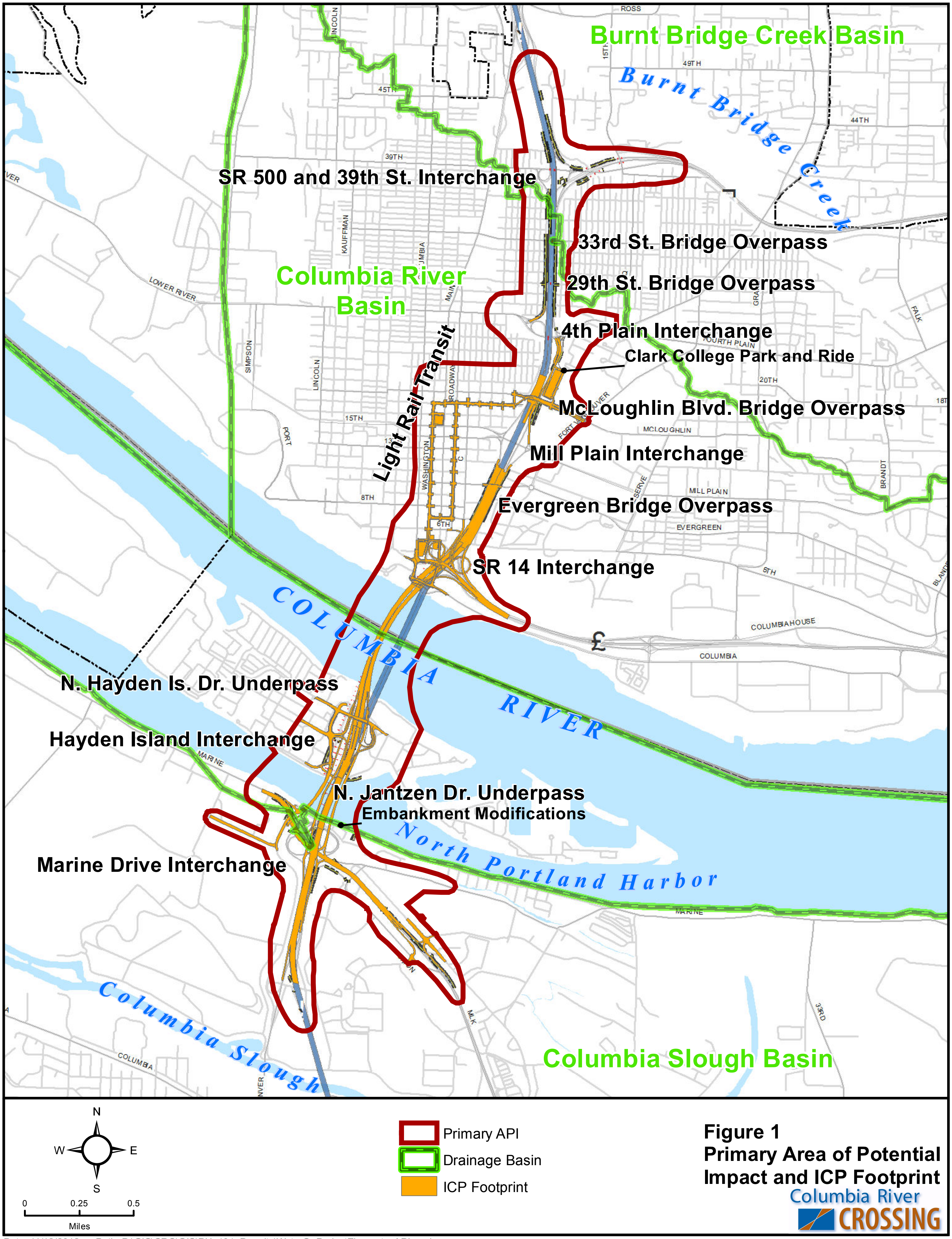
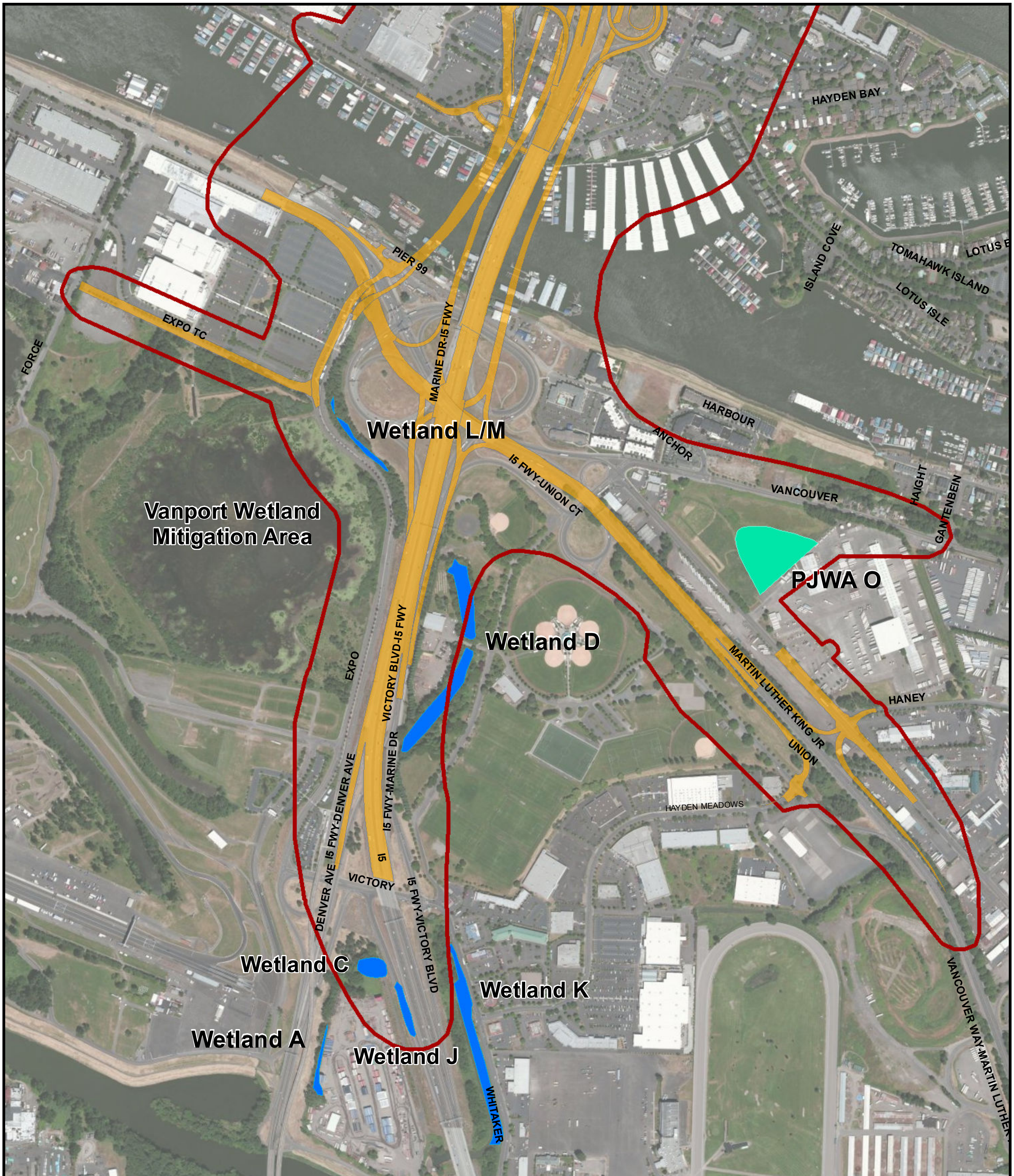


