Hood River – White Salmon BRIDGE REPLACEMENT PROJECT

Final Waterways and Water Quality Technical Report

November 2020

Prepared for:

Prepared by:

851 SW Sixth Avenue
Suite 1600
Portland, Oregon 97204

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LIST OF EXHIBITS

ATTACHMENTS

ACRONYMS AND ABBREVIATIONS

303(d)	Section 303(d) of the Clean Water Act
API	area of potential impact
BMPs	best management practices
cfs	cubic feet per second
CWA	Clean Water Act
DEQ	Oregon Department of Environmental Quality
Ecology	Washington Department of Ecology
EIS	environmental impact statement
EPA	Environmental Protection Agency
FEMA	Federal Emergency Management Agency
I-	Interstate
lbs.	pounds
MATS	Mt. Adams Transportation Service
mph	miles per hour
NEPA	National Environmental Policy Act
NGVD88	National Geodetic Vertical Datum of 1988
NPDES	National Pollutant Discharge Elimination System
ODOT	Oregon Department of Transportation
ODFW	Oregon Department of Fish and Wildlife
OHWM	ordinary high water mark
OWRD	Oregon Water Resources Department
PCBs	polychlorinated biphenyls
SR	State Route
TESCP	Temporary Erosion and Sediment Control Plan
the Port	Port of Hood River
the Project	Hood River-White Salmon Bridge Replacement Project
TMDL	total maximum daily load
TS&L	type, size, and location
U.S.	United States
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USGS	United States Geological Survey
WDFW	Washington Department of Fish and Wildlife
WSDOT	Washington State Department of Transportation

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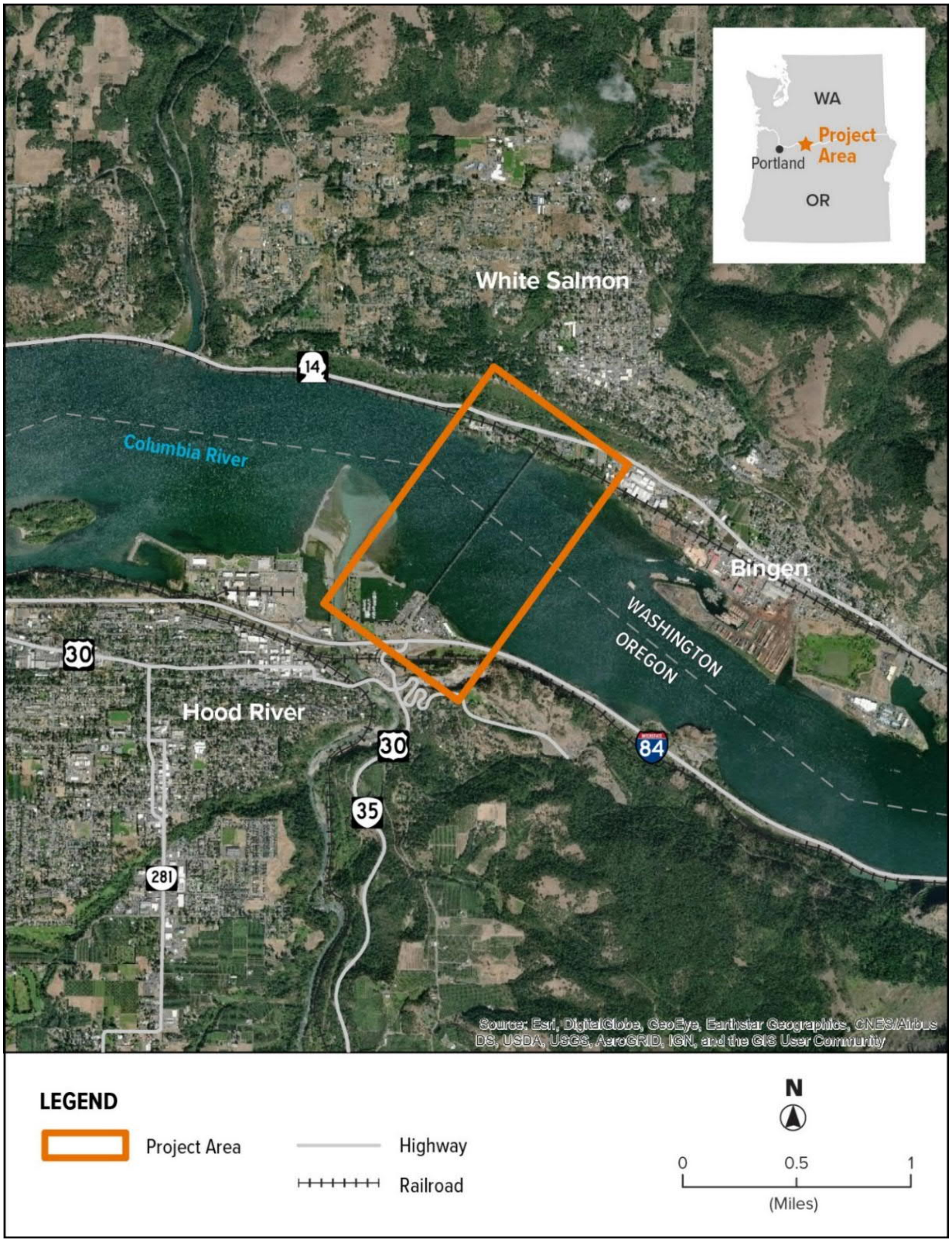
1. INTRODUCTION

The Hood River-White Salmon Bridge Replacement Project (the "Project," formerly named the SR-35 Columbia River Crossing Project) would construct a replacement bridge and then remove the existing Hood River Bridge between White Salmon, Washington, and Hood River, Oregon (Exhibit 1).The bridge is owned by the Port of Hood River (the Port), serving an average of over 4 million trips annually.

Exhibit 1. Project Area



The purpose of this Project is to improve multi-modal transportation of people and goods across the Columbia River between the communities of White Salmon and Bingen, Washington and Hood River, Oregon. The Project is intended to: a) improve traffic operations for current and future cross-river traffic and at connections to I-84 and SR 14; b) provide a cross-river connection for bicyclists and pedestrians; c) improve vehicle and freight travel safety by reducing real and perceived hazards; d) maintain and improve a transportation linkage between the White Salmon, Bingen, and Hood River communities, businesses, and services; e) fulfill the legislative directives tied to the Project funding; f) improve river navigation for vessels passing under the bridge; and g) improve the river crossing's seismic resiliency.

The overall need for the Project is to rectify current and future transportation inadequacies and deficiencies associated with the existing bridge. Specifically, these needs are to:

- Present Capacity: substandard width and operational issues are causing traffic congestion on the bridge and at both approaches
- Future Transportation Demand: the existing bridge is not designed to meet future travel demand for vehicles
- Bicycle and Pedestrian Facilities: lack of bicycle and pedestrian facilities limits multi-modal mobility
- Safety: narrow lanes and lack of shoulder create real and perceived safety hazards
- Social Demands/Economic Development: the existing bridge restricts the current and projected flow of goods, labor and consumers across the river
- Legislation: comply with federal funding obligation Transportation Equity Act for the 21st Century (TEA-21), the Washington State Legislature designation of the SR-35 corridor, and Oregon HB 2017
- River Navigation: the substandard horizontal clearance creates difficulties for safe vessel navigation
- Seismic Deficiencies: the existing bridge does not meet current seismic standards and is vulnerable to a seismic event

The Project began in 1999 with a feasibility study that ultimately resulted in the publication of the State Route (SR) 35 Columbia River Crossing Draft Environmental Impact Statement (EIS) in 2003, which identified the "EC-2 West Alignment" as the preliminary preferred alternative. In 2011, the Type, Size, and Location (TS&L) Study recommended a fixed-span concrete segmental box girder bridge as the recommended bridge type. In 2017, the Project was relaunched to complete the National Environmental Policy Act (NEPA) process. This report provides an update to the 2003 Water Quality Technical Report describing the existing conditions and anticipated construction, direct, and indirect impacts on waterways and water quality. Measures to avoid, minimize, and/or mitigate these impacts are also identified in this report.

2. PROJECT ALTERNATIVES

Four alternatives are being evaluated to address the Project's purpose and need:

- No Action Alternative
- Preferred Alternative EC-2
- Alternative EC-1
- Alternative EC-3

Exhibit 2 shows the alignment of the existing bridge, which represents the No Action Alternative, and the three build alternatives. The build alternatives connect to SR 14 in White Salmon, Washington, and Button Bridge Road in Hood River, Oregon, just north of the Interstate 84 (I-84)/United States Highway 30 (US 30) interchange (Exit 64).

Each alternative is summarized in Exhibit 3 and described in more detail in the following sections. Exhibit 4 illustrates the navigational clearance for the existing bridge and the replacement bridge (same for each build alternative).

Exhibit 2. Location of the Preferred Alternative EC-2, Alternative EC-1, and Alternative EC-3

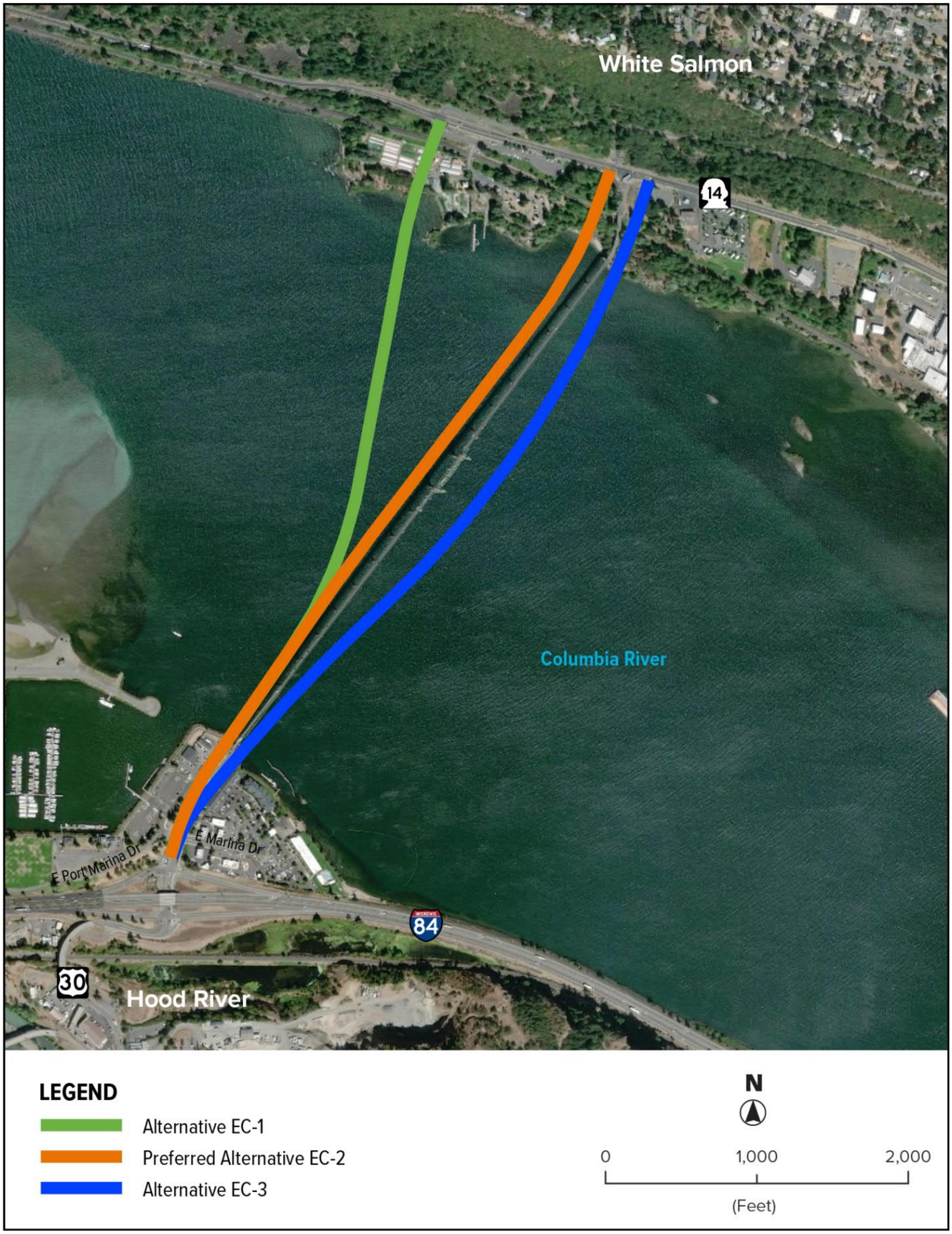
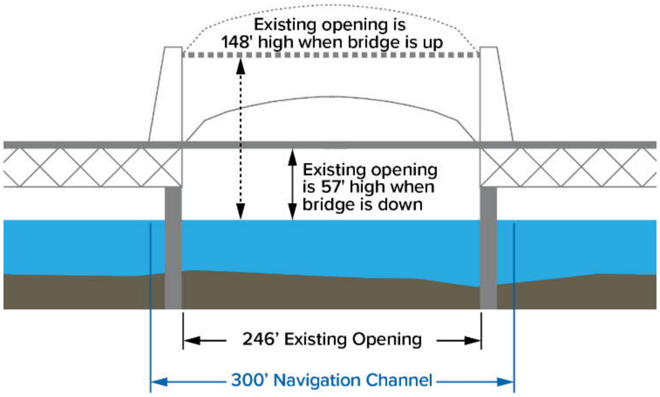


