Wallooskee-Youngs Confluence Restoration Project

Draft Environmental Assessment

December 2014

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Chapter 1
Purpose of and Need for Action

Bonneville Power Administration (BPA) needs to decide whether to fund the Wallooskee[1]-Youngs Confluence Restoration Project (project) at the confluence of the Wallooskee and Youngs rivers in Clatsop County, Oregon, five miles southeast of the Columbia River (Figure 1-1) near Astoria. The project would restore a tidal marsh in the Columbia River estuary to improve salmon and steelhead habitat. The project would restore 193 acres of tidal wetlands by modifying a levee to allow tidal influence to return to the area, creating a network of tidal channels, and reestablishing native vegetation communities. Implementing the project would also require actions to reinforce a state highway and utilities on or near the project area. Once complete, the Cowlitz Indian Tribe would provide long-term stewardship and manage the site to benefit fish and wildlife.

BPA prepared this draft environmental assessment (EA) pursuant to the National Environmental Policy Act (NEPA) (42 U.S. Code [USC] 4321 *et seq*.) and its implementing regulations, which require federal agencies to assess effects their proposed actions may have on the environment. This EA was prepared to determine if the project would be likely to significantly affect the environment and warrant preparation of an environmental impact statement or whether it is appropriate to prepare a finding of no significant impact.

This chapter describes BPA's need to take action and the purposes that BPA seeks to achieve in addressing this need. The chapter also provides project background information, identifies the entities involved in the development of this EA, and summarizes the public scoping process and comments received.

[1]For cultural reasons, the Cowlitz Indian Tribe has indicated a preference for using the spelling of "Wallooskee" rather than "Walluski" for this project. Walluski will be used for road names or other features that specifically use that spelling.

FIGURE 1-1:
Wallooskee - Youngs Confluence Restoration

0 1.5 3 Miles

8/1/2014

1.1 Need for Action

BPA needs to decide if it will fund the proposed Wallooskee-Youngs Confluence Restoration Project to restore naturally-functioning tidally-influenced floodplain habitat to benefit salmon and steelhead in the Columbia River estuary. If BPA decides to fund the proposed project, BPA could claim and document additional survival benefits for thirteen evolutionarily significant units of Columbia Basin salmon and steelhead species listed under the Endangered Species Act (ESA) (16 USC 1531 *et seq*.).

Estuaries are highly variable and complex systems and are renowned for their high production of fish and other organisms. Fish from throughout the Columbia River Basin use the Columbia River estuary for varying amounts of time during all months of the year. The estuary's diverse habitats provide food and refuge for rearing and migrating juvenile salmon and steelhead as they make their critical transition from fresh water to productive marine feeding grounds, where they grow to maturity (FCRPS 2013).

To increase the likelihood of survival for ESA-listed juvenile salmon and steelhead, more naturally-functioning tidally-influenced rearing habitat in the Columbia River estuary is needed. Lack of access to functional habitat increases competition among juvenile salmon and steelhead in the estuary and can result in greater predation on juvenile salmon and steelhead by species such as Caspian terns and other birds. Some two-thirds of the estuary's historic wetland habitat has been lost to development, but monitoring demonstrates that fish quickly make use of reopened and restored wetlands (FCRPS 2013). Reconnecting estuary habitat involves opening dikes or upgrading tide gates or culverts to allow for greater inundation of wetland sites and improved juvenile salmon and steelhead access. These reconnections also often bring a more natural water temperature regime and are the basis for restoring more natural processes within the site (2013 Comprehensive Evaluation). Reconnecting this property would provide juvenile salmon and steelhead access to additional feeding areas, export food into the larger ecosystem, provide habitat during flood events and cover to avoid predators, as well as improve water quality by restoring natural filtering processes that remove nitrogen, phosphorous, and sediment.

1.2 Purposes

In meeting the need for action, BPA seeks to achieve the following purposes:

- Comply with all applicable federal laws, regulations, and policies that guide the agency
- Support efforts to mitigate for the effects of the Federal Columbia River Power System (FCRPS) on fish and wildlife in the mainstem Columbia River and its tributaries, pursuant to the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) (16 U.S.C. § 839b(h)(10)(A)), in a manner consistent with the Northwest Power and Conservation Council's Fish and Wildlife Program.
- Secure and claim survival benefits to help fulfill BPA's commitments to implement the Reasonable and Prudent Alternative (RPA) No. 37 listed in the *2008 FCRPS Biological Opinion* (FCRPS BiOp), as amended by a *Supplemental FCRPS BiOp* in 2010 and 2014 (NMFS 2008; 2010;

2014) which direct BPA and the other FCRPS Action Agencies, which includes BPA, the U.S. Army Corps of Engineers (Corps), and the Bureau of Reclamation[2], to develop projects that improve fish habitat quality and fish survival in the Columbia River estuary.

- Minimize harm to natural or human resources, avoid jeopardy to ESA-listed species, and avoid adverse modification or destruction of designated critical habitat.

1.3 Background

1.3.1 Statutory Context

BPA is a federal power marketing agency under the US Department of Energy. BPA's operations are governed by several statutes, including the Northwest Power Act which directs BPA to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the FCRPS. To accomplish this, the Northwest Power Act requires BPA to fund fish and wildlife protection, mitigation, and enhancement actions consistent with the Northwest Power and Conservation Council's (Council) Fish and Wildlife Program. Under this program, the Council makes recommendations to BPA about which fish and wildlife projects to fund. BPA also implements its ESA obligations through the Council's Program, including funding projects to fulfill its obligations under the FCRPS BiOp.

In the Columbia River estuary, the Council's Fish and Wildlife Program includes strategies to protect, mitigate, and enhance salmon and steelhead spawning and rearing habitat. For example, the Council recommends habitat restoration work to reconnect ecosystem functions, such as removing or lowering dikes and levees that block access to habitat, and protecting or restoring off-channel habitat. BPA's program to provide survival benefits for listed salmon and steelhead species in the Columbia River estuary focuses on current and future restoration project implementation over a wide range of site characteristics and sizes throughout the Columbia River estuary. Considerations in the selection of restoration sites include proximity to the mainstem Columbia River, size of the restored tidal wetland habitats, certainty that the restoration design would provide habitat benefits, availability of the land for restoration, and other factors. Key characteristics leading to the selection of the project for consideration include availability of the land for restoration; proximity to the Columbia River; the location at the confluence of the Wallooskee and Youngs rivers which provides access to a variety of fish populations and a combination of river and tidal processes; the relatively large area of tidal wetland restoration; and the proven success of levee breaching to restore tidal processes.

1.3.2 Federal Columbia River Power System Biological Opinion

In addition to Northwest Power Act obligations, BPA, as a federal agency, also must comply with the ESA. Compliance with the ESA includes taking actions to improve Columbia River estuary habitat for salmon and steelhead as part of mitigation outlined in the FCRPS BiOp for the operations of the FCRPS. RPA No. 37 of the FCRPS BiOp stipulates that the FCRPS Action Agencies provide survival benefits for listed salmon and steelhead species in the Columbia River estuary. Survival benefits for juvenile salmon

[2] While all three federal agencies are FCRPS Action Agencies for the FCRPS BiOp, BPA and the Corps have agreed to develop the survival benefits in the Columbia River estuary.

and steelhead include increasing available rearing habitat, cover and forage opportunities, and high flow refugia habitat in the Columbia River estuary.

1.3.3 Project Review

The proposed project is part of the Cowlitz Indian Tribe Restoration Program, which was reviewed by the Council and the Independent Scientific Review Panel in November 2013 (Council 2013). The Council recommended that BPA fund the Cowlitz Indian Tribe's Program. In addition, the proposed project received a detailed review by two other groups: the Project Review Committee and the Expert Regional Technical Group.

- The Project Review Committee is a team of regional scientists, engineers, and project managers, convened by the Lower Columbia Estuary Partnership that evaluates tidal marsh restoration projects for consistency with the Council's program. The committee solicits project proposals, evaluates the project's design and feasibility, and then returns recommendations to the project sponsor and BPA.
- The Expert Regional Technical Group evaluates restoration proposals to determine the amount each project would benefit the survival of ESA-listed salmon and steelhead. This group is also made up of regional scientists specializing in restoration and tidal marsh ecology. The group provides recommendations to BPA on which projects have the greatest potential to improve the survival of salmon and steelhead. This Expert Regional Technical Group process was developed in response to RPA 37 under the FCRPS BiOp.