Figure 1
Primary Area of Potential Impact and ICP Footprint

Date: 11/12/2012 Path: P:\GIS\CRC\GIS\PH_404_Permits\WaterQ_ProjectElements_API.mxd



ICP Project Footprint
Primary API
Wetland Areas
Potentially Jurisdictional Water Area (PJWA)

N W E S

0 375 750
Feet

Figure 2
Wetlands Within Oregon

Columbia River CROSSING

Source: Locally Identified Wetlands = Clark Co. and Metro; Project Delineated Wetlands = Columbia River Crossing (Parametrix)

Date: 11/12/2012 Path: P:\GIS\CRC\GIS\PH_404_Permits\Wetlands_404.mxd

ICP Project Footprint

Primary API

Wetland Areas

Potentially Jurisdictional Water Area (PJWA)

N W E S

0 375 750

Feet

Figure 3
Wetlands Within Washington

Columbia River CROSSING

Source: Locally Identified Wetlands = Clark Co. and Metro; Project Delineated Wetlands = Columbia River Crossing (Parametrix)

Date: 11/12/2012 Path: P:\GIS\CRC\GIS\PH_404_Permits\Wetlands_404.mxd

APPENDIX B

Taxlot Numbers and Property Owner Information

Columbia River CROSSING

DRAFT Memorandum

NOVEMBER 27, 2012

TO: Steve Morrow

FROM: Elisabeth Bowers

SUBJECT: CRC ICP Taxlot Information for the USACE JPA

COPY: Jeff Heilman

INTRODUCTION

This memo provides taxlot numbers and property owner information for the Initial Construction Program (ICP) of the Columbia River Crossing (CRC) Project and the Dabney State Recreation Area Mitigation Site.