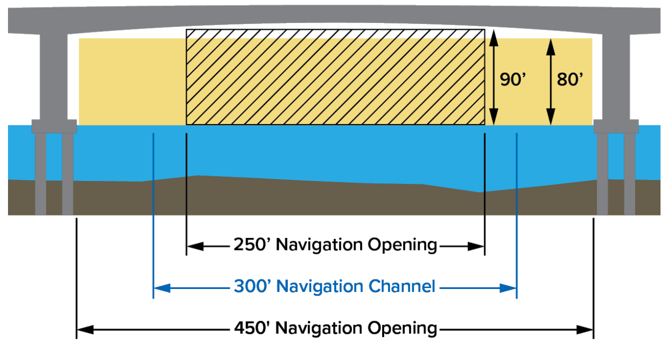
Exhibit 3. Summary Comparison of Key Elements of Alternatives

	No Action Alternative	Preferred Alternative EC-2	Alternative EC-1	Alternative EC-3
Bridge alignment	No change	Slightly west of existing	WA: West of existing OR: Slightly west of existing	Slightly east of existing
Bridge structure				
Bridge type	Steel deck truss bridge with vertical lift span	Segmental concrete box girder bridge (fixed span)		
Total number of piers (in water / on land)	28 (20 / 8)	13 (12 / 1)	13 (11 / 2)	13 (12 / 1)
Structure length	4,418 feet	4,412 feet	4,375 feet	4,553 feet
Travel lanes	9-foot 4.75-inch lanes	12-foot lanes		
Roadway shoulders	No shoulders	8-foot shoulders		
Vehicle height limit	14 feet-7 inches	None		
Shared Use Path	None	12-foot wide, only on west side with overlooks		
Bridge deck	Steel-grated	Concrete		
Vehicle Gross Weight Limit	80,000 pounds (lbs.); no trip permit allowance for overweight vehicles	> 80,000 lbs., with approved trip permit		
Design speed	Unknown	50 miles per hour (mph)		
Posted speed	25 mph	35 mph		
Toll collection	Toll booth on Oregon side	Electronic tolling/No toll booth		
Stormwater treatment	None	Detention and water quality treatment		
Navigation clearance	246 feet horizontal by 57 feet vertical when bridge is down and up to 148 feet vertical when lifted	450 feet horizontal x 80 feet vertical (maximum horizontal opening) 250 feet horizontal x 90 feet vertical (centered within maximum vertical opening)		
SR 14/Hood River Bridge intersection	Signalized intersection	Roundabout slightly west of existing intersection; SR 14 raised approximately 2 feet above existing road level	Roundabout with connection to N. Dock Grade Road west of existing intersection; SR 14 raised approximately 17 feet above existing road level	Roundabout slightly east of existing intersection; SR 14 remains at existing road level
Button Bridge Road/E. Marina Way intersection	Signalized intersection	Signalized intersection		
Anticipated construction duration	None	6 years (3 years to construct the replacement bridge and 3 years to remove the existing bridge)		

Exhibit 4. Navigation Clearance of Existing Bridge and Proposed Replacement Bridge



Existing Bridge



Proposed Replacement Bridge

2.1. No Action Alternative

The No Action Alternative would retain the existing bridge in its existing condition and configuration. Routine operations would continue and maintenance would be implemented to continue operations. Under the No Action Alternative, elements of the existing bridge include:

- Alignment: The bridge would continue to span the Columbia River between its northern terminus at the SR 14/Hood River Bridge intersection in White Salmon, Washington, and its southern terminus at the Button Bridge Road/E. Marina Way intersection in Hood River, Oregon, as shown in the aerial photograph in Exhibit 2.
- Type: The bridge would continue to be a 4,418-foot steel deck truss bridge with a vertical lift span. The bridge would continue to have 20 piers in the Columbia River.
- Ownership: The bridge will continue to be owned and operated by the Port.
- Vehicle lanes: The bridge will continue to have one narrow (9 feet, 4.75 inches) travel lane in each direction and no shoulders.
- Bicycle and pedestrian facilities: The bridge would continue to have no pedestrian or bicycle facilities, and signage would continue to prohibit pedestrians and bicycles on the bridge.
- Speed: The posted speed limit on the bridge would continue to be 25 mph.
- Vehicle restrictions: Vehicles would continue to be weight-restricted to 80,000 lbs.; vehicles with approved trip permits would still not be allowed to use the bridge. Wide loads would continue to be prohibited without special arrangements, and large vehicles would be encouraged to turn their mirrors in. The height limit for vehicles would continue to be 14 feet, 7 inches where the lift span occurs.
- Tolling: The bridge would continue to be tolled for all vehicles with a toll booth on the south end of the bridge and electronic tolls collected through the Port's Breezeby system. Plans to shift to all ETC are being considered, but there is no certainty they will be implemented.

- Navigational clearance: The horizontal clearance for marine vessels would continue to be 246 feet, narrower than the navigation channel width of 300 feet, as shown Exhibit 4. The vertical clearance would continue to be 57 feet when the lift span is down and 148 feet when it is raised; vessels would continue to be required to request bridge lifts in advance. The lift span section would continue to use gate and signals to stop traffic for bridge lifts.
- Seismic resilience: The bridge would continue to be seismically vulnerable and would not be cost effective to be seismically retrofitted.
- Stormwater: No stormwater detention or water quality treatment would be provided for the bridge. Stormwater on the bridge would continue to drain directly into the Columbia River through the steel-grated deck.
- Roadway connections: The bridge would continue to connect to SR 14 on the Washington side at the existing signalized SR 14/Hood River Bridge intersection. On the Oregon side, the southern end of the bridge would continue to transition to Button Bridge Road, connecting to the local road network at the existing signalized Button Bridge Road/E. Marina Way intersection north of I-84. The bridge would continue to cross over the BNSF Railway tracks on the Washington side and over the Waterfront Trail along the Oregon shoreline.
- Bicycle and pedestrian connections: The bridge would continue not to provide bicycle or pedestrian connections across the Columbia River. Bicyclists and pedestrians wanting to cross the river would continue to need to use an alternate means of transportation, such as the Mt. Adams Transportation Service (MATS) White Salmon/Bingen to Hood River bus (buses provide bicycle racks), or a private vehicle.

The Supplemental Draft EIS considers two scenarios for the No Action Alternative:

- End of bridge lifespan: assumes that the existing Hood River Bridge would remain in operation through 2045[1] and would be closed sometime after 2045 when maintenance costs would become unaffordable. At such a time, the bridge would be closed to vehicles and cross-river travel would have to use a detour route approximately 21 miles east on SR 14 or 23 miles east on I-84 to cross the Columbia River using The Dalles Bridge (US 197). Alternatively, vehicles could travel 25 miles west on SR 14 or 21 miles west on I-84 to cross the Columbia River via the Bridge of the Gods. When the bridge would be closed, the lift span would be kept in a raised position to support large vessel passage that previously required a bridge lift or the existing bridge would be removed.
- Catastrophic event: addresses the possibility that an extreme event that damages or otherwise renders the bridge inoperable would occur prior to 2045. Such events could include an earthquake, landslide, vessel strike, or other unbearable loads that the bridge structure cannot support.

[1] The year 2045 is the design horizon for the Project. The design horizon is the year for which the Project was designed to meet anticipated needs.

2.2. Preferred Alternative EC-2

Alternative EC-2 would construct a replacement bridge west of the existing bridge. The existing bridge would be removed following construction of the replacement bridge. Under Alternative EC-2, elements of the replacement bridge would include:

- Alignment: The main span of the bridge would be approximately 200 feet west of the existing lift span. The bridge terminus in White Salmon, Washington, would be located approximately 123 feet west of the existing SR 14/Hood River Bridge intersection, while the southern terminus would be in roughly the same location at the Button Bridge Road/E. Marina Way intersection in Hood River, Oregon, as shown in Exhibit 5 and Exhibit 6.
- Type: The bridge would be a 4,412-foot fixed-span segmental concrete box girder bridge with a concrete deck and no lift span. The bridge would have 12 piers in the Columbia River and one land-based pier on the Washington side of the river.
- Ownership: While the Port may own and operate the replacement bridge, other options for the ownership and operation of the replacement bridge that may be considered include other governmental entities, a new bi-state bridge authority, and a public-private partnership, depending on the funding sources used to construct the replacement bridge.
- Vehicle lanes: The bridge would include one 12-foot travel lane in each direction, an 8-foot shoulder on each side, as shown in Exhibit 7.
- Bicycle and pedestrian facilities: The bridge would include a 12-foot wide shared use path separated from traffic with a barrier on the west side, as shown in Exhibit 7. In the middle of the bridge the shared use path would widen an additional 10 feet in two locations to provide two 40-foot long overlooks over the Columbia River and west into the CRGNSA with benches; the overlook locations are shown in Exhibit 5 and Exhibit 6. The cross-section of the overlooks is shown in Exhibit 7.
- Speed: The design speed for the bridge would be 50 mph with a posted speed limit of 35 mph.
- Vehicle restrictions: Vehicles would no longer be limited by height, width, or weight. Vehicles exceeding 80,000 lbs. that have approved trip permits could use the bridge.
- Tolling: Tolls for vehicles would be collected electronically so there would be no toll booth on either side of the bridge. No tolls would be collected from non-motorized users (e.g., pedestrians, bicyclists) who travel on the shared use path.
- Navigational clearance: Vertical clearance for marine vessels would be a minimum of 80 feet. The horizontal bridge opening for the navigation channel would be 450 feet, greater than the existing 300-foot wide federally recognized navigation channel, as shown in Exhibit 4. Centered within this 450-foot opening, there would be a 250-foot wide opening with a vertical clearance of 90 feet. Similar to the existing bridge, the replacement bridge would cross the navigation channel at roughly a perpendicular angle as shown in Exhibit 5 and Exhibit 6.
- Seismic resilience: The bridge would be designed to be seismically sound under a 1,000-year event and operational under a Cascadia Subduction Zone earthquake.

- Stormwater: Stormwater from the entire Project area (bridge and improved roadways) would be collected and piped to detention and treatment facilities on both sides of the bridge as shown in Exhibit 6. On the Washington side, separate stormwater facilities would be used for the roadways and the bridge.
- Roadway connections: The bridge would connect to SR 14 on the Washington side at a new two-lane roundabout slightly west of the existing SR 14/Hood River Bridge intersection, as shown in Exhibit 6. On the Oregon side, the southern end of the bridge would transition to Button Bridge Road, connecting to the local road network at the existing signalized Button Bridge Road/E. Marina Way intersection north of I-84. The private driveway on Button Bridge Road north of E. Marina Way may be closed under this alternative. Like the existing bridge, the replacement bridge would cross over the BNSF Railway tracks on the Washington side and over the Waterfront Trail along the Oregon shoreline.
- Bicycle and pedestrian connections: The new shared use path would connect to existing sidewalks along the south side of SR 14 in Washington and to roadway shoulders (for bicyclists) on both sides of SR 14 at the new roundabout with marked crosswalks, as shown in Exhibit 6. On the Oregon side, the shared use path would connect to existing sidewalks, bicycle lanes, and local roadways at the signalized Button Bridge Road/E. Marina Way intersection.
- Cost: Total Project construction cost is estimated to be $300 million in 2019 dollars.