The review of the project by the Project Review Committee and the Expert Technical Review Group included evaluating project-specific design features, such as the size and extent of the levee modification and the configuration of the new channel network (Anne Creason letter 2014; Expert Regional Technical Group 2013). The reviews also accounted for other issues within and outside the project area that affect juvenile salmon and steelhead survival, including bird predation, adult salmon and steelhead harvest activities such as gill netting, and competition from net pen–reared salmon. Reviews by these two groups resulted in recommendations that improved the design of the project and the expected survival benefits.

1.4 Roles of Other Entities

1.4.1 U.S. Army Corps of Engineers

The project involves modifications to a levee that was federally authorized by the 1936 Flood Control Act (Public Law 74-736), and managed by Clatsop County, Oregon. Modifications to federally-authorized levees require a Corps permit under the Rivers and Harbors Act of 1899 (33 U.S.C. § 408). For this reason, BPA and the Corps established a cooperating agency agreement in June of 2013. June 10, 2014, Congress deauthorized the levee (as a federal levee) within the project area, through the passage of the Water Resources Reform and Development Act of 2014 (H.R. 3080). This congressional action and subsequent deauthorization of the levee eliminated the need for a Section 408 permit decision and Corps approval of levee modifications. Consequently, BPA and the Corps informally agreed (July 16,

2014) that the Corps no longer needed to participate as a cooperating agency in the development of this EA. A letter dated August 19, 2014 formally extinguished the Corps' cooperating agency status. The Corps still has jurisdiction over the project under Section 404 of the Clean Water Act and Section 10 of the Rivers and Harbors Act. Permitting under these statutes and the Corps' NEPA decisions would be made under Nationwide Permit 27.

1.4.2 Clatsop County Board of Commissioners

The Clatsop County Board of Commissioners manages the assets of the former Diking District Number 13, which was dissolved by the Board of Commissioners in 1974. Among the assets of the former diking district is the levee identified as Nurnberg Dike No. 34, which would be modified by the project. The restoration project area is within the "leveed area" of Dike No. 34, which is the land behind the levee that enjoys flood protection as a result of the levee. The Dike No. 34 is located on the western and southern perimeter of the Dike No. 34 leveed area. In coordination with the Cowlitz Indian Tribe, the Clatsop County Board of Commissioners submitted a letter of request for a Congressional de-authorization of the Nurnberg Dike No. 34. June 10, 2014, Congress deauthorized the levee (as a federal levee) within the project area, through the passage of the Water Resources Reform and Development Act of 2014 (H.R. 3080).

1.4.3 Cowlitz Indian Tribe

The Cowlitz Indian Tribe is sponsoring the proposed project. The Cowlitz Indian Tribe Natural Resources Department has a goal of restoring landscapes and processes that support culturally significant plants and animals throughout the Tribe's historical area of interest. The Cowlitz Indian Tribe originally identified this site in 2009 and subsequently partnered with Astoria Wetlands to draft design concepts, and began discussions with the Corps regarding the permitting process for modifying levees. The Cowlitz Indian Tribe would help with project oversight through completion and provide long-term stewardship to ensure permanent protection of the restored property.

1.4.4 Astoria Wetlands, LLC

Astoria Wetlands, LLC, a subsidiary of Falling Springs, LLC, an environmental resources company, currently owns the property. It is a cooperating partner with Cowlitz Indian Tribe in completing a final design, and would also conduct the restoration.

1.4.5 Memorandum of Agreement

Fallings Springs, LLC (also representing Astoria Wetlands), BPA, and the Cowlitz Indian Tribe entered into formal agreement to specify roles and responsibilities of each party and to establish the sequence of events by which the parties would coordinate to implement the project. Astoria Wetlands is proposing to implement the project on approximately 193 acres of its property. Upon project completion, Astoria Wetlands would convey its interest in the property to the Tribe. The Tribe would provide stewardship on the property, using funding provided by Falling Springs, and protect the property in perpetuity under a conservation easement granted in favor of the United States under the jurisdiction and control of BPA. The agreement between the parties details this order of events and contains the conservation easement, stewardship agreement, and preliminary designs. Completing the NEPA process is required before BPA will decide whether to fund Falling Springs, LLC to implement the proposed project.

1.5 Scoping, Public Involvement, and Issues

BPA and the Cowlitz Indian Tribe conducted public scoping outreach for the project to solicit comments and help determine the issues that should be addressed in this EA. On December 24, 2013, BPA sent a letter to parties potentially interested in, or affected by the project, including adjacent landowners, public interest groups, non-profits and non-governmental organizations, local governments, state and federal agencies, and tribes. The letter explained the proposal, the environmental review process, how to participate, and announced public scoping meetings. BPA posted the public letter on the proposed project website at www.bpa.gov/goto/WallooskeeYoungs.

In addition to the Cowlitz Indian Tribe, BPA identified seven federally-recognized tribes that have a potential interest in the project based on their historic or current use of land in the project area: the Cowlitz Indian Tribe, the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Siletz Reservation, the Confederated Tribes of the Umatilla Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Nez Perce Tribe of Idaho, and the Confederated Tribes of the Grand Ronde Community of Oregon. BPA provided project information to, and requested information from, the consulting tribes, including information on potential cultural resources in the project area.

In addition to the federally recognized tribes, the Clatsop-Nehalem Confederated Tribes and the Chinook Indian Nation may also have an interest in the proposed project. BPA will provide these two tribes with the draft EA and offer them an opportunity to comment.

To help solicit comments and describe the project, BPA held a public scoping meeting near Astoria, Oregon, on January 14, 2014. The scoping comment period for the project began on December 24, 2013, and closed on January 27, 2014. In addition to the public letter, BPA announced the public meeting through local newspapers and a digital newsletter.

Thirty-one people attended the scoping meeting. BPA received 19 comments during the scoping meeting and comment period. BPA considered the comments in preparing this EA. The comments can be found in their entirety on the project website at *https://www.bpa.gov/goto/WallooskeeYoungs*. Comments included the following topics:

Proposed Action

- A few comments indicated support for the Proposed Action and estuary restoration effort.
- One comment suggested that BPA look into funding alternative projects further up the Columbia River.

Project

- One comment noted the project would provide a good partnership opportunity with the Astoria High School marine biology program.
- One commenter questioned if the project was part of the Oregon Governor's office's effort to eliminate the number of commercial fishermen on the mainstem of the Columbia River.

- One comment noted that the spelling of Wallooskee was incorrect and should be Walluski.

Water Resources

- Several comments brought up concerns about the potential for the Proposed Action to affect private property and state highway Oregon Route 202 (OR 202), and questioned who would be responsible if problems arose because of the project. This included concerns about sedimentation, erosion, land designation, potential for flooding, and stormwater issues on properties located along the Wallooskee River and OR 202.

Fish and Wildlife

- One comment asked BPA take into account gill netting, net pen operations, and the abundance of wild salmon and steelhead within Youngs Bay.
- Another comment suggested that restoration of other sites, further upstream in the estuary, would be more beneficial to outmigrating smolts.
- The effect of avian predation within the proposed project area was also identified as a concern.

Land Use and Recreation

- Several comments requested public access for fishing, hunting, and recreation uses on the property, and questioned if the proposed project would affect roadside pull-offs along OR 202 or fishing holes north of the project.
- One comment requested BPA to vacate its transmission right-of-way on an adjacent property.

Air Quality, Climate Change, Noise, Hazardous Waste, and Public Health and Safety

- One commenter requested that climate change and the associated rise in sea level be -considered. -
- One commenter requested that no pesticides or herbicides be used that could affect their adjacent farm or their health.
- A comment asked for the proposed project to assess the potential for increased mosquito production.

This EA addresses the topics raised by the commenters, and BPA is releasing this draft EA for review and comment. BPA will post the draft EA on the proposed project website (http://www.bpa.gov/goto/WallooskeeYoungs). During the review period, BPA will accept comments via the website, email, phone, and letter. After considering comments received during the review period, BPA will revise the EA, if necessary, and finalize. Then BPA will make a decision on whether or not to proceed.

1.5.1 Issues Outside the Scope of This EA

The Confederated Tribes of the Grand Ronde Community of Oregon provided comments regarding the Cowlitz Indian Tribe sponsorship of the project. The comments did not raise environmental concerns addressed by NEPA, so this topic was not carried forward for analysis in this EA.

Chapter 2
Proposed Action and Alternatives

This chapter describes the Proposed Action, the No Action Alternative, and alternatives considered, but eliminated, from detailed study. This chapter also provides a comparison of how well the two alternatives meet the underlying need and project purposes, as well as the potential environmental effects of the alternatives.