Taxlot Numbers for the ICP on the Oregon Side (Direct Impacts)

R204700640	R204703500	R368700010	R368700050
R368700100	R368700150	R368700200	R368700250
R368700300	R426800050	R426800100	R426800150
R426950010	R426950030	R426950140	R649631170
R649631180	R649755770	R941030480	R941030490
R941031530	R941031640	R941031810	R941031840
R941032470	R941040070	R941040090	R941040100
R941040110	R941040160	R941040310	R941040390
R951330050	R951330090	R951330210	R951330240
R951330470	R951330520	R951330760	R951330870
R951330900	R951330930	R951330940	R951340140
R951340160	R951340190	R951340210	R951340270
R951340410	R951340440	R951340530	R951340600
R951340730	R951340770	R951340780	R951340820
R951340920	R951340940		

Property ID of Directly Impacted Floating Homes in Oregon

P485315	P350628	P606673	P529553
P488202	P350316	P350623	P350606
P589374	P590659	P350625	P350454
P350122	P485263	P350271	P350153
P590350	P350204	P610908	P531347
P606455	P558504	P350193	P576952
P593710	P611465	P589397	P350452
P535118	P572134	P536308	P605993
P549801	P607341	P350303	P519952
P518852	P553697	P621260	P636465

360/737-2726 503/256-2726 WWW.COLUMBIARIVERCROSSING.ORG 700 WASHINGTON STREET, SUITE 300, VANCOUVER, WA 98660

Taxlot Numbers for the ICP on the Washington Side (Direct Impacts)

038279-940	048170-300	048170-096	050225-000
038279-941	048170-302	048170-098	046390-000
038279-942	048170-304	048170-100	040870-000
038279-943	048170-282	048170-078	040900-000
038279-944	048170-284	048170-080	040650-000
038279-945	048170-286	048170-082	041460-000
038279-958	048170-288	048170-084	041140-000
038279-959	048170-290	048170-086	046570-000
038279-960	048170-292	048170-088	041127-000
038279-952	048170-270	048170-064	040980-000
038279-953	048170-272	048170-066	041123-000
038279-954	048170-274	048170-068	041255-000
038279-955	048170-276	048170-070	041330-000
038279-956	048170-278	048170-072	056875-000
038279-957	048170-280	048170-076	040880-000
038279-946	048170-258	048170-052	040631-000
038279-947	048170-260	048170-054	040790-000
038279-948	048170-262	048170-056	041090-000
038279-949	048170-264	048170-058	041205-000
038279-950	048170-266	048170-060	056870-000
038279-951	048170-268	048170-062	040220-000
039610-000	048170-246	048170-040	041440-000
039385-000	048170-248	048170-042	039140-000
038740-001	048170-250	048170-044	051790-000
048170-008	048170-252	048170-046	047101-000
048170-010	048170-254	048170-048	047299-000
048170-012	048170-256	048170-050	038279-906
048170-014	048170-234	048170-028	051650-000
048170-438	048170-236	048170-030	051630-000
048170-440	048170-238	048170-032	051510-000
048170-441	048170-240	048170-034	039150-000
098602-7573	048170-242	048170-036	051600-000
098602-7574	048170-244	048170-038	047170-000
048170-426	048170-222	048170-016	041050-000
048170-428	048170-224	048170-018	041000-000
048170-430	048170-226	048170-020	040710-000
048170-432	048170-228	048170-022	041130-000
048170-434	048170-230	048170-024	041310-000
048170-436	048170-232	048170-026	041370-000
048170-414	048170-210	038279-907	041380-000
048170-416	048170-212	038279-909	041210-000
048170-418	048170-214	038279-920	056840-000