Exhibit 5. Preferred Alternative EC-2 Alignment

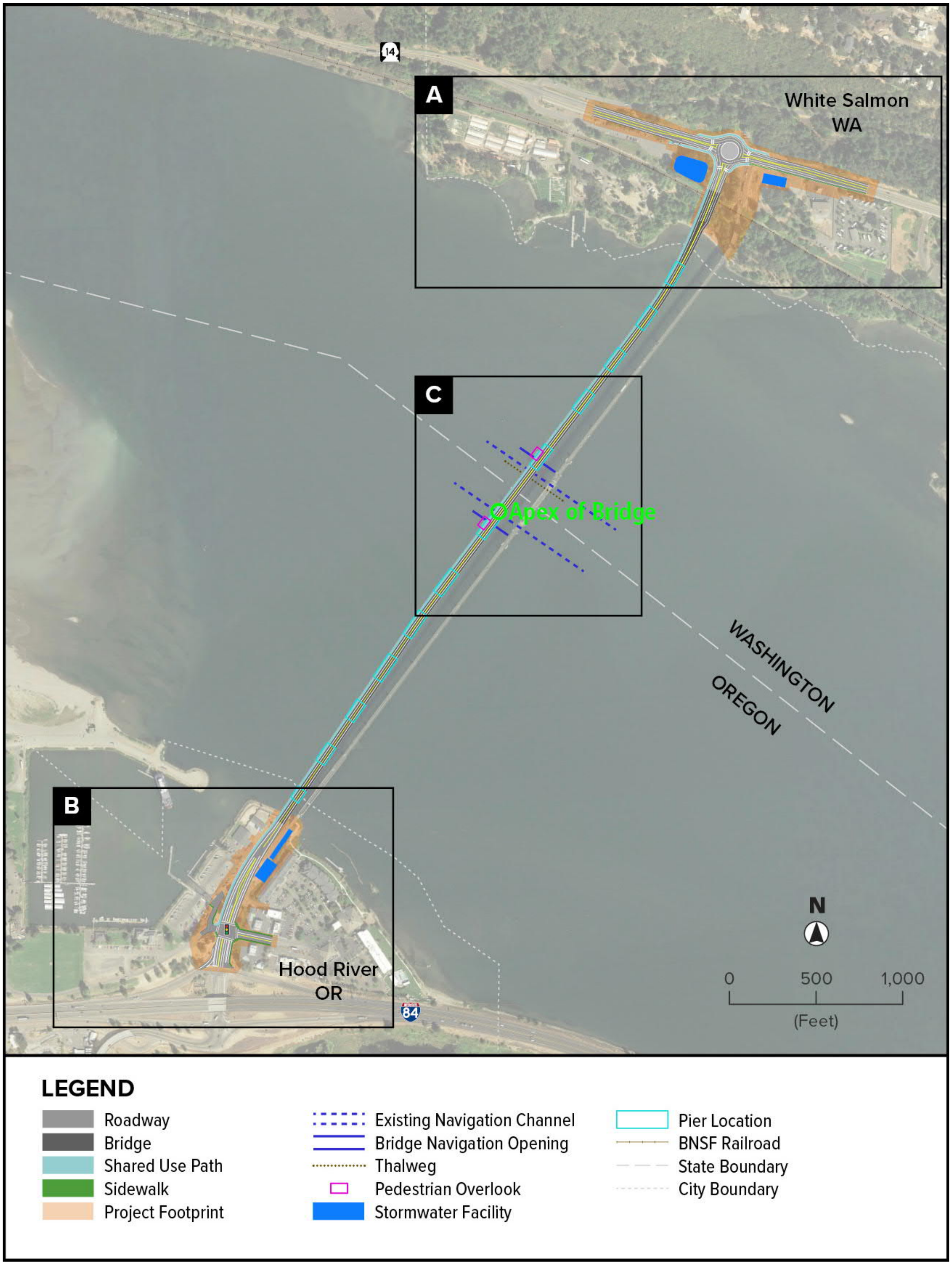


Exhibit 6. Preferred Alternative EC-2 Enlargements

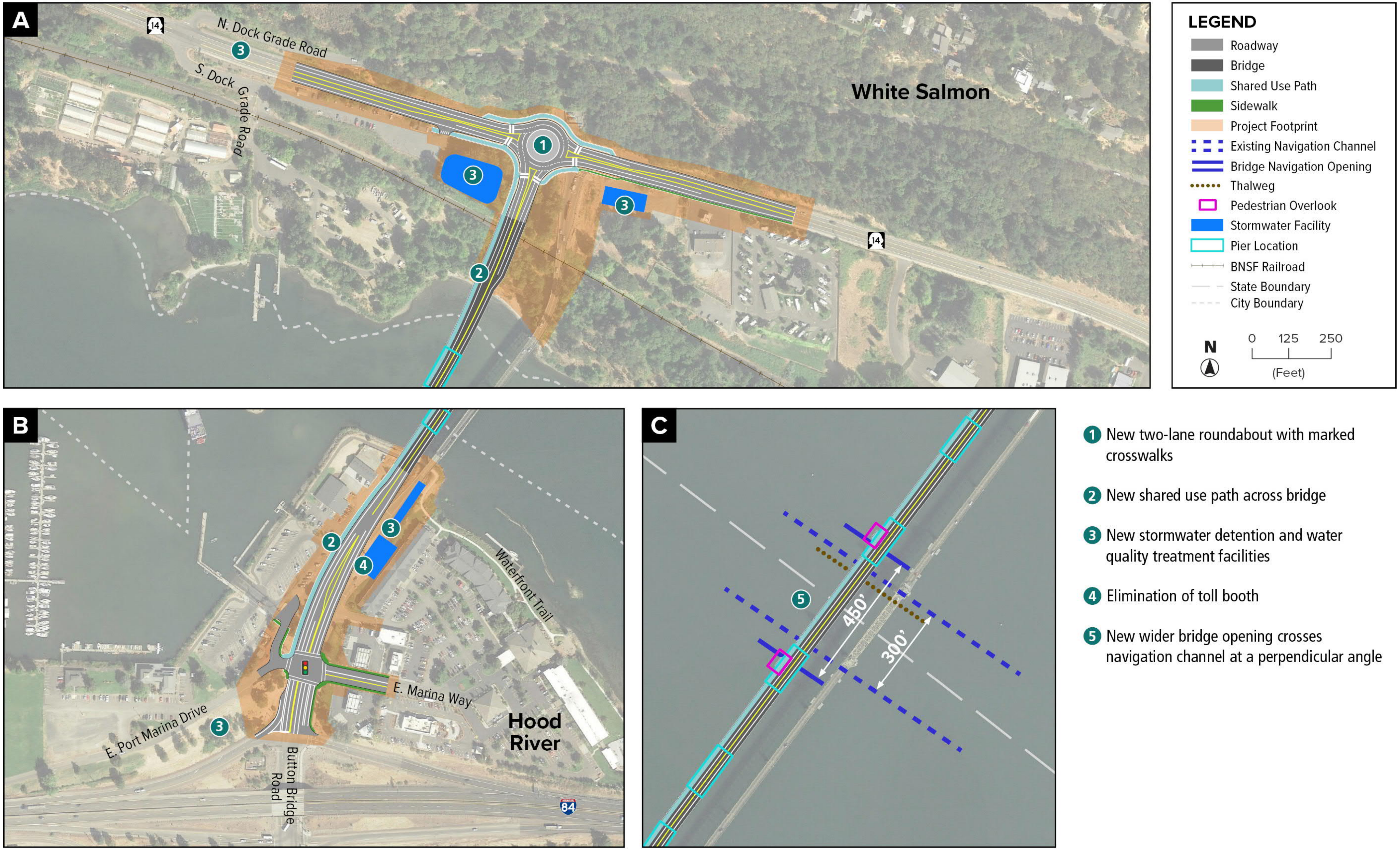


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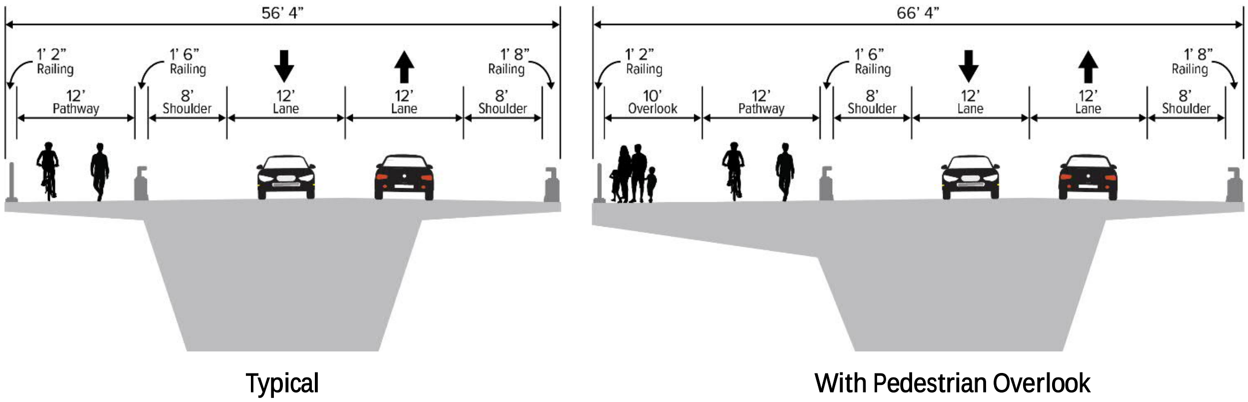
Exhibit 7. Replacement Bridge Typical Cross-Section



2.3. Alternative EC-1

Alternative EC-1 would construct a replacement bridge west of the existing bridge. Like Alternative EC-2, the existing bridge would be removed following construction of the replacement bridge. Exhibit 8 shows alignment of Alternative EC-1 and Exhibit 9 provides enlargements of the improvements that would be constructed under Alternative EC-1.

Under Alternative EC-1, elements of the replacement bridge would be the same as the elements described for Alternative EC-2 except:

- Alignment: The main span of the bridge would be approximately 700 feet west of the existing lift span. The bridge terminus in White Salmon, Washington, would be located approximately 2,309 feet west of the existing SR 14/Hood River Bridge intersection, while the southern terminus would be in roughly the same location as the existing terminus at the Button Bridge Road/E. Marina Way intersection in Hood River, Oregon.
- Type: The bridge would be a 4,375-foot fixed-span segmental concrete box girder bridge with a concrete deck and no lift span. The bridge would have 11 piers in the Columbia River.
- Navigational clearance: The navigational opening would be the same as Alternative EC-2, but the bridge would cross the navigation channel at a more skewed angle than under Alternative EC-2.
- Roadway connections: Connections to roadways would generally be the same as Alternative EC-2, but the bridge would connect to SR 14 on the Washington side at a new two-lane roundabout at the SR 14/Hood River Bridge/N. Dock Grade Road intersection west of the existing bridge. Access to S. Dock Grade Road would be provided via the driveway east of the Mt. Adams Chamber of Commerce and Heritage Plaza Park and Ride.
- Bicycle and pedestrian connections: Connections to bicycle and pedestrian facilities would generally be the same as Alternative EC-2, but the roundabout intersection with SR 14 on the Washington side would be located further west at N. Dock Grade Road.

Exhibit 8. Alternative EC-1 Alignment

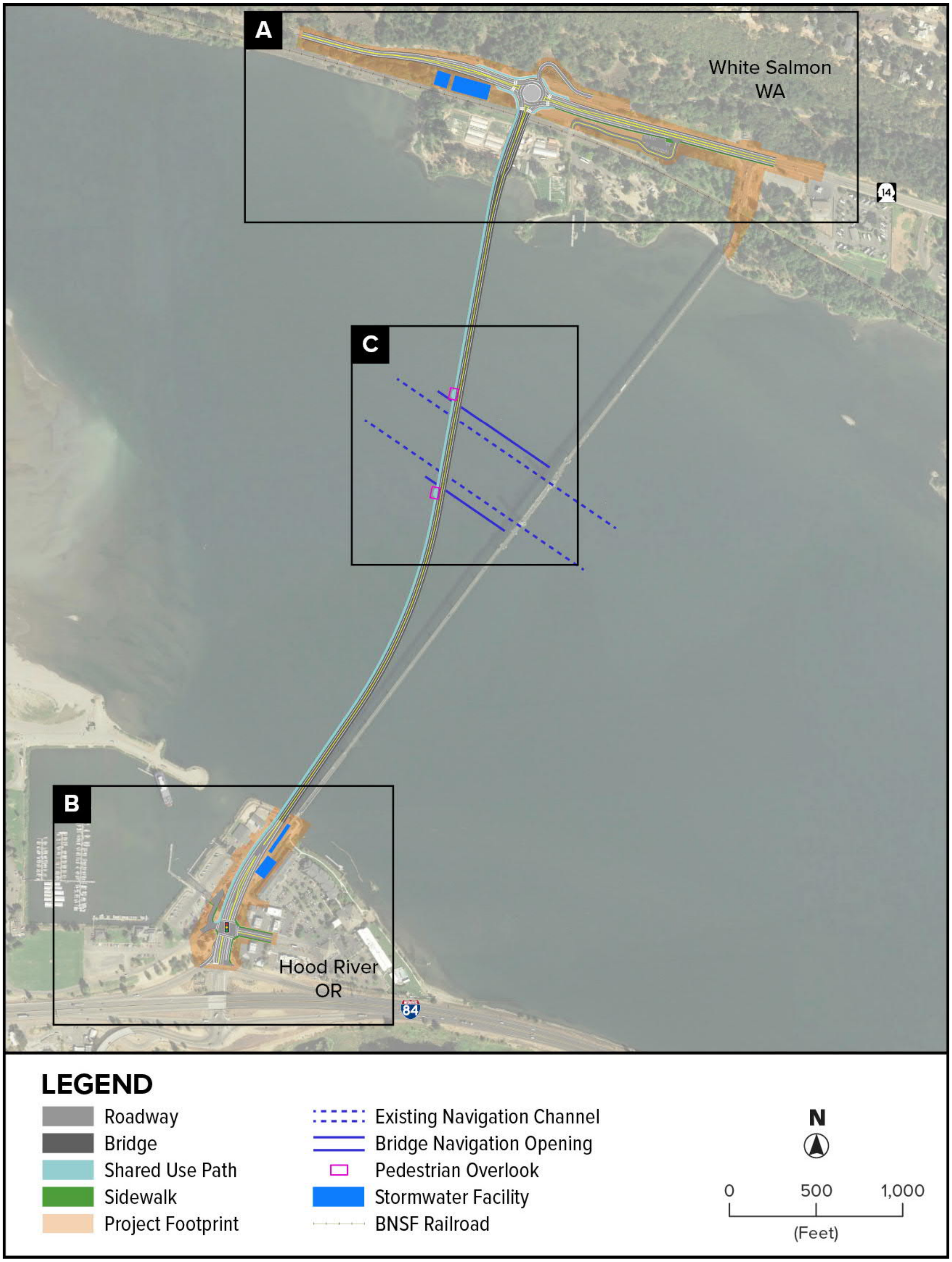
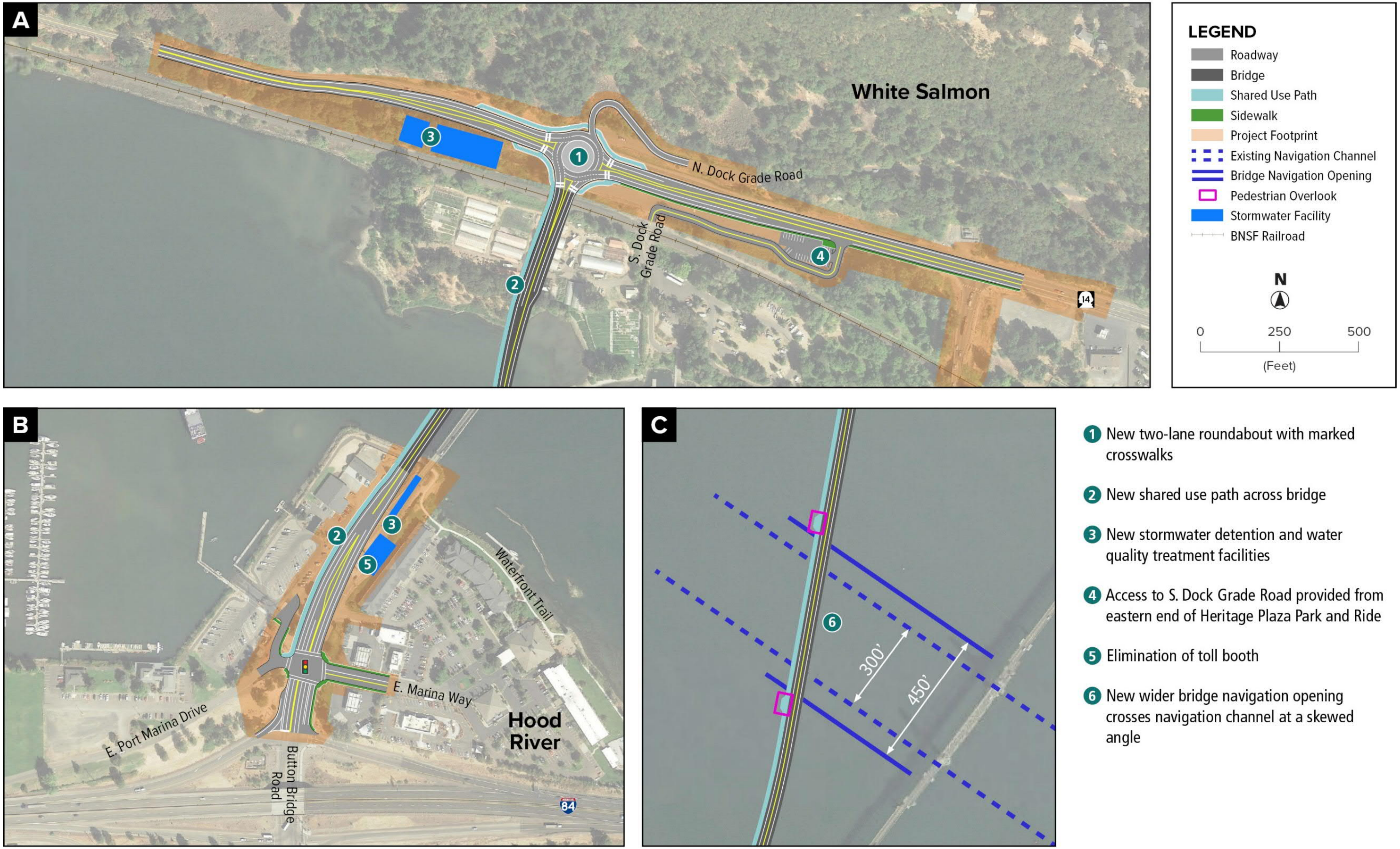