2.1 Proposed Action

Under the Proposed Action, BPA would fund the Wallooskee-Youngs Confluence Restoration Project (referred to as "project" in this document). Funding the project would allow for restoring and enhancing tidal marsh processes and habitats through levee breaching and tidal channel construction, vegetation enhancement in adjacent riparian areas, and the re-introduction of native species throughout the site. The project would also include constructing improvements for BPA infrastructure currently protected by the levee, modification of the Oregon Department of Transportation's (ODOT) drainage associated with OR 202, and construction of wind-wave mitigation features for OR 202. Once complete, the Cowlitz Indian Tribe would own and maintain the property to preserve it perpetually as naturally functioning fish and wildlife habitat.

2.1.1 Project Area

The 238-acre project area encompasses the entire property owned by Astoria Wetlands, LLC, on a former dairy farm near the City of Astoria, Oregon (Figure 2-1). The project area includes the proposed restoration area (193 acres), upland conservation area (28 acres), and locations immediately adjacent to the project area included for analysis purposes (17 acres). BPA holds a conservation easement for 221 acres, which overlays the restoration and upland conservation areas. The remainder of the project area (17 acres) was included because it is close to the restoration area and consists of open water along the Youngs and Wallooskee rivers, the OR 202 right-of-way in the area of the infrastructure improvements, and an adjacent 0.5-acre parcel west of OR 202.

The 193-acre restoration area is predominantly a pasture grass-dominated levee-protected floodplain at the confluence of the Wallooskee and Youngs rivers, on the north side of the Wallooskee River. The restoration area is generally flat, with ditches and swales in many areas, and gradually transitions to a slope in the southeast corner. The elevation ranges approximately 2 to 75 feet NAVD88[3], with higher elevations occurring in the southeast on the top of an upland knoll. A levee, located on the waterward side of the levee-protected floodplain, ranges in elevation from 10 to 12 feet. The approximate range in elevation of the levee-protected floodplain is 4.5 feet to 8.5 feet. The tidal restoration area includes a freshwater wetland dominated by pasture grasses (163

[3] All elevations in this document are in the vertical datum NAVD88 unless otherwise stated.

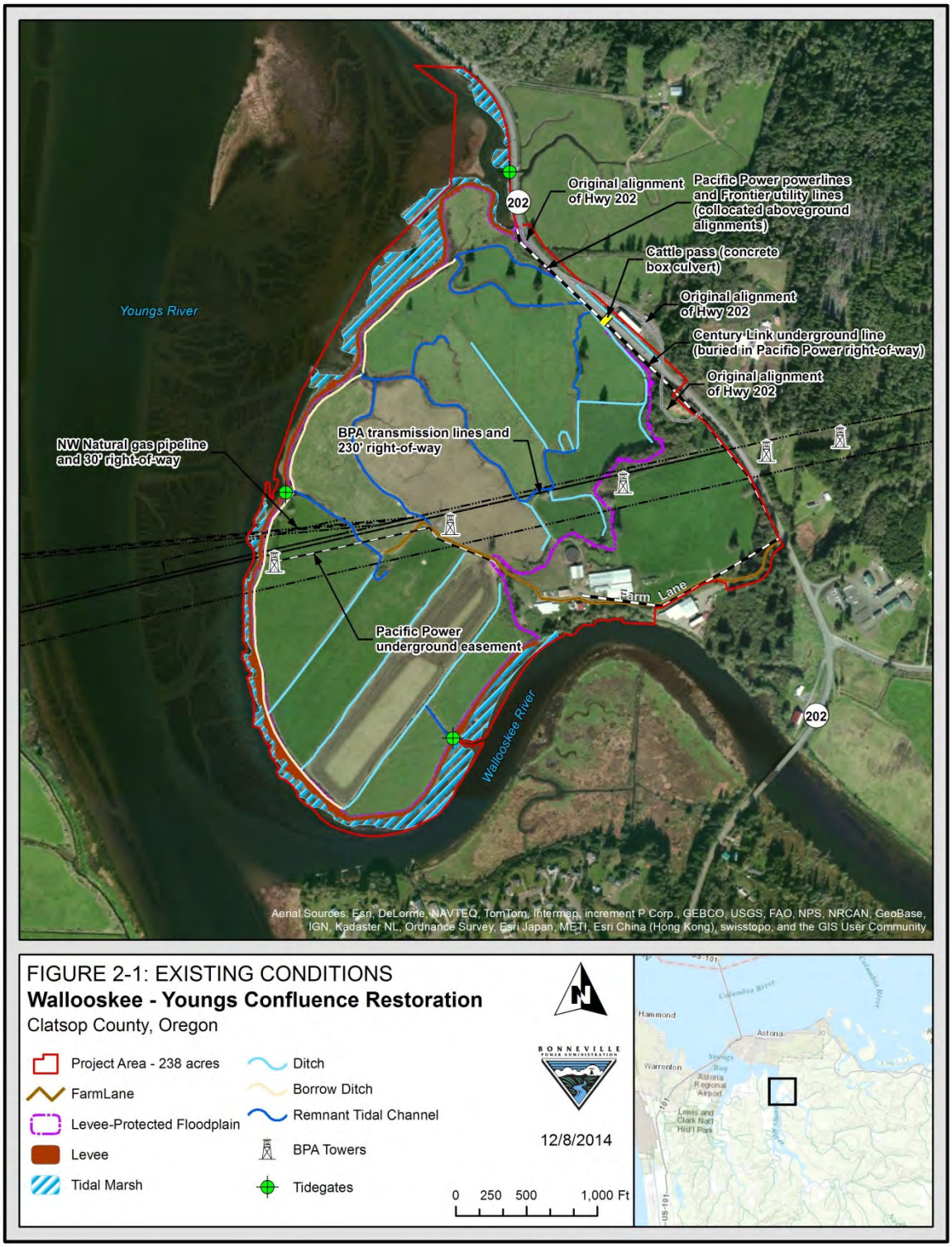
acres), the levee (6 acres), a tidal wetland dominated by native tidal species on the waterward side of the levee (14 acres), and riparian buffer area landward of the levee-protected floodplain that contains a mix of pasture and weedy upland areas (10 acres).

The project area is in Hydrogeomorphic Reach A (a "reach" is a river segment) of the Columbia River estuary within the US Environmental Protection Agency Level IV Coastal Lowland ecoregion (Simenstad et al. 2011). Reach A has the most extensive mixing of estuarine and marine waters at the estuary entrance and within the surrounding bays and tributaries. This reach features dynamic environmental conditions with factors such as salinity, velocity, and turbidity fluctuating dramatically. Reach A is also subject to storm surges, fluvial flooding, and extreme coastal disturbances, such as earthquakes and tsunamis, and continually experiences coastal uplift due to coastal tectonics (Simenstad et al. 2011). The restoration area would be the primary location where restoration and stewardship actions would take place.

The 28-acre upland conservation area contains an existing house, barn, outbuildings, utilities, and access road from OR 202, and is a highly disturbed area with infrastructure, pasture, and forested components. Limited construction activities would occur in this area, including the staging of equipment, site access, selected invasive species control, and deposition of overburden material. This area would be included in long-term stewardship and future actions are likely to include invasive species control, seeding and planting, and other site stewardship that would maintain the area in a natural state and protect its habitat values. Removing buildings is not part of the restoration project since the buildings are in uplands outside of the restoration area. Building removal is likely to occur in the future, however, under site stewardship management actions.

Conservation easement restrictions limit the future use of the property to maintain the conservation values for fish and wildlife. Specifically, the conservation easement prohibits residential, commercial, and industrial use of the property; construction of new buildings; structures, roads, or utilities; mining; changes to topography, watercourses, or wetlands; removal of native vegetation; or subdivision of the property. Modifications to topography, wetlands, and waters associated with a permitted restoration project are allowed, as are stewardship actions—such as invasive weed control—necessary to maintain the conservation values of the property.

The remainder of the project area (17 acres) includes areas of open water along the Youngs and Wallooskee rivers, the OR 202 right-of-way in the area of the infrastructure improvements, and an adjacent 0.5-acre parcel west of OR 202. Actions within these areas would be limited to infrastructure improvements associated with OR 202. No work would be conducted on the privately owned parcel west of OR 202. Work within waters would be limited to permitted activities associated with the restoration such as the pilot channel creation. The conservation easement does not cover the OR 202 right-of-way or the privately owned parcel west of OR 202 and stewardship actions would not occur within these areas.