048170-420	048170-216	047600-000	039320-000
048170-422	048170-218	038279-937	038580-000
048170-424	048170-220	047615-000	039570-000
048170-402	048170-198	038279-930	039331-000
048170-404	048170-200	047580-000	041390-000
048170-406	048170-202	038279-962	0413850-00
048170-408	048170-204	038279-911	048835-000
048170-410	048170-206	040940-000	040330-000
048170-412	048170-208	041260-000	038600-000
048170-390	048170-186	048080-000	056910-000
048170-392	048170-188	048320-000	040950-000
048170-394	048170-190	040170-000	041450-000
048170-396	048170-192	041470-000	048094-000
048170-398	048170-194	041340-000	047880-000
048170-400	048170-196	040270-000	039490-000
048170-378	048170-174	048840-000	039410-000
048170-380	048170-176	046485-000	048090-000
048170-382	048170-178	048400-000	047291-000
048170-384	048170-180	046950-000	048470-000
048170-386	048170-182	051800-000	048350-000
048170-388	048170-184	040990-000	048380-000
048170-366	048170-162	041320-000	039560-000
048170-368	048170-164	039610-001	039290-000
048170-370	048170-166	039283-000	038610-000
048170-372	048170-168	047920-000	040290-000
048170-374	048170-170	051640-000	046920-000
048170-376	048170-172	039380-000	047277-000
048170-354	048170-150	047985-000	051680-000
048170-356	048170-152	047940-000	051830-000
048170-358	048170-154	039630-000	047280-000
048170-360	048170-156	048430-000	047296-000
048170-362	048170-158	047930-000	038828-000
048170-364	048170-160	039620-000	048420-000
048170-342	048170-138	038740-000	048410-000
048170-344	048170-140	038550-000	048370-000
048170-346	048170-142	048450-000	048844-000
048170-348	048170-144	048480-000	056920-000
048170-350	048170-146	040240-000	040890-000
048170-352	048170-148	047960-000	040800-000
048170-330	048170-126	051760-000	041200-000
048170-332	048170-128	040310-000	041250-000
048170-334	048170-130	047281-000	041300-000
048170-336	048170-132	051520-000	051580-000

048170-338	048170-134	047285-000	040190-000
048170-340	048170-136	048360-000	041410-000
048170-318	048170-114	040230-000	047272-000
048170-320	048170-116	051550-000	046850-000
048170-322	048170-118	047870-000	039330-000
048170-324	048170-120	048841-000	038710-000
048170-326	048170-122	047890-000	038840-000
048170-328	048170-124	048475-000	056880-000
048170-306	048170-102	051840-000	038279-927
048170-308	048170-104	047283-000	038670-000
048170-310	048170-106	038685-000	041520-000
048170-312	048170-108	039000-000	048790-000
048170-314	048170-110	047860-000	048760-000
048170-316	048170-112	048390-000	051720-000
048170-294	048170-090	048170-004	048170-296
048170-092	048120-000	048170-298	048170-094
047288-000			

Property Owner Information for Properties Directly Impacted by the ICP and Adjacent to the Impacts

Oregon Property Owner Information (see Figure 1)

Map ID	Property Owner	Street	City	State	Zipcode
	DIRECTLY IMPACTED PROPERTIES				
205	JBH PROPERTY ACQUISITIONS LLC	909 N HAYDEN ISLAND DR	PORTLAND	OR	97217-8118
219	OREGON STATE OF(LEASED WINMAR)	755 SUMMER ST NE	SALEM	OR	97310-0230
224	MOB INVESTMENTS INC	8320 NE HWY 99	VANCOUVER	WA	98665-8819
206	HAYDEN ISLAND MARINA LLC	833 SW 11TH AVE #200	PORTLAND	OR	97205-2116
227	JANTZEN BEACH MOORAGE INC	1881 N JANTZEN AVE	PORTLAND	OR	97217-7808
209	JANTZEN BEACH MOORAGE INC	1881 N JANTZEN AVE	PORTLAND	O2R	97217-7808
222	MILTON O BROWN	8320 NE HIGHWAY 99	VANCOUVER	WA	98665-8819
203	THUNDERBIRD HOTEL LLC	909 N HAYDEN IS DR	PORTLAND	OR	97217-8118
204	OREGON STATE (ODOT TECHNICAL LEADERSHIP CENTER)	4040 FAIRVIEW IND'L DR SE #MS2	SALEM	OR	97302
	PROPERTIES ADJACENT TO DIRECTLY IMPACTED PROPERTIES				
226	MOB INVESTMENTS INC	8320 NE HWY 99	VANCOUVER	WA	98665-8819
225	MOB INVESTMENTS INC	8320 NE HWY 99	VANCOUVER	WA	98665-8819
214	COLUMBIA CROSSING LLC ET AL	2001 WESTERN AVE # 330	SEATTLE	WA	98121-2133
217	COLUMBIA CROSSINGS LLC	2001 WESTERN AVE # 330	SEATTLE	WA	98121-2133
212	(503) REAL ESTATE LLC	PO BOX 684	BEMIDJI	MN	56619-0684
211	PORTLAND CITY BUREAU OF FIRE & RESCUE	55 SW ASH ST	PORTLAND	OR	97204-3509
208	WATERSIDE CONDOMINIUM	1430 SW HIGHLAND RD	PORTLAND	OR	97221-2724
201	HAYDEN ISLAND ENTERPRISES	31550 NORTHWESTERN HWY #200	FARMINGTON HILLS	MI	48334-2532
221	HAYDEN ISLAND INC	2001 WESTERN AVE # 330	SEATTLE	WA	98121-2133
223	OREGON STATE (DSL)	1445 STATE ST	SALEM	OR	97310-0001
218	ASSOCIATION OF UNIT OWNERS OF	606 N TOMAHAWK ISLAND DR	PORTLAND	OR	97217-7926
210	COLUMBIA CROSSING LLC-36.86% &	2001 WESTERN AVE #330	SEATTLE	WA	98121-2133
213	BUENA-HAYDEN LLC	4800 SW MACADAM AVE #120	PORTLAND	OR	97239-3929
216	PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912
215	PORTLAND WATER BUREAU	1120 SW 5TH AVE #609	PORTLAND	OR	97204-1912