Exhibit 9. Alternative EC-1 Enlargements



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2.4. Alternative EC-3

Alternative EC-3 would construct a replacement bridge east of the existing bridge. Like Alternative EC-2, the existing bridge would be removed following construction of the replacement bridge. Exhibit 10 shows alignment of Alternative EC-3 and Exhibit 11 provides enlargements of the improvements that would be constructed under Alternative EC-3.

Like Preferred Alternative EC-2, the total Project construction cost for Alternative EC-3 is estimated to be $300 million in 2019 dollars. Under Alternative EC-3, elements of the replacement bridge would be the same as the elements described for Alternative EC-2 except:

- Alignment: The main span of the bridge would be approximately 400 feet east of the existing lift span. The bridge terminus in White Salmon, Washington, would be located approximately 140 feet east of the existing SR 14/Hood River Bridge intersection, while the southern terminus would be roughly the same as the existing terminus at the Button Bridge Road/E. Marina Way intersection in Hood River, Oregon.
- Type: The bridge would be a 4,553-foot fixed-span segmental concrete box girder bridge with a concrete deck and no lift span. Like Alternative EC-2, the bridge would have 12 piers in the Columbia River and one land-based pier on the Washington side of the river.
- Roadway connections: Connections to roadways would generally be the same as Alternative EC-2, but the bridge would connect to SR 14 on the Washington side at a new two-lane roundabout slightly east of the existing SR 14/Hood River Bridge intersection. On the Oregon side, improvements extend slightly further south to the Button Bridge Road/I-84 on and off ramps. The private driveway on Button Bridge Road north of E. Marina Way would be closed under this alternative.
- Bicycle and pedestrian connections: Connections to bicycle and pedestrian facilities would generally be the same as Alternative EC-2, but the roundabout intersection with SR 14 on the Washington side would be located approximately 264 feet further east than under Alternative EC-2.

Exhibit 10. Alternative EC-3 Alignment

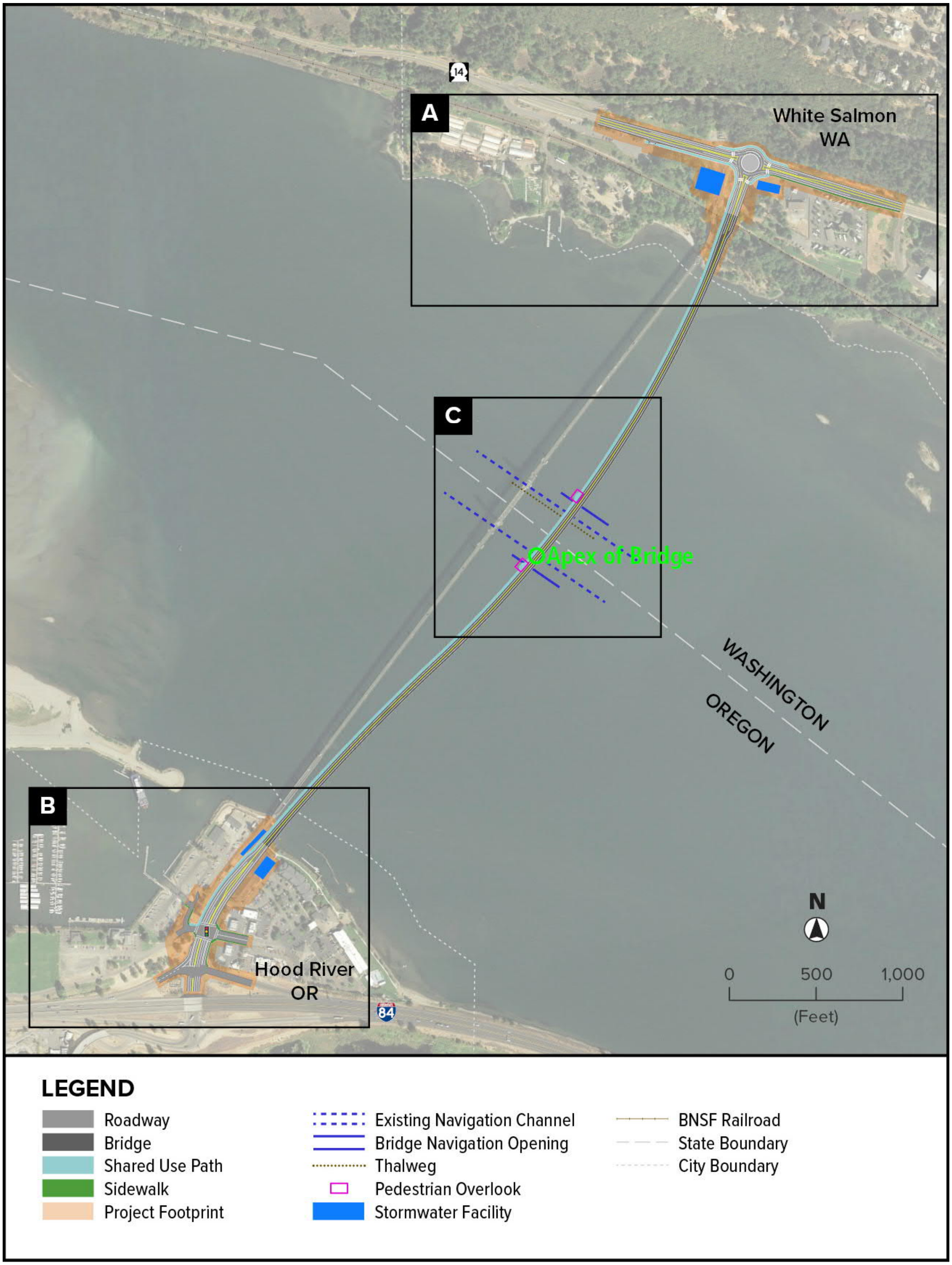
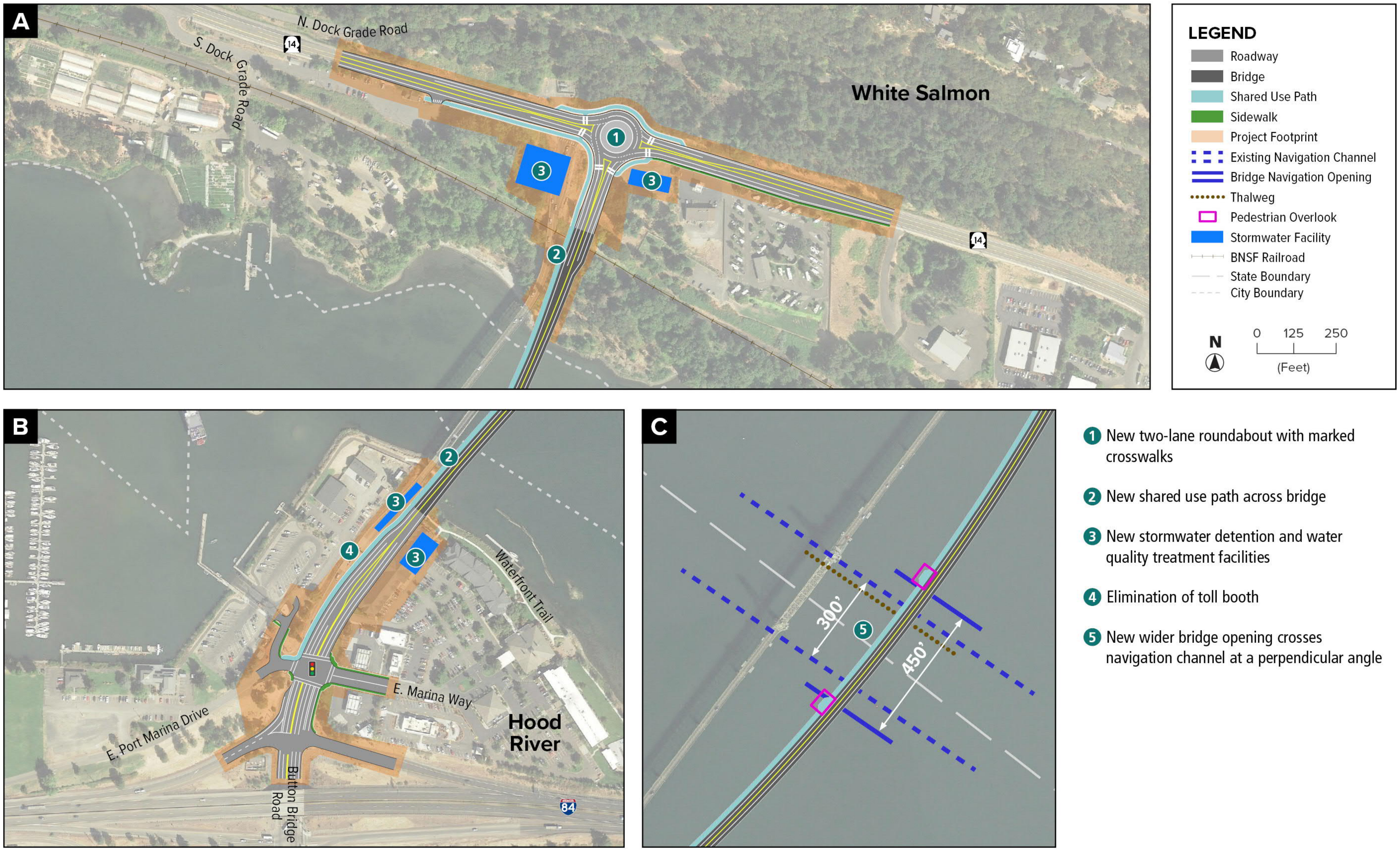


Exhibit 11. Alternative EC-3 Enlargements



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2.5. Construction of the Build Alternatives

Construction of the build alternatives would be similar in duration and approach.