Original alignment of Hwy 202
Pacific Power powerlines and Frontier utility lines (collocated aboveground alignments)
Cattle pass (concrete box culvert)
Original alignment of Hwy 202
Century Link underground line (buried in Pacific Power right-of-way)
Original alignment of Hwy 202
Youngs River
NW Natural gas pipeline and 30' right-of-way
BPA transmission lines and 230' right-of-way
Farm Lane
Pacific Power underground easement
Wallooskee River
202
202
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-1: EXISTING CONDITIONS
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
FarmLane
Levee-Protected Floodplain
Levee
Tidal Marsh
Ditch
Borrow Ditch
Remnant Tidal Channel
BPA Towers
Tidegates
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
Astoria Regional Airport
Lewis and Clark Nat'l Hist'l Park
US-101

Infrastructure within the project area includes the following:

- Several abandoned buildings
- BPA transmission towers and an associated transmission line bisecting the property
- A buried NW Natural gas pipeline
- A buried Pacific Power utility line which supplies power to an aircraft light on the BPA transmission tower adjacent to the river
- Farm Lane (the project area access)
- A segment of the OR 202 right-of-way
- A segment of the original (now abandoned) alignment of OR 202
- An overhead Pacific Power line along OR 202 and Farm Lane
- An overhead Frontier cable line along OR 202
- A buried Century Link communication line within the OR 202 right-of-way
- A concrete cattle pass under OR 202 and within the right-of-way
- The levee
- Three tide gates that drain the levee-protected floodplain areas through the levee.

Narrative below further describes the infrastructure within the project area:

Levees: The majority of the wetlands within the project area are protected by levees within the defunct Wallooskee River Diking District 13. The levee targeted for breaching is the Nurnberg Dike No. 34 located southwest of OR 202.[4] Construction of the earthen Nurnberg Dike No. 34 began in 1871 during the initial conversion to levee-protected floodplain. As described in Section 1.4.2, Clatsop County assumed control of the levee in 1974. The current deficient condition of the levee is most apparent in the inconsistent lineal crest elevation, with only 5 percent of the levee at or above 12.7 feet. The most recent Flood Insurance Study shows the project area would be inundated during the 100-year base flood: a flood event that has a 1 percent chance in any given year or a probability of occurring once every 100 years, due to the poor condition of the levee (FEMA 2010).

Tide Gates: Three tide gates are within the project area. One, which was replaced in the late 1990's, drains to the Wallooskee River at the south end of the project area. One drains to the Youngs River at the west end of the project area. The tide gates are located on remnant tidal channels, tidal channels which no longer have water flow from the river, and function to conduct water from the ditches and regulate tidal inundation of the project area. A third tide gate is within a levee not associated with the proposed project, along the northern edge of the project area and connects the Crosel Creek drainage to the Youngs River.

Ditches/Tiles: To drain the levee-protected floodplain southwest of OR 202, ditches were excavated in the 1950's and tiles installed between 1982 and 1987. Ditches within the project area south of OR 202 total 14,225 feet (2.69 miles) and divide the area into several fields. Tiles drain into the ditches or into remnant tidal channels, which discharge through the tide gates and into the adjacent

[4] The levee discussed in this document is the levee within the project area, unless otherwise noted.

waterways. This drainage system removes excess water from the soil to maintain suitable pasture land.

Utilities: Utilities in the project area include BPA transmission lines, NW Natural gas pipelines, Pacific Power distribution lines, a Frontier cable line, and a Century Link communication line.

The Allston-Clatsop No 1 BPA transmission line bisects the site, running east-northeast, with three associated transmission towers located within the project area. Two towers are in the levee-protected floodplain portion of the project area, one is in the upland portion. BPA built the towers and transmission lines in the 1980's. BPA holds a 230-foot wide perpetual easement to access, maintain, and repair the towers and lines. An unimproved, lightly graveled dirt road provides access to the eastern transmission tower in the floodplain, and overland access through pasture provides access to the second tower in the floodplain near the Youngs River. A 100-foot wide danger tree removal easement also exists where the lines cross into the upland knoll.

Two NW Natural 30-foot wide easements are in or near the BPA right-of-way. NW Natural installed an underground gas pipeline in the 1960's. It runs along the northern portion of the BPA right-of-way, and in 2009, NW Natural installed a new 8-inch pipeline just north of the original line The newer gas pipeline ties in to the original gas pipeline approximately 1,000 feet inside the western site boundary, and diverges north of the original easement. NW Natural holds a 30-foot wide perpetual access and maintenance easement for both pipelines and a 100-foot wide construction easement in-between the pipelines.

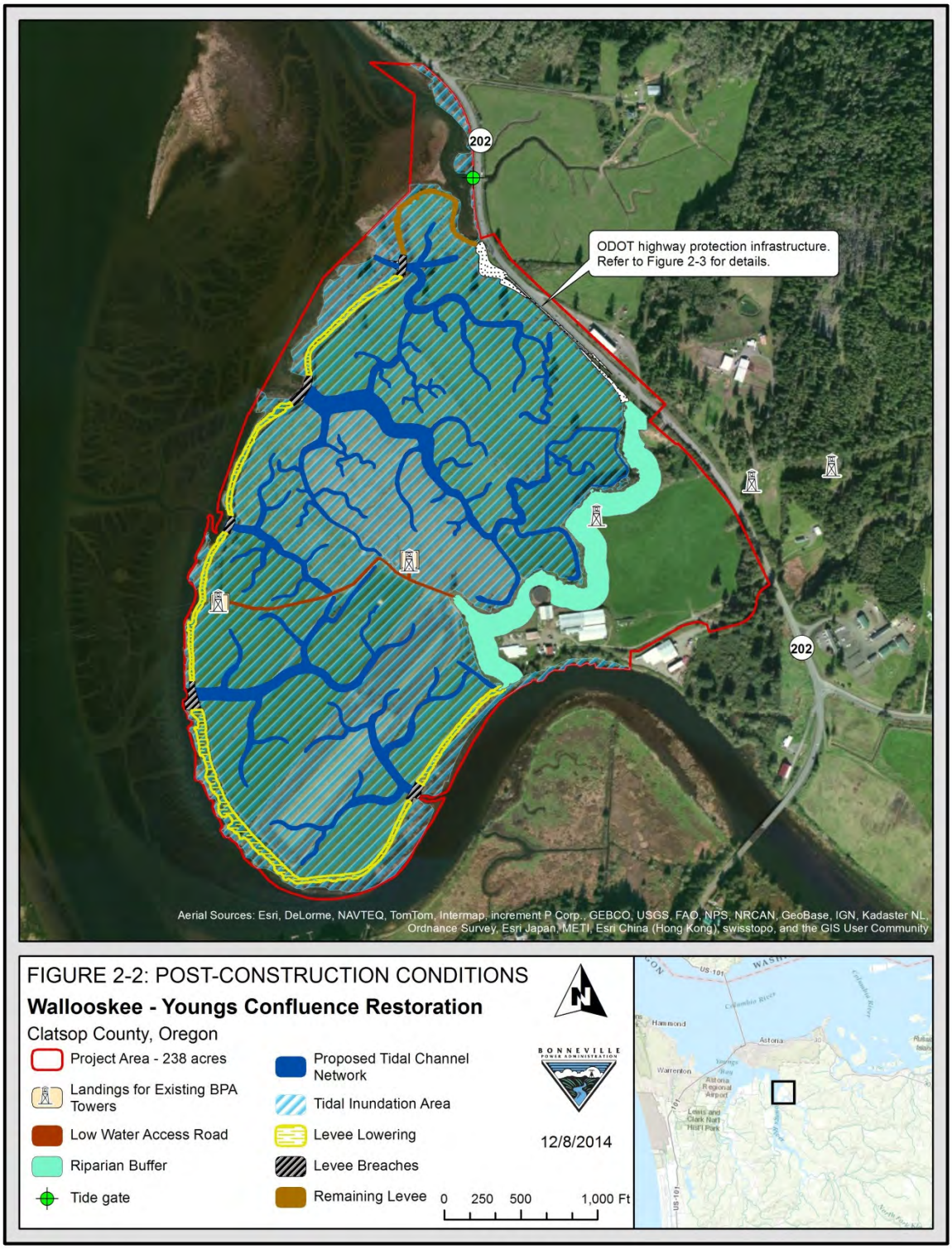
A Pacific Power underground distribution line, used to power aircraft lighting on the BPA transmission tower, is within the BPA right-of-way, beginning at the southwestern transmission tower and running along the BPA easement and access road to the above-ground power line located on the knoll. Above-ground Pacific Power distribution lines run along the southern side of OR 202 and along Farm Lane within the project area. Pacific Power holds an access and maintenance easement for these distribution lines.

Underground Century Link conduit and communication lines are within the OR 202 right-of-way. In addition, a Frontier cable line is co-located with the Pacific Power distribution lines along OR 202.

Highways/Roads: The project area includes a segment of the state highway OR 202 and segments of the former highway alignment built around 1935.