Map ID	Property Owner	Street	City	State	Zipcode
207	OREGON STATE (DSL)	775 SUMMER ST NE	SALEM	OR	97301-1274
220	WHITECAP COVE INC	P O BOX 83723	PORTLAND	OR	97283-0723
202	UMATILLA INC	2800 EAST LAKE ST	MINNEAPOLIS	MN	55406-1930

Directly Impacted Floating Home Addresses in Oregon

Property ID	Street	City	State	Zipcode
P485315	1525 N JANTZEN AVE	PORTLAND	OR	97217
P350628	1527 N JANTZEN AVE	PORTLAND	OR	97217
P606673	1529 N JANTZEN AVE	PORTLAND	OR	97217
P529553	1531 N JANTZEN AVE	PORTLAND	OR	97217
P488202	1533 N JANTZEN AVE	PORTLAND	OR	97217
P350316	1535 N JANTZEN AVE	PORTLAND	OR	97217
P350623	1545 N JANTZEN AVE	PORTLAND	OR	97217
P350606	1547 N JANTZEN AVE	PORTLAND	OR	97217
P589374	1549 N JANTZEN AVE	PORTLAND	OR	97217
P590659	1551 N JANTZEN AVE	PORTLAND	OR	97217
P350625	1553 N JANTZEN AVE	PORTLAND	OR	97217
P350454	1555 N JANTZEN AVE	PORTLAND	OR	97217
P350122	1613 N JANTZEN AVE	PORTLAND	OR	97217
P485263	1615 N JANTZEN AVE	PORTLAND	OR	97217
P350271	1619 N JANTZEN AVE	PORTLAND	OR	97217
P350153	1621 N JANTZEN AVE	PORTLAND	OR	97217
P590350	1623 N JANTZEN AVE	PORTLAND	OR	97217
P350204	1625 N JANTZEN AVE	PORTLAND	OR	97217
P610908	1627 N JANTZEN AVE	PORTLAND	OR	97217
P531347	1629 N JANTZEN AVE	PORTLAND	OR	97217
P542565	11804 N JANTZEN	PORTLAND	OR	97217
P606455	11808 N JANTZEN	PORTLAND	OR	97217
P558504	11812 N JANTZEN	PORTLAND	OR	97217
P350193	11816 N JANTZEN	PORTLAND	OR	97217
P576952	11820 N JANTZEN	PORTLAND	OR	97217
P593710	11824 N JANTZEN	PORTLAND	OR	97217

Property ID	Street	City	State	Zipcode
P611465	11828 N JANTZEN	PORTLAND	OR	97217
P589397	11832 N JANTZEN	PORTLAND	OR	97217
P350452	11836 N JANTZEN	PORTLAND	OR	97217
P535118	11840 N JANTZEN	PORTLAND	OR	97217
P572134	11844 N JANTZEN	PORTLAND	OR	97217
P536308	11848 N JANTZEN	PORTLAND	OR	97217
P605993	11852 N JANTZEN	PORTLAND	OR	97217
P549801	11856 N JANTZEN	PORTLAND	OR	97217
P607341	11860 N JANTZEN	PORTLAND	OR	97217
P350303	11864 N JANTZEN	PORTLAND	OR	97217
P519952	11868 N JANTZEN	PORTLAND	OR	97217
P518852	11872 N JANTZEN	PORTLAND	OR	97217
P553697	1523 N PIER 99 ST	PORTLAND	OR	97217
P621260	1535 N PIER 99 ST SP C-02	PORTLAND	OR	97217
P636465	1535 N PIER 99 ST SP	PORTLAND	OR	97217