- Timeline and sequencing: The NEPA process is anticipated to be complete in 2021; subsequent phases of the Project would be dependent on funding availability. Construction would take approximately 6 years and would require work during approximately six IWWWs. Approximately three IWWWs would be necessary to construct the replacement bridge, and approximately three additional IWWWs would be necessary to complete the removal of the existing bridge.
- In-water work window: Certain construction and removal activities conducted below the OHWM of the Columbia River would be restricted to an IWWW established for the Project. The IWWW would be established in permits for the Project through inter-agency coordination including Washington Department of Fish and Wildlife (WDFW), Oregon Department of Fish and Wildlife (ODFW), NOAA Fisheries, and USFWS. Preliminary discussions with these agencies indicate that the authorized IWWW would likely be October 1-March 15 of each year. In-water work activities that would be restricted to this IWWW would include vibratory and impact pile installation, installation of drilled shaft casings, installation of cofferdams, and unconfined wiresaw removal of the existing pier foundations. Vibratory pile removal would not be restricted to the IWWW.
- Mobilization and site preparation: The contractor would likely mobilize equipment to the construction site via barges and trucks. Erosion control measures (e.g., silt fences, etc.) and debris containment devices (i.e., floating debris booms) would be installed and clearing and grubbing limits would be established prior to vegetation removal. Barges would require anchoring, tethering, and spudding.
- Construction staging: At least two staging areas would be necessary for staging and storage of materials and equipment; the location of these areas would be determined later in the design process, including obtaining all relevant environmental permits and land use approvals. It is estimated that a minimum of 2 acres would be necessary for staging and storage of materials and equipment. Materials arriving by barge may be offloaded to upland staging areas or may be temporarily stored on barges. All staging areas and equipment fueling areas would be located above the OHWM and outside of environmentally sensitive areas. Staging and temporary access areas will occur in upland locations, on areas that are either already disturbed or that will be restored post-Project.
- Temporary work structures: The Project would likely require the installation of several temporary in-water structures during construction and removal of the existing bridge. These structures would include temporary work bridges, cofferdams, drilled shaft casings, and temporary piles. These temporary features would be designed by the contractor after a contract is awarded, but prior to construction.

  Three temporary work bridges would likely be installed to support construction activities. One temporary work bridge would be installed at each end of the replacement bridge alignment. A third temporary work bridge would be constructed on the Washington side of the river to support the removal of the existing bridge. These temporary structures would likely be supported by 24-inch steel pipe piles.

  Additional temporary piles would be necessary throughout construction and removal of the existing bridge for a variety of purposes, including supporting falsework and formwork, pile templates, reaction piles, and for barge mooring. These temporary piles would also likely be 24-inch steel pipe piles.

Barges would be used as platforms to conduct work activities and to haul materials and equipment to and from the work site. Three barges would typically be needed at each pier during drilled shaft construction, and at least one barge would remain at each pier after shaft construction to support column and superstructure construction.

Temporary cofferdams would likely be installed to create isolated in-water work areas for certain activities. A temporary cofferdam would likely be installed to create an isolated in-water work area for construction of a spread footing foundation on the Washington shoreline. Sheet pile cofferdams may also be installed at one or more piers on the existing bridge to create an isolated work area for removal of the existing bridge foundations.

Drilled shaft casings would also be installed as temporary work structures to create isolated work areas for drilled shaft construction. An outer steel casing, with a diameter approximately 12-inches larger than that of the finished drilled shaft, would be installed to act as an isolation structure. The outer cases will be 84 inches in diameter for the 72-inch shafts, and 108 inches in diameter for the 96-inch shafts.

- Work area isolation and fish salvage: To minimize impacts to fish, fish salvage measures would be employed to remove fish from temporarily isolated in-water work areas during and after the installation of drilled shaft casings and cofferdams. Fish salvage would follow the BMPs established in the biological opinion for FHWA and ODOT's Federal Aid Highway Program programmatic consultation and would be supervised by a fish biologist. A fish biologist with the experience and competence to ensure the safe capture, handling, and release of all fish would supervise all fish capture and release. To minimize take, efforts would be made to capture ESA-listed fish known or likely to be present in an in-water isolated work area using methods that are effective, minimize fish handling, and minimize the potential for injury. Attempts to seine and/or net fish, or the use of minnow traps shall precede the use of electrofishing equipment. Isolation structures would be installed such that they would not be overtopped by high water. A reasonable effort would be made to re-locate threatened or endangered fish using methods that minimize the risk of injury.
- Bridge foundation installation: The foundations for the replacement bridge would consist of three different foundation types: 1) pile-supported foundations; 2) drilled-shaft-supported foundations; and 3) spread footings. In general, pile-supported foundations would be used at locations where the depths to bedrock are relatively deep (greater than 50 feet below ground surface) while drilled shaft-supported foundations would be more economical in locations where depths to bedrock are nearer to the surface (less than 50 feet below ground surface). Spread footings would be used where bedrock is located at or near the surface and deep foundations are not required.

  Pile-supported foundations would be supported by 48-inch diameter steel pipe piles. The typical in-water foundation would require 25 piles, where-as smaller terrestrial pile-supported foundations would require fewer piles. Piles would be installed with a vibratory hammer to the extent practicable, as a means of minimizing impacts associated with underwater noise. An impact hammer would be used to drive the piles to the final tip elevation, and/or to proof the piles to verify load-bearing capacity.

  Drilled shaft-supported foundations would be supported by either 72-inch-diameter drilled shafts or 96-inch-diameter drilled shafts. The larger-diameter drilled shafts would be used on the bents that flank the navigation channel. Installation of drilled shafts would be conducted by first oscillating an outer steel casing to a specified design depth. As the casing is being advanced to the design depth, soil would be removed from inside the casing using an auger and clamshell. Excavated soils would be temporarily placed onto a barge with appropriate containment and ultimately placed at an approved upland site. Once the interior of the casing has been excavated to the design depth, an interior steel casing of the finished diameter of the shaft would be installed. This casing would be installed either with an oscillator or vibratory hammer. Once the interior casing has been installed to final depth, a steel reinforcement cage would be installed within the casing, and the shaft would be filled with concrete.

Construction of spread footing foundations below the OHWM of the river would be conducted within a temporarily dewatered work area within a cofferdam. Once the cofferdam is installed and the work area established, formwork would be installed for the spread footing, steel reinforcing would be installed within the forms, and the concrete for the footing would be poured. The cofferdam would remain in place until the concrete is fully cured to allow the concrete to cure in a dewatered environment. Once the concrete for the footing is fully cured, the formwork would be removed followed by the temporary cofferdam.

- Bridge superstructure construction: Once the foundation piles and drilled shafts are installed, a concrete pile cap would be installed atop the shafts at the waterline, and the concrete pier and superstructure would be installed atop the pile cap. Pile caps may be either precast or cast-in-place.

  The superstructure would consist of both precast and cast-in-place concrete segments. Additional finish work would also be conducted, including surfacing, paving, and installation of other finish features, such as striping and signage.

  Work on the superstructure would be conducted either from the bridge deck, from the deck of temporary work bridges, or from barges. It is anticipated that the superstructure would be constructed using a balanced cantilever method that uses paired sets of form travelers to build outwards from each pier. It is assumed that a contractor may operate up to four pairs of form travelers at a given time to expedite the construction of the superstructure.

  Many of the bridge superstructure components would be composed of precast concrete. Precast elements would likely include bridge columns, beams, girders, and deck panels. Precast bridge elements would be constructed in upland controlled environments and would be transported to the Project site by either barge or truck.

- Dismantling and removal of the existing bridge: The existing bridge would remain open until the replacement bridge is constructed and operational, at which point it would be dismantled and removed. This work would be conducted via barges and/or temporary work platforms and may require in-water isolation.

  Removal of the superstructure would most likely be conducted by barge-mounted cranes. Removal of the superstructure would likely begin with removal of the counterweights, followed by the lift towers and the individual truss sections. The lift towers and truss sections would be cut into manageable pieces and loaded onto barges or trucks by a crane. Each section would then be either transported to an upland site for further dismantling or disposed of directly at an appropriately permitted upland facility.

  Removal of the existing foundations would be conducted by one of the following two methods:

- Wiresaw removal to mudline, without a cofferdam. A diamond wire/wire saw would be used to cut the foundation into manageable pieces that would be transported to a barge and disposed of in a permitted off site upland location. The foundations would be removed to the mudline and the substrate would be naturally restored with surrounding sediments.
- Wiresaw or conventional pier removal techniques within a cofferdam. Conventional removal techniques consist of using a hydraulic ram to break the piers into rubble, and torches or other cutting methods to cut reinforcement. Materials would then be transported to a barge and disposed of in a permitted off site upland location. The foundations would be removed to the mudline and the substrate would be naturally restored with surrounding sediments.

It is assumed that the cofferdam removal option would be used at both piers that flank the navigation channel, but may also be used in other pier locations. At the two navigation channel piers, once cofferdams are installed and fish salvage has occurred, approximately 7,800 cubic yards of existing riprap would be removed. Riprap would be removed via a barge mounted clamshell, and loaded onto barges, and disposed of at an off-site permitted upland location. Once riprap has been removed, the existing piers would either be removed using one of the methods described above.

- Post-Project site restoration: Construction of the Project would result in temporary impacts to native and non-native vegetation on both the Oregon and Washington sides of the river. Areas temporarily disturbed during construction would be restored upon completion of the Project consistent with state and local regulations.

  On the Oregon side of the river, most temporary disturbance would occur within areas that are either impervious or already developed. Temporary disturbance would occur within areas that consist of landscaping, lawns, or similar heavily managed vegetation. Post-Project site restoration in these areas would likely consist of replacement landscaping with similar ornamental species. No native plant communities would be disturbed on the Oregon side of the river.

  On the Washington side of the river, vegetation would be cleared within temporary work zones to allow construction equipment to access the site, to construct the replacement bridge abutments and stormwater treatment facilities, and to remove the existing bridge. A portion of the area to be cleared would be within a forested riparian area that is within the 200-foot shoreline jurisdiction of the Columbia River, and is regulated by the City of White Salmon under its Shoreline Master Program (City of White Salmon 2016). A large oak tree that is present east of the existing bridge would be preserved and would not be affected.

  Temporarily disturbed areas within ODOT and WSDOT rights-of-way would be replanted consistent with applicable ODOT and WSDOT requirements and design standards. Temporarily disturbed vegetation within the riparian shoreline buffer on the Washington side of the river would be conducted consistent with requirements in the City of White Salmon Critical Areas Ordinance (White Salmon Municipal Code (WSMC) Chapter 18.10) and Shoreline Master Program (City of White Salmon 2016).

- Compensatory Mitigation: The Project would result in permanent impacts to wetland and aquatic habitats, and a compensatory mitigation plan would likely be required by federal, state and local regulations to offset these permanent impacts. The compensatory mitigation plan would be developed during the permitting phase of the Project. The mitigation plan would identify the amount, type, and specific locations of any proposed compensatory mitigation actions, specific impact avoidance and minimization measures to be implemented, as well as the goals, objectives, and performance standards for measuring success. Full implementation of the compensatory mitigation plan would be a condition of the applicable permits of the agencies with jurisdiction (i.e., USACE Section 404 permit, the Oregon Department of Environmental Quality [DEQ] and the Washington State Department of Ecology [Ecology] Section 401 permits, the Oregon Department of State Lands [DSL] Removal-Fill permit, WDFW Hydraulic Project Approval, and City of White Salmon Shorelines and Critical Areas permits), and the mitigation would comply fully with all applicable permit terms and conditions.

The method of delivery for Project final design and construction has not been determined at this time. Traditional delivery methods, such as design-bid-build, and alternative delivery methods, such as design-build and public-private-partnerships to name a few, will continue to be considered by the Port. As part of Oregon's HB 2017, the Port was provided legal authority by the state to enter into a public-private-partnership.

3. METHODOLOGY

Waterways and water quality were previously analyzed in the Project's Draft EIS and Water Quality Technical Report (Entranco 2003).

3.1. Area of Potential Impact

The area of potential impact (API) for the water quality analysis is shown in Exhibit 12. The API encompasses the area anticipated for direct and indirect impacts to water quality resulting from the Project. The API was selected to be 150 feet upstream and 300 feet downstream of the three build alternatives. Turbidity monitoring locations have not been determined at this time through regulatory permit review but are anticipated to be within 300 feet downstream of active in-water work locations per Washington Administrative Code 173.201A-200(1)(e). The action area defined for Endangered Species Act/Magnuson-Stevens Act consultation is larger than the water quality API to address stormwater and acoustical impacts on fish species associated with construction activities.

3.2. Regulations, Standards, and Guidelines

Federal:

- Clean Water Act (CWA) (33 U.S. Code (U.S.C.) § 1251 et seq.), specifically:
    - Section 401, CWA, 33 U.S.C. §1313
    - Section 402, CWA, 33 U.S.C. §1342
    - Section 404, CWA, 33 U.S.C. §1344
- Floodplain/Wetlands Environmental Review Requirements (10 Code of Federal Regulations 1022.12) and Federal Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands)
- Rivers and Harbors Appropriation Act:
    - Section 9 (33 U.S.C. § 401)
    - Section 14 (33 U.S.C. § 408)

Exhibit 12. Waterways and Water Quality API

Oregon:

- Water Quality Standards (Oregon Administrative Rules 341-041)
- Removal-Fill Law (Oregon Revised Statutes 196.795-990)

Washington:

- The Water Pollution Control Act (Revised Code of Washington 90.48)
- Water Quality Standards for Surface Waters of the State of Washington (Washington Administrative Code 173-201A)
- Shoreline Management Act (Revised Code of Washington 90.58)

Regulations, standards, and guidelines related to aquatic species are addressed in the Fish and Wildlife Technical Report.