2.1.2 Project Elements

The project would restore tidal marsh wetlands and provide salmon and steelhead habitat, while protecting infrastructure to support the restoration elements (Figure 2-2) and long-term stewardship. The narrative below describes the project elements and the construction actions required to complete the project and stewardship actions to maintain the project.


202
ODOT highway protection infrastructure. Refer to Figure 2-3 for details.
202
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-2: POST-CONSTRUCTION CONDITIONS
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
Landings for Existing BPA Towers
Low Water Access Road
Riparian Buffer
Tide gate
Proposed Tidal Channel Network
Tidal Inundation Area
Levee Lowering
Levee Breaches
Remaining Levee
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
US-101

2.1.2.1 Infrastructure Protection Elements

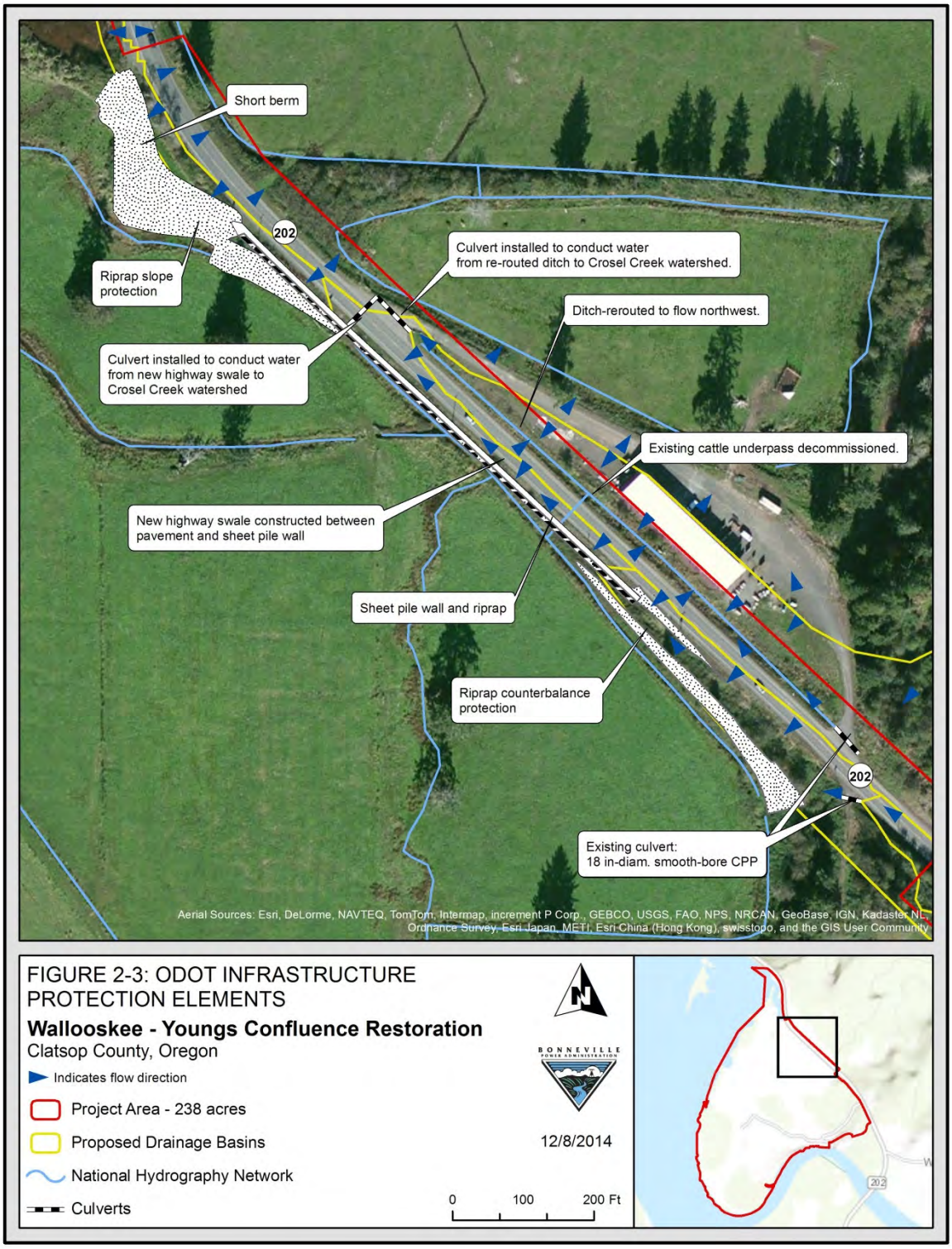
The infrastructure protection elements would protect infrastructure within and near the project area, while supporting and minimizing effects to the restoration project elements. The project would include the following infrastructure protection elements:

ODOT Infrastructure Protection

A sheet pile wall and a short section of earthen berm would protect ODOT infrastructure from wind-derived wave energy and surface water (Figure 2-2 and detailed in Figure 2-3). Additionally, riprap (0.5 to 2-foot diameter rock) would be placed along the ODOT infrastructure protection elements to protect against erosion from waves. The sheet pile wall would be approximately 10 feet tall on the waterward side and extend a maximum of 5 feet above the road grade of OR 202 with a guardrail on the interior. The sheet pile wall extent approximately 500 feet, at an elevation of 4-5 feet above the road surface and gradually degreases in height as the road climbs up the knoll.

The project would also require re-routing a roadside ditch that receives runoff from OR 202 and upland areas. The ditch routes runoff along the landward (north) side of the highway and under the highway via a cattle pass into the ditch network within the project area (Figure 2-3). The concrete cattle pass would be sealed to prevent tidal waters from extending under OR 202 and beyond. The cattle pass would be sealed at both ends with plugs of poured concrete or soil—a hole would be cut into the top of the cattle pass and concrete slurry would be poured from above to fill it. As it is within the ODOT right-of-way, ODOT has agreed to this approach. To facilitate drainage of the highway and upland areas, the ditch would be re-routed to flow towards the northwest and remain landward of the highway. Two new culverts would be installed under roadways to manage stormwater from OR 202 (See Figure 2-3.).

ODOT has approved (Tardif pers. comm. 2014) this design approach and would issue a use permit when design approval is complete. If required by ODOT, a long-term maintenance easement would be established or adjustments to the right-of-way designation would occur to assure long-term maintenance of the ODOT infrastructure protection elements.


Short berm
202
Riprap slope protection
Culvert installed to conduct water from re-routed ditch to Crosel Creek watershed.
Ditch-rerouted to flow northwest.
Culvert installed to conduct water from new highway swale to Crosel Creek watershed
Existing cattle underpass decommissioned.
New highway swale constructed between pavement and sheet pile wall
Sheet pile wall and riprap
Riprap counterbalance protection
202
Existing culvert: 18 in-diam. smooth-bore CPP
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-3: ODOT INFRASTRUCTURE PROTECTION ELEMENTS
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Indicates flow direction
Project Area - 238 acres
Proposed Drainage Basins
National Hydrography Network
Culverts
12/8/2014
0
100
200 Ft

BPA Infrastructure Protection

To protect BPA infrastructure, raised landings (access pads) would be built to encase, the two tower footings currently protected by the levee, to establish safe work surfaces above 10 feet (Figure 2-2). The two landings combined would be made of approximately 2,270 cubic yards of soil and surfaced with 400 cubic yards of 6-inch minus aggregate. In addition, 685 cubic yards of riprap would be placed on the landings to protect against erosion, with 730 cubic yards of imported soil added to the side slopes to fill riprap voids. Side slopes would be seeded with native grass seed mix. The transmission towers would not be modified.

The project would also include construction of a low-water access road that can withstand tidal inundation, which would to provide access to the pads during low tides. The road would be 14-feet wide and 12 to 18 inches above the floodplain, with elevations ranging from 6.8 to 8.5 feet. The road would be built by excavating approximately 2,360 cubic yards of floodplain soils, which would be used as fill in two locations: on existing highway fill behind the ODOT earthen protection berm and in existing drainage ditches near the ODOT sheet pile wall. The road would be built by placing approximately 3,050 cubic yards of 12-inch (or smaller) aggregate, and 500 cubic yards of 2 .5-inch (or smaller) surface aggregate to create a level road bed. This bed would be surfaced with 1,615 linear feet of concrete blocks held together by steel cables. The low-water access road would be built along a topographic divide between the channel network to minimize effects on site hydrology and tidal channel evolution. The low-water access road would not include any culverts or other structures to convey water. Power would be supplied to an aircraft light on the tower next to the river via a 3-inch Pacific Power conduit that would be buried approximately 3 feet below the road grade.

Construction of the BPA transmission infrastructure would occur in the levee-protected floodplain before levees are breached.