Washington Properties Owner Information (see Figure 2)

Map ID	Owner	Street	City	State	Zipcode
	DIRECTLY IMPACTED PROPERTIES				
105	CLARK PUBLIC UTILITIES	PO BOX 8900	VANCOUVER	WA	98668
108	CLARK PUBLIC UTILITIES	PO BOX 8900	VANCOUVER	WA	98668
107	CLARK PUBLIC UTILITIES	PO BOX 8900	VANCOUVER	WA	98668
103	PORT OF VANCOUVER	3103 NW LOWER RIVER RD	VANCOUVER	WA	98668
104	RED LION PROPERTIES INC	W 201 NORTH RIVER DR #100	SPOKANE	WA	99201
	PROPERTIES ADJACENT TO DIRECTLY IMPACTED PROPERTIES				
106	COLUMBIA WAY INVESTORS, C/O GEORGE H KILLIAN	500 E BROADWAY 110	VANCOUVER	WA	98660
102	PORT OF VANCOUVER	3103 NW LOWER RIVER RD	VANCOUVER	WA	98660
111	CITY OF VANCOUVER	PO BOX 1995	VANCOUVER	WA	98668
101	PORT OF VANCOUVER, C/O RED LION VANCOUVER	3103 NW LOWER RIVER RD	VANCOUVER	WA	98660
109	ACW PROPERTIES SERIES 1 LLC	969-G EDGEWATER BLVD #350	FOSTER CITY	CA	94404

Map ID	Owner	Street	City	State	Zipcode
110	ACW PROPERTIES SERIES 1 LLC	969-G EDGEWATER BLVD #350	FOSTER CITY	CA	94404

Dabney State Recreation Area Mitigation Site Adjacent Property Owner Information (see Figure 3)

Taxlot Number	Name	Street	City	State	Zipcode
R994050350	UNITED STATES OF AMERICA (DEPT OF LABOR)	601 D ST NW	WASHINGTON	DC	20213-0001
R994050051	METRO LEASED	600 NE GRAND AVE	PORTLAND	OR	97232-2736
R994050600	METRO	600 NE GRAND AVE	PORTLAND	OR	97232-2736
R994050120	RONALD H JOHNSTON	1918 SE 302ND AVE	TROUTDALE	OR	97060-9430
R994050710	ALLEN B II & JUNE L KALKHOVEN	31005 E HIST COLUMBIA RIVER HWY	TROUTDALE	OR	97060
R994050270	ALLEN B II & JUNE L KALKHOVEN	31005 E HIST COLUMBIA RIVER HWY	TROUTDALE	OR	97060
R994050060	METRO PARKS & GREEN SPACES	600 NE GRAND AVE	PORTLAND	OR	97232-2736
R994050280	AKANA K J MA & SYDNEY A THOMSON	30936 SE NEILSON RD	TROUTDALE	OR	97060-9309
R994050340	HENRY A CUPPER & DAVID W SKILTON	3284 NE GOING ST	PORTLAND	OR	97211-7751
R994060470	CHRIS C WINTERS	29446 E WOODARD RD	TROUTDALE	OR	97060-8315
R994060730	DAVID E, ARTHUR S, & JAMES W BURNS	1522 SE 302ND AVE	TROUTDALE	OR	97060-9430
R994060550	JUNKI & LINDA YOSHIDA	PO BOX 100	TROUTDALE	OR	97060-0100
R994060640	YOSHIDA REAL ESTATE	8440 NE ALDERWOOD RD #A	PORTLAND	OR	97220-1471
R994060090	R EILEEN & MARVEN W WINTERS	705 NE SEIDL RD	TROUTDALE	OR	97060-9398
R944310520	BRYAN T DICKERSON & SHARI A SIRKIN	29820 SE WOODARD RD	TROUTDALE	OR	97060-8312
R944310470	JAMES TARPLEY	29700 E WOODARD RD	TROUTDALE	OR	97060-8313
R944310650	DANIELA & NARCIS RAGALIE	29622 E WOODARD RD	TROUTDALE	OR	97060-8314
R994060020	DANIELA & NARCIS RAGALIE	29622 E WOODARD RD	TROUTDALE	OR	97060-8314
R944310450	DUNCAN L & CATHERINE E GLADSTONE	30144 E WOODARD RD	TROUTDALE	OR	97060-9312
R944310720	ALICE E TARPLEY	29926 E WOODARD RD	TROUTDALE	OR	97060-9311
R053506460	RONALD THOMAS & KATHLEEN M RHEW	30244 E WOODARD RD	TROUTDALE	OR	97060-8326
R994050100	JAMES W & JULIE M BURNS	1522 SE 302ND AVE	TROUTDALE	OR	97060-9430
R994060060	GERALD A & DONNA L WAAGE	PO BOX 37	TROUTDALE	OR	97060-0037
R994060650	WANDA J STARLING	28724 E CROWN POINT HWY	TROUTDALE	OR	97060-9346
R994060580	MICHAEL E DRAIS & DEBORAH A BURTON	28632 E HIST COLUMBIA RIVER HWY	TROUTDALE	OR	97060