3.3. Sources of Existing Data

Current water quality data was collected from the Oregon Department of Environmental Quality (DEQ) and the Washington Department of Ecology (Ecology). Current floodplain mapping was collected from the Federal Emergency Management Agency (FEMA). The Oregon Water Resources Department (OWRD) and the Ecology databases were queried to identify the location of any existing wells within the API. Oregon Department of Transportation (ODOT) provided National Pollutant Discharge Elimination System (NPDES) stormwater sampling results for roadway surfaces with similar traffic volumes as those that currently occur on the bridge.

3.4. Data Collection or Development

Project engineers provided the following data with respect to the bridge and roadway system so that the Project's impacts to waterways and water quality from the Project's proposed changes to the bridge and roadway system could be assessed:

- Existing impervious surfaces within public right-of-way
- New impervious surface as a result of the Project within public right-of-way
- Identification and demarcation of stormwater drainage basins within the API
- Existing stormwater drainage facilities and treatment methods by drainage basins
- Proposed stormwater drainage facilities and treatment methods by drainage basins
- Number of acres of new and existing bridge and roadway generating stormwater runoff (by subbasin in the Project area and for each alternative)
- Design storm event – volume of water that would go to the stormwater facilities
- Amount of upland ground disturbance during construction expressed in acres
- Amount of in-water disturbance during construction expressed in square feet and acres
- Average daily traffic

The waterways affected environment was updated using the most current water quality data with respect to the 303(d) of the CWA listing for the Columbia River, Hood River, and White Salmon River. The location of any existing wells within the API were described in the text.

3.5. Impact Analysis Techniques

3.5.1. Construction Impacts

The construction impacts section was updated based upon the methods and means for bridge foundation construction and existing bridge and pier removal, specifically focusing on in-water work area isolation techniques, if used. The amount or area of impact for in-water work was estimated for all new and existing bridge foundations. The potential for increased turbidity in the Columbia River during in-water work was qualitatively evaluated based upon best management practices for work area isolation. The potential for soil erosion from upland grading activities was addressed by referencing ODOT's and Washington State Department of Transportation's (WSDOT) latest erosion control procedures and requirements. The amount or area of disturbance for upland approach/connection roadways was quantified. Hydroacoustic impacts from pile driving and other impacts specific to aquatic species are addressed separately in the Fish and Wildlife Technical Report. Groundwater resources potentially impacted by construction were identified and strategies were developed to either avoid or replace in kind prior to construction.

3.5.2. Direct Impacts

The net change in impervious surface for both bridge deck and approach/connection roadways was quantified. An estimate of changes in pollutant loading from the new impervious surfaces (e.g., bridge deck and approach/connection roadways) was calculated. Stormwater management techniques developed as part of preliminary engineering were presented to demonstrate compliance with water quality discharge requirements for both Oregon and Washington. Snow and ice management techniques were also discussed. Direct impacts to aquatic species from the operation of the replacement bridge are included in the Fish and Wildlife Technical Report.

3.5.3. Indirect Impacts

Indirect impacts on water resources and water quality would include improved water quality as stormwater treatment would be installed where few or none currently exist by evaluating the pollutant removal efficiency of the stormwater treatment facilities. A decrease in direct pollutant discharge from leaks and spills on the replacement bridge relative to the existing bridge would be expected; however, pollutants from stormwater runoff, even after treatment, would continue to be discharged to the Columbia River. Indirect impacts to aquatic species from the construction (e.g., hydroacoustic and turbidity impacts) and operation of the replacement bridge are included in the Fish and Wildlife Technical Report.

3.6. Agency Coordination

The Project team will be confirming the area of impact for in-water work and the methods and means for in-water foundation construction and removal with NOAA Fisheries, USFWS, ODFW, and WDFW. Special focus was on work area isolation from the water column, if used, and turbidity control methods. The framework for the stormwater management plan will be presented to the natural resource agencies. Erosion control methods deployed during construction will also be presented.

4. AFFECTED ENVIRONMENT

4.1. Basins and Subbasins

The existing Hood River Bridge crosses the main stem of the Columbia River at river mile 169.8. Because the Project bisects the main channel it is within the Columbia River Basin and is not contained within a subbasin. Washington resource inventory area 29 is adjacent to the Columbia River on the northern bank. Washington resource inventory area 29 encompasses the watersheds feeding both the White Salmon River and the Wind River; though these two rivers drain to the Columbia River independently of one another. The Hood River Basin in Oregon is adjacent to the Columbia River on the southern bank.

On the west side of the bridge, the river's vegetated riparian corridor extends north approximately 450 feet from the river's shoreline to SR 14 and approximately 270 feet on its east side to the BNSF Railway tracks. On the Oregon side, the riparian corridor has been heavily modified by development including marina construction, river bank armoring, and construction of beaches and jetties and retains little or no natural habitat.

4.2. Surface Water Resources

4.2.1. Water Quality

Since the publishing of the Draft EIS, Ecology, and DEQ, through their partnership with U.S. Environmental Protection Agency (EPA) Region 10, have made efforts to improve water quality for this segment of the Columbia River. Although water quality in and around the Project area has generally improved, water quality concerns in specific segments of the surface water resources in the Project area remain and are being addressed. Per DEQ and Ecology, the Columbia River in this area is listed as not meeting current water quality standards under Section 303(d) for several characteristics; it is water quality limited for dissolved gases year-round, for dioxin, for temperature, and for pH. For the Columbia River, between the Bonneville Dam and the The Dalles Dam, U.S. EPA Region 10 has established and approved Total Maximum Daily Load (TMDL) limits for total dissolved gases and dioxin. TMDL limits for pH and temperature are being developed by U.S. EPA Region 10. Benthic substrates consist largely of silts and medium-to-coarse alluvial sands typical of this reach of the Lower Columbia River.

Ecology lists part of the White Salmon River as water quality limited for bacteria, temperature, polychlorinated biphenyls (PCBs) in tissue, and in-stream flow. The White Salmon River does not have established TMDLs limits for bacteria, PCBs, and temperature. All the exceedances of water quality standards were based upon data collected before the removal of Condit Dam in 2011 and 2012. The Condit Dam was located about 3 miles upstream from the confluence of the White Salmon River with the Columbia River. The dam's removal has drastically altered the instream flow and habitat conditions of the White Salmon River.

The Hood River is monitored for water quality by DEQ at the footbridge north of I-84. Portions of the Hood River are listed under 303(d) by DEQ for not meeting water quality standards for copper, iron, lead, thallium, and temperature (DEQ 2019). The Hood River has an established TMDL for temperature. During heavy precipitation and high flows, water quality is affected by high levels of biochemical oxygen demand, fecal coliforms, and total phosphorous. At other times, the Hood River is affected by natural glacial runoff that contributes to the sedimentation and turbidity problems; although other activities such as road building, agricultural, urban development, and timber harvest activities also contribute to sedimentation and turbidity problems. During the summer low-flow periods, moderately high temperatures, and high levels of total phosphorous, biochemical oxygen demand, and total solids have been detected. Water temperatures and flow are affected by the large amount of water withdrawn from the river for consumptive and non-consumptive uses. Flow is critically low in the East Fork Hood River and in the main stem during high irrigation withdrawals. High pesticide concentrations are likely the result of agricultural runoff in the valley. The Hood River has had two recorded chemical spills that resulted in fish kills in 1977 and 1987. Despite these water quality concerns, average Oregon Water Quality Index scores for the Hood River are good in the summer and fair during the fall, winter, and spring (Cude 2000).

4.2.2. Hydrology

The Columbia River is the main drainage pathway in the Project area. Both the White Salmon River and the Hood River enter the Columbia River downstream of the existing Hood River Bridge. Water from the Project would ultimately discharge to the Columbia River. The Columbia River basin, upstream from Hood River, covers an area of approximately 237,000 square miles. Average annual flow at this point along the river is over 192,000 cubic feet per second (cfs) (U.S. Geological Survey (USGS) gage 17070105). The Hood River drains 339 square miles with average annual flows of 1,079 cfs (USGS gage 14120000). The White Salmon River drains 386 square miles with average annual flows of 1,122 cfs (USGS gage 14123500).

Climatic conditions produce high flows during the winter when precipitation is more frequent. Low flows occur in the summer as a response to the dry, warmer weather typical of this season in the Pacific Northwest. Spring hydrology can produce extreme flow events when increasing temperatures in combination with heavy precipitation causes excessive snowmelt.

The existing Hood River Bridge spans the river over the pool created by the Bonneville Dam downstream (river mile 146). The dam controls the hydraulics of the river at this point by controlling the volume of water released downstream. The water surface elevation in the pool fluctuates in response to both the volume of water entering the pool from the river and the volume of water being released from the pool through the dam. The minimum operating pool elevation is 73.3 feet based on the National Geodetic Vertical Datum of 1988 (NGVD88) and the maximum is 85.8 feet, NGVD88. Ordinary high water mark elevation is approximately 84.2 feet NGVD88 (USACE 2017).

The U.S. Army Corps of Engineers (USACE) manages water levels, the federal navigation channel, and levees along the Columbia River. The existing bridge crosses over the navigation channel on the Columbia River, which extends 83.2 miles from Vancouver, Washington, to The Dalles, Oregon. This section includes a shallow draft navigation channel and pile dike structures that stabilize the channel. The 300-foot-wide navigation channel is authorized to be 27 feet deep, but is currently maintained to a 17-foot depth, which is considered adequate for current users (primarily tug and barge traffic). Actual water depths at the Project location are much deeper ranging from approximately 35 feet to 50 feet deep according to USACE hydrographic surveys (USACE 2020). USACE also has property rights along the shoreline in the form of restrictive easements providing for the continued operation and maintenance of the reservoir behind Bonneville Dam. Development activities within these areas must be consistent with the language of the specific agreement and/or requires review and approval by the USACE. Two levees are located in the general vicinity of the Project, but outside the API; these include a levee on the Washington side of the river located approximately 2 miles upstream from the Project near the City of Bingen and an embankment located along Hood River before it enters the Columbia River upstream from the Port's Marina.

4.2.3. Floodplain

The small floodplain that is along the Columbia River near the Hood River Bridge is designated as Zone A (approximate). Unofficial flood profile elevations and flows were obtained from the Floodplain Management Section of the Portland District U.S. Army Corps of Engineers and are estimated based on Bonneville Dam full pool elevations. The 100-year floodplain elevation at the Project site is at approximately +90.4 feet (North American Vertical Datum 1988). The river has been largely isolated from its historic floodplain, and hydrology is controlled by dams upstream and downstream of the project site.

The City of Hood River would be the regulatory review agency for work within the FEMA floodplain under Chapter 15.44 (Flood Hazards) of the City of Hood River Municipal Code. A detailed evaluation of the hydraulic impacts of the replacement bridge, including the results of Hydrologic Engineering Centers' River Analysis System (HEC-RAS) modeling, are included in the Bridge Hydraulics Technical Report.

4.3. Soils and Groundwater

The soils on the Washington side of the Project are silt loams formed in loess and materials weathered from the basalt cliffs above. These soils are moderately deep and well drained, although when wet they have a slow infiltration rate. Runoff potential is moderate. Very little fill is present on the Washington side. The soils on the Oregon side of the Project are composed of xerofluvents formed in recently deposited alluvium from Hood River outwash. These soils are generally well drained and permeable with only slight erosion hazard. Extensive fill material has been placed over top of these soils.

Groundwater elevations on the Washington side of the Project were investigated through a review of Ecology water well records within and near the API. In general, useable groundwater elevations come from deep wells terminated in basalt formations at depths greater than 400 feet below ground surface. Shallow wells terminated at depths less than 150 feet below ground surface have static water levels ranging from 22 feet to 42 feet below ground surface. Based on the local topography and proximity of surface water bodies, local groundwater flow is presumed to be to the south. However, local subsurface geologic and manmade features can affect groundwater flow; therefore, this groundwater flow interpretation is only an estimate based on surface observations. The City of White Salmon has a municipal water system that draws water from Buck Creek (surface source) and two deep groundwater wells which pump from the Grand Ronde Aquifer. The wells are located 4 miles north of the City of White Salmon, west of SR 141. The Buck Creek intake is located 8 miles up Buck Creek road off SR 141. The City of White Salmon does not use local groundwater for municipal water; however, there are individual well water users with the API. One well at the Bridge RV Park and Campground is used for irrigation purposes only.

Groundwater elevations on the Oregon side of the Project were investigated through a review of water well records within and near the API filed with the OWRD. These water well records indicate that shallow wells terminated at depths less than 30 feet below ground surface have static water levels ranging from 5 feet to 15 feet below ground surface. Based on the local topography and proximity of surface water bodies, local groundwater flow is presumed to be to the north. However, local subsurface geologic and manmade features can affect groundwater flow; therefore, this groundwater flow interpretation is only an estimate based on surface observations. The City of Hood River obtains its drinking water supply from three springs located 15 miles southwest of the city near Lost Lake and does not use local groundwater.

4.4. Land Use and Urban Development Patterns

The existing Hood River Bridge crosses the navigable waterway of the Columbia River within the Columbia River Gorge National Scenic Area. Urban development is restricted to within the city boundaries of Hood River, White Salmon, and Bingen. The current bridge, and all the proposed alternatives for replacement, touch down within these city limits. Small farms can be found in the areas surrounding the cities on both sides of the river, although most of the area contains relatively undeveloped woodlands, forest, and agricultural areas.