Pacific Power, Frontier, and Century Link Infrastructure Protection

The Pacific Power underground distribution line, used to power aircraft lighting on the BPA transmission tower, is within the BPA right-of-way and would be rerouted to be co-located under the BPA access road as described above (Figure 2-2).

The above-ground Pacific Power and Frontier overhead utility lines and poles along OR 202 may be relocated or upgraded to allow for construction of the highway protection measures and protect the utilities. If necessary, the project would also move or reinforce the Century Link conduit and communication line buried within the OR 202 right-of-way.

NW Natural Infrastructure Protection

The project would not excavate below 4-feet underground within the NW Natural easement, thereby avoiding effects to the NW Natural infrastructure NW Natural has reviewed project plans and provided approval for the work in the right-of-way (Girard pers. comm. 2013).

2.1.2.2 Restoration Elements

The project includes restoration elements that would restore estuary processes and functions to the site and enhance salmon and steelhead habitat. Restoration would include channel creation, channel modification, and levee breaching. Placement of soil in areas that have subsided would help create topographic diversity. Restoration elements are detailed below.

Channel Excavation and Grading

Channel work would include excavation in the levee-protected floodplain to restore the network of historical tidal channels previously modified through grading, drainage tiles, linear ditch networks. Ground disturbance within the levee-protected floodplain is expected to encompass approximately 52 acres of access routes and soil deposition areas, an additional 16 acres associated with the creation or modification of tidal channel networks, and an additional 6 acres of disturbance associated with levee lowering and breaching. The 52 acres of levee-protected floodplain areas affected by grading, excavation, and deposition would be seeded with native grass species as they are brought to final grade. The tidal channel areas and portions of the levee that are lowered would not be revegetated as the tidal channels would be frequently inundated, making active planting difficult, and the remaining levee is intended to erode over time. New channel segments would be excavated and existing channels would be modified via excavation to restore historic widths and sinuosity.

The channel network would consist of one primary channel associated with each breach and secondary and tertiary channels branching off each primary channel. The primary channels would be flat, and secondary and tertiary channels would slightly slope along the entire channel length. Giving the upper reaches of the channels, a slight slope would ensure positive drainage so that there would be no isolated ponded areas where fish might become stranded as tide waters recede or areas where populations of mosquitoes might pool and breed. The channel slope would also make construction easier by draining groundwater from the channels.

Construction of the channel network would require the excavation of about 47,228 cubic yards of soil. An earthen plug would be left in place at the downslope end of all new channel excavation segments so that excavated areas would not be connected via surface water to any channel that may have fish. Therefore, no fish rescue would be needed during the construction of new channel segments. Localized dewatering may be used if groundwater impedes construction. Construction would be within wetlands and may occur during wet months.

Modification of existing channels would include widening of relic channels to historic configurations, connecting to the newly constructed channel segments by removing the earthen plug, and filling drainage ditches as described in following sections. Modification of channels would require diversion/dewatering and fish salvage. Existing channels to be modified would be disconnected from the borrow ditch with an earthen plug until excavation is complete to limit fish access into construction areas. All channel segment plugs would be removed from downstream to upstream after excavation is complete. Earthen plugs adjacent to the borrow ditch would be removed last, after all other plugs have been removed and the channel is ready for fish.

All material removed in the excavation of channel segments and channel modification would be placed next to the borrow ditch and eventually used to fill the borrow ditch, to fill linear ditches, and to create topographic diversity via placement of soil in areas that have subsided. The project would have a balanced cut and fill and all of the soil that is excavated would be used in the floodplain for fill activities.

Levee Breaches, Excavation, and Grubbing

All levee modification work would be conducted with excavators situated on the levee (uplands), but some excavation and lowering activities would occur at or below wetland elevations. Specifically, the levee would be excavated down to elevation 8.5 feet (mean higher high water[5]) in all areas of the levee, with the exception of the northernmost area of the project. The levee would not be lowered in the northern most portion of the site, at ODOT's request, because the levee attenuates some wave energy that could affect OR 202 outside the project area.

Excavation to elevation 8.5 feet would provide the following benefits:

- Enhance the connection between the restoration area and Waallooskee and Youngs rivers
- Restore hydrologic processes during high tide events
- Enhance erosional processes to allow for expansion of the breach openings
- Increase the possibility of spontaneous breaches within the remaining excavated levee which would further enhance tidal connectivity
- Maximize sediment delivery during high flow events.

In addition, invasive vegetation in the excavated areas would be removed, which would increase tidal interactions during high tide events, and further weakening the levee.

The levee would be breached in five locations. Each breach would have a main breach opening, with benches at the floodplain elevation on either side, before sloping to meet the top of levee elevation (8.5 feet in areas next to the breaches following restoration activities). Both of the site's tide gates are located at proposed breach locations and would be removed during the levee breaching. The Crosel Creek tide gate under OR 202 would not be modified.

Portions of the outside of the levee along the Youngs River are currently armored with riprap. According to the former landowner, riprap was placed along locations where the levee was eroding. In addition to the breaches and excavation of the levee, riprap would be removed to help accelerate erosion. This riprap would be placed in the bottom of the borrow ditch, next to the levee, along with invasive vegetation removed from the levee. This material would be buried with soil generated from tidal channel excavation and soil removed to lower the levee.

[5] Mean higher high water (estimated to be at elevation 8.5 feet at this site) is the average of the higher daily high tide.

Levee modifications would include excavation of approximately 7,783 cubic yards of levee material for breaching and 11,387 cubic yards of soil for invasive vegetation grubbing and levee lowering. As part of the project, Clatsop County would quitclaim its right to maintain the levee in favor of the United States.

Ditch Filling and Drainage Tiles

Soil removed during channel excavation and grading (about 11,132 cubic yards) would be used to fill the network of drainage ditches. The ditches would be filled to floodplain elevations after dewatering and after fish salvage (if needed). These areas would be seeded with native grass seed after final grade is reached.

As described above, riprap, along the levee, would be removed and placed in the bottom of the borrow ditch as part of the fill material. Vegetation grubbed from the levee would be chipped, and also placed in the bottom of the borrow ditch. Excess channel excavation material temporarily stored next to the borrow ditches would be placed on top of the vegetation and riprap. Material removed from the levee during breaching and excavation would also be placed within the borrow ditches to fill the channel to the floodplain elevation. Filling the borrow ditches would require placing about 19,685 cubic yards of soil from channel excavation, in addition to soil, vegetation, and riprap from levee lowering.

There are drainage tiles south of the BPA transmission easement, where the linear ditch network is. The tiles drain to the ditch network, which routes surface drainage to tide gates. Exact locations of all tiles are not known, but proposed work to fill ditches and establish the tidal channel network would intercept the entire ditch network sufficient to disable tile functions. Upon encountering the drainage tiles during construction, workers would remove the soil above each tile, fold the tiled backwards, and crimp the ends of the tile to disable it. The crimped tile section would then be buried and the old tile channel backfilled to abandon the tile in place.

Pilot Channel Through Tidal Marsh

One pilot channel is proposed outside of the levee at the northernmost breach area to establish tidal channel connectivity through the vegetated tidal marsh. The marsh elevation is higher than the restored channel network behind the levee. The pilot channel would be dug to the edge of vegetation to ensure that full tidal interaction occurs at this breach location. The pilot channel would require excavation of approximately 478 cubic yards of intertidal floodplain soils and would be constructed prior to the last (northernmost) levee breach. Excavated soils would be deposited behind the levee, on top of the filled borrow ditch.

Large Wood Retention

Existing buried wood, downed wood, and living trees would be retained within the project area to provide habitat benefits. The downed wood and living trees are in locations where wood would naturally collect due to prevailing wind and wave direction. Leaving trees and wood in place would promote recruitment of additional woody debris by providing roughness. Buried wood would be removed when encountered if practical and incorporated as habitat structures.

Invasive Species Control

The project would remove and manage invasive vegetation and help native plants establish throughout the project area. Historically, the floodplain, levee, and upland were grazed and the current vegetation cover is dominated by non-native species. Allowing native plants to recolonize through tidal inundation, controlling invasive species, active re-vegetation of riparian areas, and ongoing stewardship would promote native plant communities throughout the site.

During construction, invasive species would be controlled through mechanical removal along the levee and with herbicide in the tidal marsh waterward of the levee. Non-native and invasive species within the levee-protected floodplain would be controlled upon project competition through exposure to tidal conditions. Invasive species in the riparian buffer would also be mechanically removed or treated with herbicides during construction. Removing vegetation along the levee and exposing the remaining levee area to tidal exchange would help reduce re-colonization of invasive species along the remnant levee sections.