Figure 1
Oregon Taxlots Directly Impacted and Adjacent to Direct Impacts of In-Water Work

Date: 11/26/2012 Path: P:\GIS\CRC\GIS\PH_404_Permits\Ph_404_Oregon_InWater.mxd

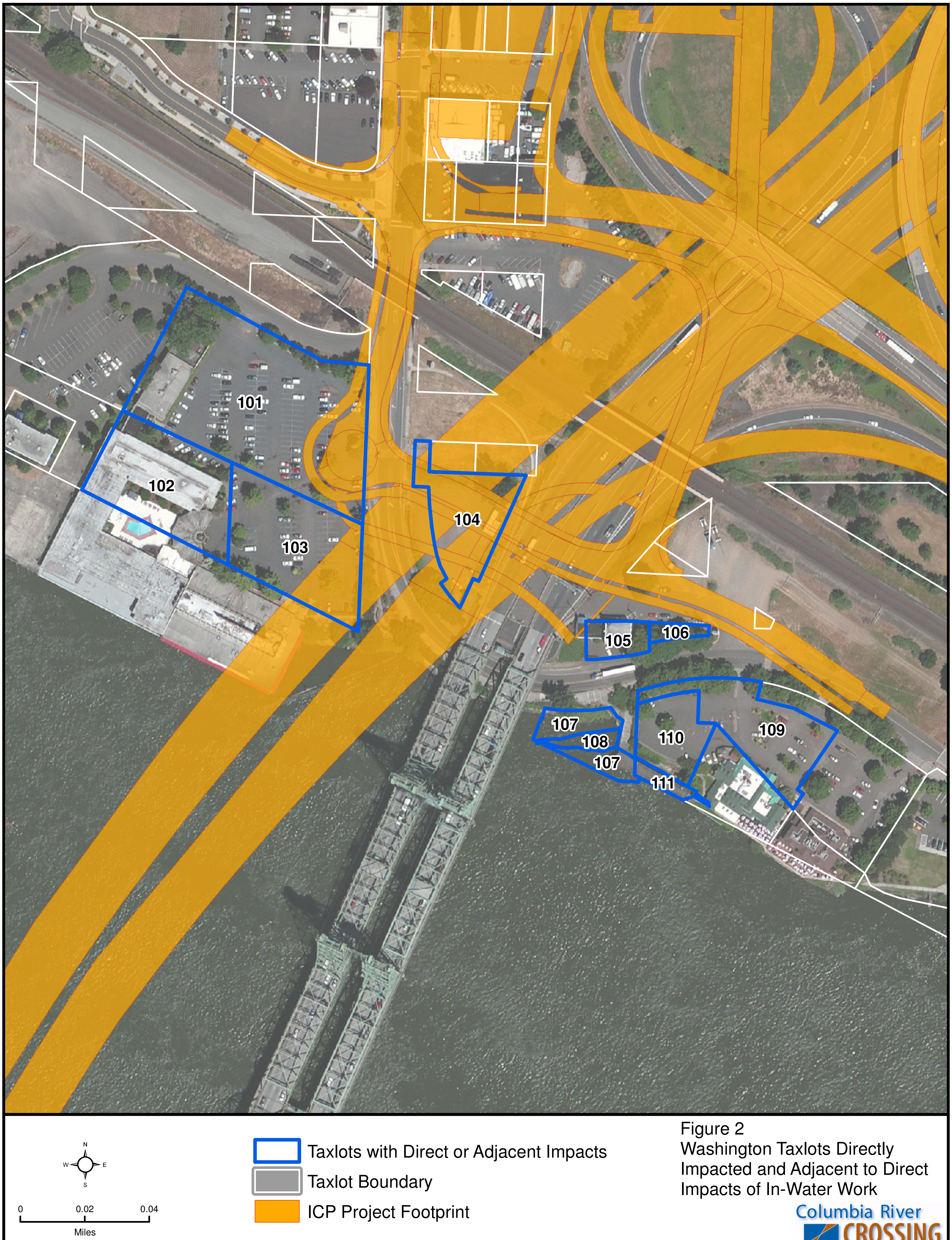


Figure 2
Washington Taxlots Directly Impacted and Adjacent to Direct Impacts of In-Water Work