5. ENVIRONMENTAL CONSEQUENCES

The greatest water quality concerns during bridge construction are from increased turbidity during installation of piers and potential hazardous spills from construction equipment over the open water. The differences between alternatives described for the Project are primarily different alignments of the replacement bridge. These differences in the replacement bridge alignment are unlikely to present substantially different or unique water quality difficulties among the different build alternatives. Water quality concerns would be primarily from construction of the replacement bridge regardless of alignment, removal of the old bridge, and operation of the completed bridge. None of the impacts associated with the Project would be expected to exacerbate the water quality limitations that place this stretch of river on the 303(d) list and no substantial impacts to pH, total dissolved gas, dioxin, or water temperature are anticipated.

The displaced volume of water during construction from cofferdams, barges, and new piers would be insufficient to raise the surface of base flood elevations 1 foot or more. There would also be no substantial hydraulic impacts anticipated from construction or removal of the bridge.

5.1. No Action Alternative

5.1.1. Direct Impacts

With the No Action Alternative, there would be no construction of a replacement bridge and no removal of the existing bridge. With no construction or removal, no direct impacts are anticipated. Untreated stormwater and snowmelt from the existing bridge would continue to discharge directly to the Columbia River through the metal grated deck. The existing bridge deck is estimated to be 1.93 acres. Petroleum fuels and other hazardous materials from the regular use of vehicles and unforeseen spills on the bridge would continue to have a direct pathway to the river.

If a catastrophic event occurs such as an earthquake, landslide, or barge or vessel strike, the bridge could be damaged or collapse into the river. Direct impacts from a catastrophe could include release of hazardous materials such as lead-based paint chips from the bridge, asbestos and hydraulic fluids entering the water from bridge infrastructure, as well as the potential that all or part of the bridge superstructure could fall into the Columbia River or the bridge lift could be stuck or inoperable preventing some vessels from passing. There would be no indirect improvements to waterway function and navigation from reduction of the number of in-water piers if the existing bridge remains in place.

5.1.2. Indirect Impacts

No indirect impacts are anticipated from the No Action Alternative.

5.2. Preferred Alternative EC-2

5.2.1. Construction Impacts

The greatest impact to water quality from the bridge construction would be from installing the bridge piles and footings or accidental spills of materials or chemicals. Bridge footings are constructed directly in the river by necessity. Different construction techniques would have varying levels of impact on water quality. The two main choices in construction techniques for building the footings are a waterline footing or a cofferdam footing.

The waterline footings are constructed on piles that are set in place without a cofferdam. The piles can either be driven or drilled into the riverbed. If piles are driven, water quality is impacted where the pile meets the alluvial material of the river bottom. As the piles are driven in, sediment is disturbed and mixes into the water column around and downstream of the pile thereby increasing local turbidity. This impact would be temporary and does not linger once the pile is in place. If the piles are drilled, a steel casing contains slurry materials during installation. Water contaminated with sediment and drilling slurry would be pumped from within the casing and treated or disposed of per the applicable permits, including the Section 401 water quality certification and the NPDES permit. With drilling there is a risk of accidental spills from both pouring concrete and the use of drilling slurry. This risk is not present with driven piles; however, hydroacoustic impacts to aquatic species from pile driving would be substantially increased. Refer to the Fish and Wildlife Technical Report for additional detail on construction impacts on aquatic species.

Cofferdam footings have some water quality impact during the installation of the cofferdam itself. Local turbidity increases are generated during the placement of sheet piles and pipe piles. Turbidity increases are temporary and would diminish once the cofferdam is in place. After the cofferdam is erected and dewatered, the piles and footings are installed in a dry environment with no further water quality impacts, other than possible fuel emissions from barges and other motorized equipment in the water. Removal of the cofferdam once construction is complete would again create a limited turbidity plume that is localized and temporary.

The number of piers needed to construct the bridge influences water quality because each pier contributes some water quality impact as described above. For Alternative EC-2 it is estimated that 13 in-water piers would be required.

Concerns about pouring concrete over open water while constructing the bridge deck are reduced by using pre-cast concrete construction for the bridge superstructure. Some pouring would still be required for fixing the segments together and paving the road surface along the top of the bridge. Concrete spilled into open waters can impact local pH.

Removal of the existing bridge would have similar impacts on water quality as construction of the replacement bridge. Removing the old piers from the river would disturb the river bed sediments and create localized turbidity plumes. Two methods of removal are being considered; using cofferdams to isolate the piers to the footings and using either an underwater saw to cut the piles into sections for removal or a hydraulic ram to break the piers into rubble. Using cofferdams would have the same impacts discussed above for construction of the footings. Cutting the piles would be done directly in the water inside the cofferdam and some turbidity and suspended solids would occur from the generation of concrete sawdust. Such impacts would be temporary, only occurring during the cutting process and would settle out inside the cofferdam. The existing piles would be cut to 2 feet below the sediment surface, so some disturbance of the river bottom would be anticipated.

Additional water quality concerns during removal of the existing bridge include possible materials entering the water during dismantling of the decking. Lead paint has been used on the existing bridge and could flake into chips and enter the river as the superstructure is dismantled and removed by barge. There is also a high probability that asbestos is present in the insulation of electrical equipment used to operate the movable span. Asbestos containing equipment would need to be properly abated and dispose of prior to bridge removal so that none of it is released into the river below.

There would be the potential for accidental spills of hazardous materials during construction. Relatively small quantities of fuels (including diesel, gasoline, and propane) for various pieces of small equipment would likely be stored at a construction staging area. There would be the potential for accidental spills of these materials with a risk of polluting the waterway or ground.

5.2.2. Direct Impacts

Additional new impervious surfaces would be added to the API from the bridge deck as well as the approach areas and roadway improvements on both the Washington and Oregon sides of the replacement bridge (Exhibit 13 in Section 5.5). Stormwater, including snowmelt, that discharges to the Washington end of the bridge would meet WSDOT standards for treatment and detention, while stormwater and snowmelt that discharges to the Oregon end of the bridge would meet ODOT standards. On the Washington side, stormwater from the bridge would be handled separately from stormwater from SR 14. Rainwater from the bridge deck would be collected and treated prior to discharge into the river. Detention ponds that function as bio-infiltration ponds would remove the majority of particulates. The Project also proposes a bioswale to be constructed on the Oregon side of the river. The replacement bridge would be an improvement over the existing bridge that has no treatment system for water quality[2]. Direct impacts associated with the operation of the replacement bridge on aquatic species are addressed in the Fish and Wildlife Technical Report.

The existing bridge deck is 1.9 acres and provides no stormwater runoff control or water quality treatment. As shown in Exhibit 13 (in Section 5.5), the replacement bridge deck would have an area three times as large as the existing bridge deck and would provide full treatment of stormwater. Exhibit 14 (in Section 5.5) presents an estimate of the pollutant loading for all roadway surfaces (paved and steel grating) for both treated and untreated roadway surface areas. The Columbia River is assumed to be the receiving water body for stormwater runoff but the Project acknowledges that some of the stormwater runoff may infiltrate and reach groundwater before getting to the river. This would be especially true for the Washington side due to the higher percentage of natural ground cover adjacent to roadway surfaces. Alternative EC-2 would discharge fewer pollutants than the existing conditions (No Action Alternative). Alternative EC-2 would also represent a small improvement to floodplain and hydrodynamic function at the site as a result of the removal of approximately 5,267 cubic yards of material below the 100-year floodplain elevation.

Modifications to the Port facilities including parking and entrance roadway, breakwater, beach and delta access, boat ramps, and dolphins may be required. These types of impacts are addressed in the Parks

[2] The discussion of direct and indirect impacts is based upon the NEPA definitions, which are different than the definitions for direct and indirect effects within the Endangered Species Act.

and Recreation Technical Report. As the design is advanced, specific impacts would be quantified and either avoided or mitigated by applying mitigation measures.

5.2.3. Indirect Impacts

Removal of existing in-water piers, with a net decrease of seven in-water piers, would improve the function of the waterway and improve navigation by decreasing obstructions to river traffic. The removal and replacement of the existing grated deck would remove a direct pathway for petroleum products and other hazardous materials from directly discharging to the Columbia River from the bridge deck in the event of spills or accidents because the new deck would be solid and continuous and any spills would be directed to the stormwater treatment systems near both bridge abutments.

5.3. Alternative EC-1

5.3.1. Construction Impacts

In-water construction impacts for Alternative EC-1 would be similar to those presented for Alternative EC-2 with the exception that two less in-water piers would be required due to the shorter over-water bridge length. Impacts associated with existing bridge removal would be the same as presented for Alternative EC-2.

5.3.2. Direct Impacts

Direct impacts for Alternative EC-1 would be similar to those presented for Alternative EC-2 with the exception that Alternative EC-1 has the largest impervious surface area (Exhibit 13 in Section 5.5) and as a result has the highest estimated pollutant loading of all the build alternatives as presented in Exhibit 14 (in Section 5.5). However, Alternative EC-1 would still have less pollutant loading than the current conditions (No Action Alternative).

5.3.3. Indirect Impacts

Removal of existing in-water piers, with a net decrease of nine in-water piers, would improve the function of the waterway and improve navigation by decreasing the number obstructions to river traffic. The removal and replacement of the existing grated deck would remove a direct pathway for petroleum products and other hazardous materials from directly discharging to the Columbia River in the event of spills or accidents.

5.4. Alternative EC-3

5.4.1. Construction Impacts

In-water construction impacts for Alternative EC-3 would be the same as those presented for Alternative EC-2. Impacts associated with existing bridge removal would be the same as presented for Alternative EC-2.

5.4.2. Direct Impacts

Direct impacts for Alternative EC-3 would be similar to those presented for Alternative EC-2 with the exception that Alternative EC-3 has the smallest impervious surface area (Exhibit 13 in Section 5.5) and, as a result, has the lowest estimated pollutant loading of all the build alternatives as presented in Exhibit 14 (in Section 5.5). In addition, Alternative EC-3 would have less pollutant loading than the current conditions.

5.4.3. Indirect Impacts

Removal of existing in-water piers, with a net decrease of eight in-water piers, would improve the function of the waterway and improve navigation by decreasing the number obstructions to and river traffic. The removal and replacement of the existing grated deck would remove a direct pathway for petroleum products and other hazardous materials from directly discharging to the Columbia River in the event of spills or accidents.

5.5. Summary of Impacts by Alternative

Exhibit 13 provides a comparison of anticipated changes in impervious surfaces by alternative. Exhibit 14 provides a comparison of anticipated pollutant loading by alternative. Exhibit 15 provides a comparison of anticipated waterways and water quality impacts by alternative.

Exhibit 13. Changes in Impervious Surface Area for Each Alternative (acres)

Project Component	No Action Alternative	Preferred Alternative EC-2	Alternative EC-1	Alternative EC-3
Existing Approaches in WA	4.41	4.41	5.23	4.01
Existing Approaches in OR	11.43	11.43	11.43	11.43
Existing Bridge	1.93	0	0	0
Replacement Bridge	0	5.87	5.91	6.03
New Approaches in WA	0	1.17	1.14	1.33
New Approaches in OR	0	0.55	0.49	0.58
Retrofit for Treatment in WA	0	0.79	0.79	0.84
Total for Treatment in WA	0	4.83	4.73	5.02
Total for Treatment in OR	0	3.57	3.60	3.75
Total Untreated in WA	5.34	3.60	4.44	3.18
Total Untreated in OR	12.43	10.88	10.94	10.85
Overall Project Impervious in WA	5.34	8.43	9.17	8.20
Overall Project Impervious in OR	12.43	14.45	14.54	14.60

Exhibit 14. Pollutant Loading Estimates for Each Alternative (lbs./year)

Roadway Pollutant of Concern	No Action Alternative	Preferred Alternative EC-2	Alternative EC-1	Alternative EC-3
Total Suspended Solids Untreated	5,386.0	4,514.0	4,671.0	4,284.0
Total Suspended Solids Treated	0	254.0	252.0	263.0
Total Suspended Solids Total	5,386.0	4,768.0	4,923.0	4,511.0
Copper Untreated	1.2	1.0	1.0	0.9
Copper Treated	0	0.1	0.1	0.1
Copper Total	1.2	1.1	1.1	1.0
Zinc Untreated	7.5	6.3	6.5	6.0
Zinc Treated	0	0.7	0.7	0.7
Zinc Total	7.5	7.0	7.2	6.7

Exhibit 15. Summary of Water Quality Impacts by Alternative

Impacts	No Action Alternative	Preferred Alternative EC-2	Alternative EC-1	Alternative EC-3
Construction Impacts	• No in-water work required	• Requires in-water work • 12 new in-water piers • Potential for hazardous material spills to water or ground	• Requires in-water work • 11 new in-water piers • Potential for hazardous material spills to water or ground	• Requires in-water work • 12 new in-water piers • Potential for hazardous material spills to water or ground
Direct Impacts	• Highest pollutant loading • 17.77 acres of impervious surface	• Less pollutant loading than the No Action Alternative • 22.88 acres of impervious surface	• Less pollutant loading than the No Action Alternative • 23.71 acres of impervious surface	• Less pollutant loading than the No Action Alternative • 22.80 acres of impervious surface
Indirect Impacts	• Continued risk of spills discharging to the River	• Minimize risk of spills occurring on the bridge discharging into the Columbia River		

6. AVOIDANCE, MINIMIZATION, AND/OR MITIGATION MEASURES

6.1. Construction Impacts

The following measures would be implemented by the bridge owner to avoid, minimize, or mitigate construction impacts to waterways and water quality resources:

- A mixing zone for turbidity is authorized in Washington Administrative Code 173.20 IA-030 during and immediately after necessary in-water or shoreline construction activities that result in the disturbance of in-place sediments. The turbidity requirement for Oregon would be determined as part of the Water Quality Certification for in-water work from Oregon DEQ. Use of a turbidity mixing zone is intended for brief periods of time (such as a few hours or days) and is not an authorization to exceed the turbidity standard for the entire duration of the Project. For waters above 100 cfs flow at the time of construction, the point of compliance is 300 feet downstream of Project activities.
- To avoid fish exposure to increased pH, all in-water concrete pours would be isolated and allowed to cure for a minimum of 7 days.
- If drilled piles are used, the resulting contaminated water removed during the concrete pour would be treated to regulatory standards prior to release. Treatment commonly employs detention and treatment tanks. The associated BMPs would be set up in advance and are included in WSDOT Standard Specification Section 8-01 “Erosion Control and Water Pollution Control” and ODOT Special Provision 00290.30(a)(7) “Water Quality.” Wash-water from concrete delivery trucks, pumping equipment, and tools would also be similarly (impervious basins) contained.
- Equipment entering state waters (including barges, boats, cranes, etc.) would be maintained to prevent any visible sheen from petroleum products from appearing on the water’s surface. No

oil, fuel, or chemicals would be intentionally discharged into the Columbia River. Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc. would be checked regularly for drips or leaks; they would be maintained to prevent spills. Concentrated waste or spilled chemicals would be removed from the site and disposed of at a facility approved by Ecology, Oregon DEQ, or the appropriate county health department.