Only herbicide products labeled for use in or near waters would be used for control of invasive species in wetlands and riparian areas. Pursuant to the requirements of Section 7(c) of the ESA, BPA is preparing a biological assessment to submit to National Marine Fisheries Service (NMFS) that includes restrictions on herbicide application methods and appropriate conservation measures to assure protection of ESA-listed fish species. All herbicide applications would be conducted in accordance with the biological assessment requirements and application methods would eliminate drift to neighboring properties. Herbicide treatment that may be used during the long-term stewardship would be described in the management plan that the Cowlitz Indian Tribe would develop upon completion of the restoration as described in Section 2.1.2.3.

Native Vegetation Establishment

Soil disturbed during construction in the levee-protected floodplain would be seeded to reestablish vegetation. After the levee is breached, seeded vegetation and undisturbed areas of pasture grass would likely not persist because of increased water depths and salinities. Vegetation within these areas would be allowed to recolonize on its own. Vegetation would begin to transition from a pasture grass community to an emergent marsh community within one year after the levee is breached (Thom et al. 2012). It will, however, take several years for the vegetation community to develop fully as conditions become more favorable to intertidal vegetation species (Refer to Figure 2-4).

Allowing native plants to colonize on their own is the preferred method for rehabilitating vegetation communities in intertidal marshes. That is because of the cost, maintenance, and high mortality of nursery stock and seed installed under tidal conditions. In addition, there is abundant vegetation nearby that would be “recruited” into the marsh to promote colonization.

The photographs below, taken on March 7, 2013 on a reference site near the project area, show a previously levee-protected floodplain pasture site that naturally breached in 2011 and is reverting to tidal marsh.

Photograph 1. View of levee breach and native plant colonization three years after levee breach. -

Photograph 2. View into the levee-protected floodplain showing channel formation and native plant colonization.

This reference site is on the south side of the Wallooskee River, across from the project site. Like the project site, it has a broad, flat marsh plain with ground surface elevations ranging from 3 to 8 feet. The photograph shows the formation of tidal channels and the colonization of the tidally-restored marsh plain by common rush and other emergent wetland vegetation. Pasture grasses, including creeping bentgrass (*Agrostis stolonifera*) and Kentucky bluegrass (*Poa pratensis*) continue to grow on

hummocks scattered throughout the site, but the majority of the site is developing into native tidal marsh vegetation.

Based on monitoring data collected from numerous restoration and reference sites within the Columbia River estuary, ground surface elevations of approximately 4 to 8.5 feet are expected to support a variety of native marsh vegetation species, including areas of shrub and tree establishment (Diefenderfer et al 2013; Borde et al 2010). These elevations coincide with the restoration area. Table 2.1 shows common vegetation expected to colonize the area and the elevation ranges associated with them. The species list also includes those in the tidal marsh riverward of the levee. Due to the low elevation and broad, flat character of the project site, it is expected that reed canarygrass (*Phalaris arundinacea*, which is currently on the site) would unlikely become widely established (Diefenderer et al 2013). Other invasive vegetation, such as yellow flag iris (*Iris pseudacorus*), common reedgrass (*Phragmites australis*), and purple loosestrife (*Lythrum salicaria*) are within the tidal marsh waterward of the levee in low quantities. These would be controlled during construction, and are not expected to drastically increase in abundance. Stewardship would include invasive species control if invasive vegetation threatens the development of native marsh communities.

Table 2-1. Plant Species Expected to Colonize the Tidal Restoration Area

Common Name	Scientific Name	Min. Elevation	Max. Elevation
Lyngbye's sedge	*Carex lyngbyei*	3.2	8.5
tufted hairgrass	*Deschampsia cespitosa*	5.0	7.1
creeping spikerush	*Eleocharis palustris*	5.0	7.5
bulrush spp	*Schoenoplectus spp.*	5.9	8.0
cattail	*Typha species*	6.8	8.4
water parsley	*Oenanthe sarmentosa*	7.3	8.8
soft rush	*Juncus effusus*	7.3	7.3
silverweed cinquefoil	*Potentilla anserina*	8.2	8.9
Sitka/Hooker's willow	*Salix sitchensis/S. hookeriana*	8.3	8.3
twinberry	*Lonicera involucrata*	8.3	8.3
Sitka spruce	*Picea sitchensis*	8.9	13.5

Early successional species would start to colonize the site within 1 year. This assumption is based on observations references sites, including aerial photos of the unplanned levee breach (with similar elevations) directly across the Wallooksee River. The elevations are greater than 3 feet, and thus should be suitable to support marsh species (Batelle Marine Sciences Laboratory 2011). As soil deposition (accretion) continues, the site would continue to develop for several years as natural site succession progresses (Figure 2-4).

As sediment accumulates within the project site, the higher marsh plain elevations would favor the establishment and spread of woody vegetation. Woody vegetation communities including willows (*Salix species*), spiraea (*Spiraea douglasii*), Nootka rose (*Rosa nutkana*), twin berry (*Lonicera involucrata*), and red-osier dogwood (*Cornus sericea)* are projected to establish within 21-30 years; and a climax forested swamp community including Sitka spruce, Pacific crabapple (*Malus fusca*), cascara (*Frangula purshiana*), and lady fern (*Athyrium filix-femina*) would likely establish in 30.

As mentioned above, prior to levee breaching, the levee-protected floodplain would be seeded as elevations are brought to grade. Construction-related soil disturbance areas in the levee-protected floodplain (163 acres) would be seeded with the following native grasses.

Floodplain Seed Mix

- Meadow barley (*Hordeum brachyantherum*)
- Spike bentgrass (*Agrostis exarata*)
- Tufted hairgrass (*Deschampsia cespitosa*)

The riparian buffer area includes the transition areas between the restored tidal marsh and uplands (10 acres). Seeding with a native grass seed mix would occur after invasive species are removed.

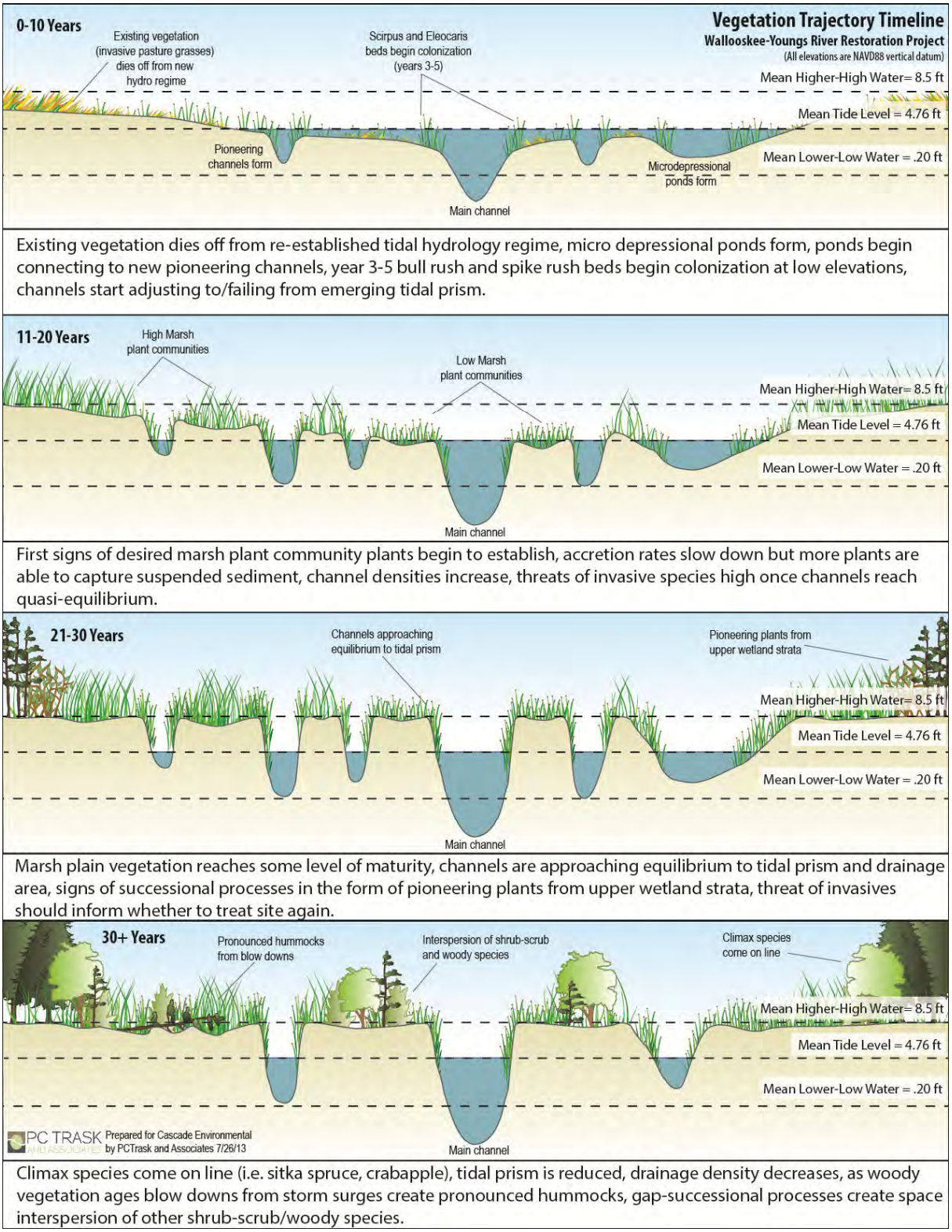
Riparian Buffer Seed Mix

- California brome (*Bromus carinatus*)
- Columbia brome (*Bromus vulgaris*)
- Red fescue (*Festuca rubra*)
- Blue wild rye (*Elymus glaucus*)

Woody vegetation would also be planted in the riparian buffer area. The species composition was determined by evaluation of nearby riparian reference sites and remnant native vegetation communities found within the project area.