Columbia River CROSSING

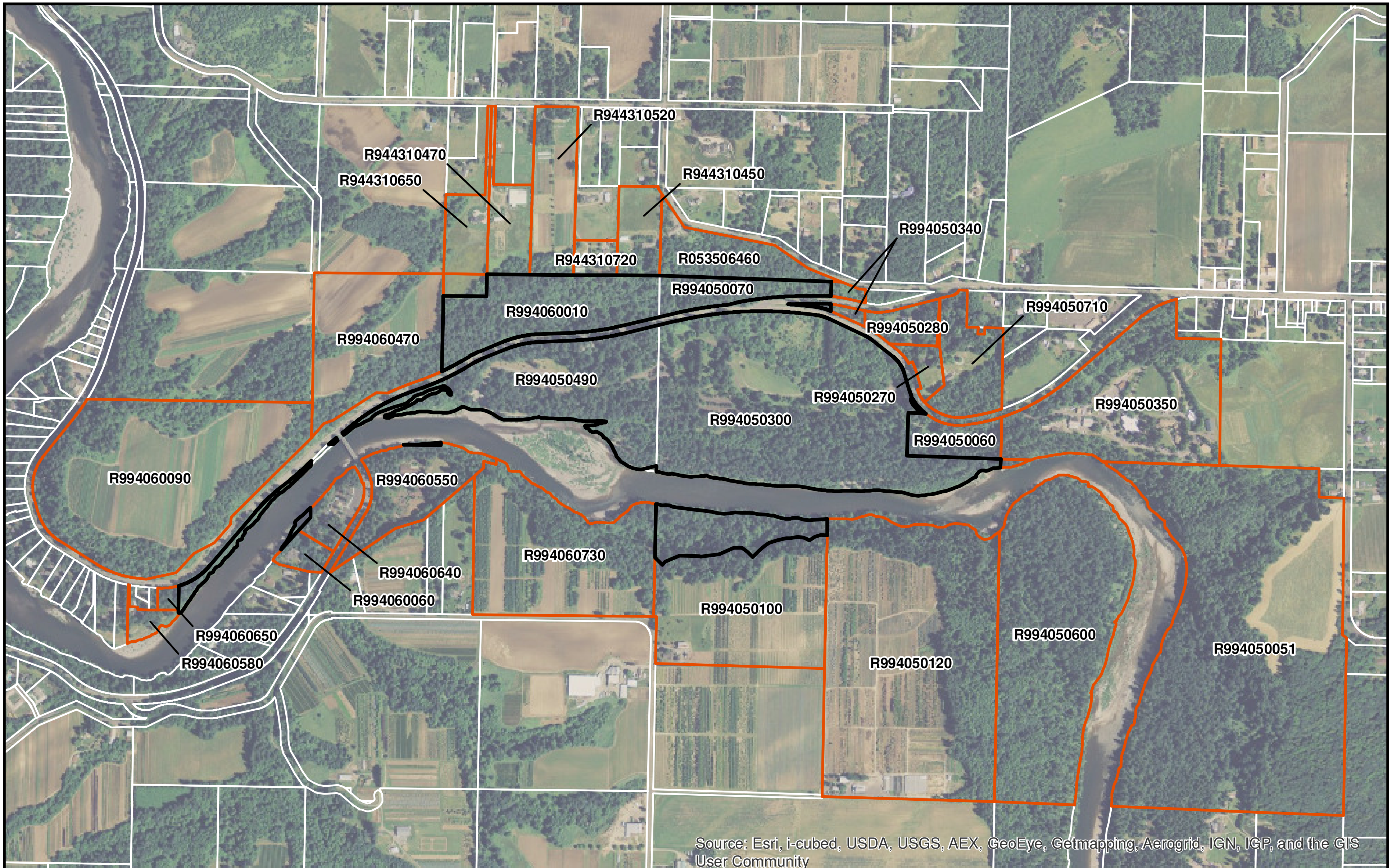


Figure 3:
Dabney State Recreation Area
Mitigation Site Taxlot Map

Columbia River CROSSING

Date: 11/27/2012 Path: P:\GIS\CRC\GIS\PH_404_Permits\Mitigation_Dabney.mxd