- Spills into the Columbia River, or onto land, with a potential to enter the water would be reported immediately to relevant agencies including U.S. Environmental Protection Agency, U.S. Coast Guard, Oregon Department of Environmental Quality, and Washington State Department of Ecology. Emergency spill control equipment would be on-site at all times. If a spill occurs, containment and clean-up efforts would begin immediately and be completed as soon as possible, taking precedence over normal work. Paint and solvent spills will be considered as oil spills and thus prevented from entering the Columbia River.
- Conduct pre-removal surveys for asbestos, PCBs, and lead for the existing bridge and all other structures to be removed. If necessary, proceed with removal and disposal in accordance with regulations prior to removal of the existing bridge. Prepare pollution prevention plans and hazardous materials containment plans in accordance with WSDOT Standard Specification Section 1-07.15(1) “Spill Prevention, Control and Countermeasures Plan” and ODOT Standard Specification Section 00290.20(g) “Spills and Releases” and Section 00290.30 “Pollution Control.”
- During the construction of the SR 14/bridge approach road intersections, all erosion and stormwater control measures would either meet or exceed WSDOT’s Highway Runoff Manual requirements and be used along with other required erosion management techniques established for road construction in the Temporary Erosion and Sediment Control Plan.
- Throughout the construction process, the development and implementation of a construction stormwater runoff monitoring plan would provide information on the effectiveness of mitigation measures. Monitoring would, at a minimum, consist of turbidity and suspended solids testing in outfall from stormwater collection ponds, construction de-watering settling basins, and down river just beyond mixing zones. Routine inspections of all sediment control and erosion prevention measures would be included in regular monitoring.

6.2. Long-Term Impacts

The following measures would be implemented by the bridge owner to avoid, minimize, or mitigate long-term impacts to waterways and water quality resources:

- Newly constructed stormwater management for the Project would employ BMPs at both ends of the bridge prior to discharge into the Columbia River.
- Post-construction maintenance and monitoring to document maintenance activities could be undertaken to ensure that stormwater collection systems are functioning properly and that water quality standards are being met.
- During final design, avoid or minimize impacts to the Port’s existing marina facilities.

7. PREPARERS

Individuals involved in preparing this technical report are identified in Exhibit 16.

Exhibit 16. List of Preparers

Name	Role	Education	Years of Experience
Peter Geiger	Waterways and Water Quality Technical Lead	MSc, Physics BS, Physics	31
Angela Findley	Project Manager; QC	MS, Forest Resources BA, Mathematics	25
Scott Polzin	Environmental Task Lead; QC	MCRP, Planning BS, Finance	24

8. REFERENCES

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ATTACHMENT A

Pollutant Loading Calculation Sheets

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POLLUTANT LOADING ESTIMATES

Volumetric conversion --> 1 acre-foot of water = 1.23 E6 liters

Average annual rainfall in Hood River, Oregon = 31.26 inches = 2.605 feet[1]

Pollutant runoff concentrations in stormwater for the Bridge (average daily traffic = 12,300)

Pollutant – Concentration[2]

- Total Suspended Solids – 43 mg/liter
- Total Copper – 0.0093 mg/liter
- Dissolved Copper – n/a
- Total Zinc – 0.060 mg/liter
- Dissolved Zinc – n/a

No Action Alternative

17.77 acres of existing impervious (including the existing bridge) with no engineered stormwater treatment facilities

Annual average volume of water collected: 17.77 acres x 2.605 feet = 46.29 acre-feet = 56.94 E6 liters

Annual Pollutant Loading to Columbia River

- Total Suspended Solids = 43 mg/l x 56.94 E6 liters x 1kg/1.0E6 mg = 2,448 kg x 2.2 lbs./kg = 5,386 lbs./year
- Total Copper = 0.0093 mg/l x 56.94 E6 liters x 1kg/1.0E6 mg = 0.53 kg x 2.2 lbs./kg = 1.2 lbs./year
- Total Zinc = 0.060 mg/l x 56.94 E6 liters x 1kg/1.0E6 mg = 3.42 kg x 2.2 lbs./kg = 7.5 lbs./year

Annual Pollutant Loading after Treatment = 0

Totals for No Action Alternative (Sum of No Treatment and Treatment)

- Total Suspended Solids = 5,386 lbs./year
- Total Copper = 1.2 lbs./year
- Total Zinc = 7.5 lbs./year

[1] https://www.usclimatedata.com/climate/hood-river/oregon/united-states/usor0162

[2] Taylor, S., Barrett, M., Ward, G., Leisenring, M., Venner, M., and Kilgore, R. 2014. Bridge Stormwater Runoff Analysis and Treatment Options. Washington D.C. Transportation Research Board. National Cooperative Highway Research Program Report 778.

Preferred Alternative EC-2

8.40 acres of total impervious proposed for engineered treatment (36 percent of total)

14.48 acres of total impervious proposed for no treatment (64 percent of total)

Annual average volume of water collected by total impervious surface:
22.88 acres x 2.605 feet = 60.63 acre-feet = 74.58 E6 liters

Average annual volume of water collected for engineered treatment:
0.36 x 74.58 E6 liters = 26.85 E6 liters

Average annual volume of water collected for no treatment:
0.64 x 74.58 E6 liters = 47.73 E6 liters

<u>Treatment Efficiencies for Engineered Treatment</u>[3]

- Total Suspended Solids = 90 percent
- Total Copper = 75 percent
- Total Zinc = 80 percent

<u>Annual Pollutant Loading to Columbia River: Engineered Treatment</u>

- Total Suspended Solids = 43 mg/l x (1 - 0.9) x 26.85 E6 liters x 1kg/1.0E6 mg = 115 kg x 2.2 lbs./kg = 254 lbs./year
- Total Copper = 0.0093 mg/l x (1 - 0.75) x 26.85 E6 liters x 1kg/1.0E6 mg = 0.06 kg x 2.2 lbs./kg = 0.14 lbs./year
- Total Zinc = 0.060 mg/l x (1 - 0.8) x 26.85 E6 liters x 1kg/1.0E6 mg = 0.32 kg x 2.2 lbs./kg = 0.71 lbs./year

<u>Annual Pollutant Loading to Columbia River: No Treatment</u>

- Total Suspended Solids = 43 mg/l x 47.73 E6 liters x 1kg/1.0E6 mg = 2,052 kg x 2.2 lbs./kg = 4,514 lbs./year
- Total Copper = 0.0093 mg/l x 47.73 E6 liters x 1kg/1.0E6 mg = 0.44 kg x 2.2 lbs./kg = 0.98 lbs./year
- Total Zinc = 0.060 mg/l x 47.73 E6 liters x 1kg/1.0E6 mg = 2.86 kg x 2.2 lbs./kg = 6.30 lbs./year

<u>Totals for Alternative EC-2 (Sum of Engineered and No Treatment)</u>

- Total Suspended Solids = 254 lbs./year + 4,514 lbs./year = 4,768 lbs./year
- Total Copper = 0.14 lbs./year + 0.98 lbs./year = 1.12 lbs./year
- Total Zinc = 0.71 lbs./year + 6.30 lbs./year = 7.01 lbs./year

[3] WSDOT 2009. Quantitative Procedures for Surface Water Impact Assessments

Alternative EC-1

8.33 acres of total impervious proposed for engineered treatment (35 percent of total)

15.38 acres of total impervious proposed for no treatment (65 percent of total)

Annual average volume of water collected by total impervious surface:
23.71 acres x 2.605 feet = 61.76 acre-feet = 75.97 E6 liters

Average annual volume of water collected for engineered treatment:
0.35 x 75.97 E6 liters = 26.59 E6 liters

Average annual volume of water collected for no treatment:
0.65 x 75.97 E6 liters = 49.38 E6 liters

Treatment Efficiencies for Engineered Treatment

- Total Suspended Solids = 90 percent
- Total Copper = 75 percent
- Total Zinc = 80 percent

Annual Pollutant Loading to Columbia River: Engineered Treatment

- Total Suspended Solids = 43 mg/l x (1 - 0.9) x 26.59 E6 liters x 1kg/1.0E6 mg = 114 kg x 2.2 lbs./kg = 252 lbs./year
- Total Copper = 0.0093 mg/l x (1 - 0.75) x 26.59 E6 liters x 1kg/1.0E6 mg = 0.06 kg x 2.2 lbs./kg = 0.14 lbs./year
- Total Zinc = 0.060 mg/l x (1 - 0.8) x 26.59 E6 liters x 1kg/1.0E6 mg = 0.32 kg x 2.2 lbs./kg = 0.71 lbs./year

Annual Pollutant Loading to Columbia River: No Treatment

- Total Suspended Solids = 43 mg/l x 49.38 E6 liters x 1kg/1.0E6 mg = 2,123 kg x 2.2 lbs./kg = 4,671 lbs./year
- Total Copper = 0.0093 mg/l x 49.38 E6 liters x 1kg/1.0E6 mg = 0.46 kg x 2.2 lbs./kg = 1.01 lbs./year
- Total Zinc = 0.060 mg/l x 49.38 E6 liters x 1kg/1.0E6 mg = 2.96 kg x 2.2 lbs./kg = 6.52 lbs./year

Totals for Alternative EC-1 (Sum of Engineered and No Treatment)

- Total Suspended Solids = 252 lbs./year + 4,671 lbs./year = 4,923 lbs./year
- Total Copper = 0.14 lbs./year + 1.01 lbs./year = 1.15 lbs./year
- Total Zinc = 0.71 lbs./year + 6.52 lbs./year = 7.23 lbs./year

Alternative EC-3

8.77 acres of total impervious proposed for engineered treatment (38 percent of total)

14.03 acres of total impervious proposed for no treatment (62 percent of total)

Annual average volume of water collected by total impervious surface:
22.80 acres x 2.605 feet = 59.39 acre-feet = 73.05 E6 liters

Average Annual Volume of Water Collected for Engineered Treatment:
0.38 x 73.05 E6 liters = 27.76 E6 liters

Average Annual Volume of Water Collected for No Treatment:
0.62 x 73.05 E6 liters = 45.29 E6 liters

Treatment Efficiencies for Engineered Treatment

- Total Suspended Solids = 90 percent
- Total Copper = 75 percent
- Total Zinc = 80 percent

Annual Pollutant Loading to Columbia River: Engineered Treatment

- Total Suspended Solids = 43 mg/l x (1 - 0.9) x 27.76 E6 liters x 1kg/1.0E6 mg = 119 kg x 2.2 lbs./kg = 263 lbs./year
- Total Copper = 0.0093 mg/l x (1 - 0.75) x 27.76 E6 liters x 1kg/1.0E6 mg = 0.06 kg x 2.2 lbs./kg = 0.14 lbs./year
- Total Zinc = 0.060 mg/l x (1 - 0.8) x 27.76 E6 liters x 1kg/1.0E6 mg = 0.33 kg x 2.2 lbs./kg = 0.73 lbs./year

Annual Pollutant Loading to Columbia River: No Treatment

- Total Suspended Solids = 43 mg/l x 45.29 E6 liters x 1kg/1.0E6 mg = 1,947 kg x 2.2 lbs./kg = 4,284 lbs./year
- Total Copper = 0.0093 mg/l x 45.29 E6 liters x 1kg/1.0E6 mg = 0.42 kg x 2.2 lbs./kg = 0.93 lbs./year
- Total Zinc = 0.060 mg/l x 47.73 E6 liters x 1kg/1.0E6 mg = 2.72 kg x 2.2 lbs./kg = 5.98 lbs./year

Totals for Alternative EC-3 (Sum of Engineered and No Treatment)

- Total Suspended Solids = 263 lbs./year + 4,248 lbs./year = 4,511 lbs./year
- Total Copper = 0.14 lbs./year + 0.93 lbs./year = 1.07 lbs./year
- Total Zinc = 0.73 lbs./year + 5.98 lbs./year = 6.71 lbs./year