- Douglas fir (*Pseudotsuga menziesii*)
- Hooker's willow
- Red elderberry (*Sambucus racemosa*)
- Red-osier dogwood
- Scouler's willow (*Salix scouleriana*)
- Sitka spruce (*Picea sitchensis*)
- Twinberry

A conservation easement permanently protects the restoration site, and the Cowlitz Indian Tribe would become the long-term stewards of the land. Stewardship activities are described in Section 2.1.2.3.


0-10 Years
Vegetation Trajectory Timeline
Wallooskee-Youngs River Restoration Project
(All elevations are NAVD88 vertical datum)
Existing vegetation (invasive pasture grasses) dies off from new hydro regime
Scirpus and Eleocaris beds begin colonization (years 3-5)
Mean Higher-High Water= 8.5 ft
Mean Tide Level = 4.76 ft
Mean Lower-Low Water = .20 ft
Pioneering channels form
Microdepressional ponds form
Main channel
Existing vegetation dies off from re-established tidal hydrology regime, micro depressional ponds form, ponds begin connecting to new pioneering channels, year 3-5 bull rush and spike rush beds begin colonization at low elevations, channels start adjusting to/failing from emerging tidal prism.
11-20 Years
High Marsh plant communities
Low Marsh plant communities
Mean Higher-High Water= 8.5 ft
Mean Tide Level = 4.76 ft
Mean Lower-Low Water = .20 ft
Main channel
First signs of desired marsh plant community plants begin to establish, accretion rates slow down but more plants are able to capture suspended sediment, channel densities increase, threats of invasive species high once channels reach quasi-equilibrium.
21-30 Years
Channels approaching equilibrium to tidal prism
Pioneering plants from upper wetland strata
Mean Higher-High Water= 8.5 ft
Mean Tide Level = 4.76 ft
Mean Lower-Low Water = .20 ft
Main channel
Marsh plain vegetation reaches some level of maturity, channels are approaching equilibrium to tidal prism and drainage area, signs of successional processes in the form of pioneering plants from upper wetland strata, threat of invasives should inform whether to treat site again.
30+ Years
Pronounced hummocks from blow downs
Interspersion of shrub-scrub and woody species
Climax species come on line
Mean Higher-High Water= 8.5 ft
Mean Tide Level = 4.76 ft
Mean Lower-Low Water = .20 ft
PC TRASK
Prepared for Cascade Environmental by PCTrask and Associates 7/26/13
Main channel
Climax species come on line (i.e. sitka spruce, crabapple), tidal prism is reduced, drainage density decreases, as woody vegetation ages blow downs from storm surges create pronounced hummocks, gap-successional processes create space interspersion of other shrub-scrub/woody species.

2.1.2.3 Additional Project Elements

The construction of the project elements would require the following:

1. - Staging Areas: Workers would create staging areas for equipment and construction materials. These staging areas would be in the uplands next to the farm buildings, adjacent to OR 202, and within the levee-protected floodplain, on either side of the proposed BPA access road. Access would be from Farm Lane for pre-levee breach project elements. Levee breach work elements would require additional staging areas to be located out of the floodplain.

   Stored materials would include erosion and sediment control materials, root wads, tree stems, plant stock, rock, and the articulated concrete structure for the BPA access road. Fueling and hazardous materials storage would follow spill containment measures. Best management practices (BMP) would be established through a spill prevention and response plan. BMPs would help prevent site contamination by fuel or other contaminants such as herbicides or equipment fluid leakage. BMPs would also identify active spill responses. In addition, the staging and fuelling areas would be accessible from the work areas and established by orange temporary construction fencing.

   At times, refueling would be necessary outside of the staging area to minimize levee degradation and excessive heavy equipment travel. A pickup truck with appropriate containment devices would conduct refueling. A spill kit would be available during refueling activities outside of the staging areas, and workers would place absorbent mats on the ground beneath the fueling operations.

2. - Construction Access Roads: No new construction access roads would be built, and no improvements would be made to farm roads; all construction access would be via Farm Lane or dirt farm roads. Improvements to OR 202 would require traffic control and lane closures during construction of the highway protection and drainage modification elements. Workers would create construction entrances as needed to prevent offsite sediment transport and maintain access roads as needed during construction. All roads within the project area are private and used for site and utility access. Farm Lane, a private one-lane gravel road, leads southwest from OR 202, to the buildings on the knoll in the eastern portion of the site, and then extends down to the central BPA transmission tower within the site (Figure 2-1). Primitive dirt farm roads lead from Farm Lane to the southwest tower next to the Youngs River and the field in the southeast section of the project area. Another primitive road leads westward from the farm buildings, down the knoll, and then northward to the ditches in the northeast portion of the project area. These roads have been used to access the property for farm and utility maintenance purposes. The levee-protected floodplain and levee would also provide construction access. State highway OR 202 would be used to bring equipment to the project area, but construction traffic would be contained primarily within the project area. BPA access road construction is described in Section 2.1.2.1.

3. - Equipment: Building the restoration and infrastructure protection elements may require the use of excavators, graders, a front end loader, 30-ton off road haul trucks, a high tracked bulldozer, a compactor, a Gator and/or 4 wheelers, two 25-kilovolt-amps (kVA) super silent

generators for pumps, and small gas-powered 2-inch trash pumps. A 1500-gallon water truck would help keep the dust down in later summer months. Workers would use a vibratory pile driver to place the ODOT wind-wave sheet pile wall. Other common construction equipment may be added to facilitate construction of the project elements.

4. - Stewardship: Upon completion of the project the property would be transferred to the Cowlitz Indian Tribe and the Tribe would become the long-term steward of the land. Stewardship activities and uses of the property would comply with the terms of the conservation easement. Conservation easement restrictions would remain unchanged and limit the future use of the property to maintain the conservation values for fish and wildlife. Specifically, the conservation easement does not allow for the residential, commercial, and industrial use of the property, construction of new buildings, structures, roads, or utilities, mining, changes to topography, watercourses, or wetlands, removal of native vegetation, or subdivision of the property. Modifications to topography, wetlands, and waters associated with a permitted restoration project are allowed as are stewardship actions, such as invasive weed control, necessary to maintain the conservation values of the property. Upon the completion of the restoration, the Cowlitz Indian Tribe, with public involvement, would develop a management plan that guides stewardship actions within the site. Key points of the management plan would address: existing infrastructure; public access and maintenance access; invasive species control, stewardship; and restoration and conservation goals.

   Typical stewardship actions in the management plan would include:

   a. Maintain and defend property boundaries and other legal property interests
   b. Maintain gates, fences, locks and signage
   c. Control and prevent unauthorized public access or use
   d. Prevent encroachment and mitigate risk of catastrophic wildfire
   e. Outreach to neighbors, stakeholders, local governments and volunteers
   f. Manage public and tribal access for uses compatible with the restoration project and conservation values of the conservation easement
   g. Detect, map and treat invasive species; all herbicide application would be conducted in accordance with label requirements and the Biological Assessment approved by NMFS, or via other appropriate ESA coverage mechanisms obtained at a later date
   h. Mowing and other vegetation management

The management plan would determine allowable use of the site, and methods to regulate use by both specific constituencies and the public. The plan would also outline cultural use by members of the Cowlitz Indian Tribe and other tribes. The management plan would also include management of the upland areas that are part of the conservation easement.

The management plan is a condition of the conservation easement and would be finalized upon project completion.

2.1.3 Construction Activities

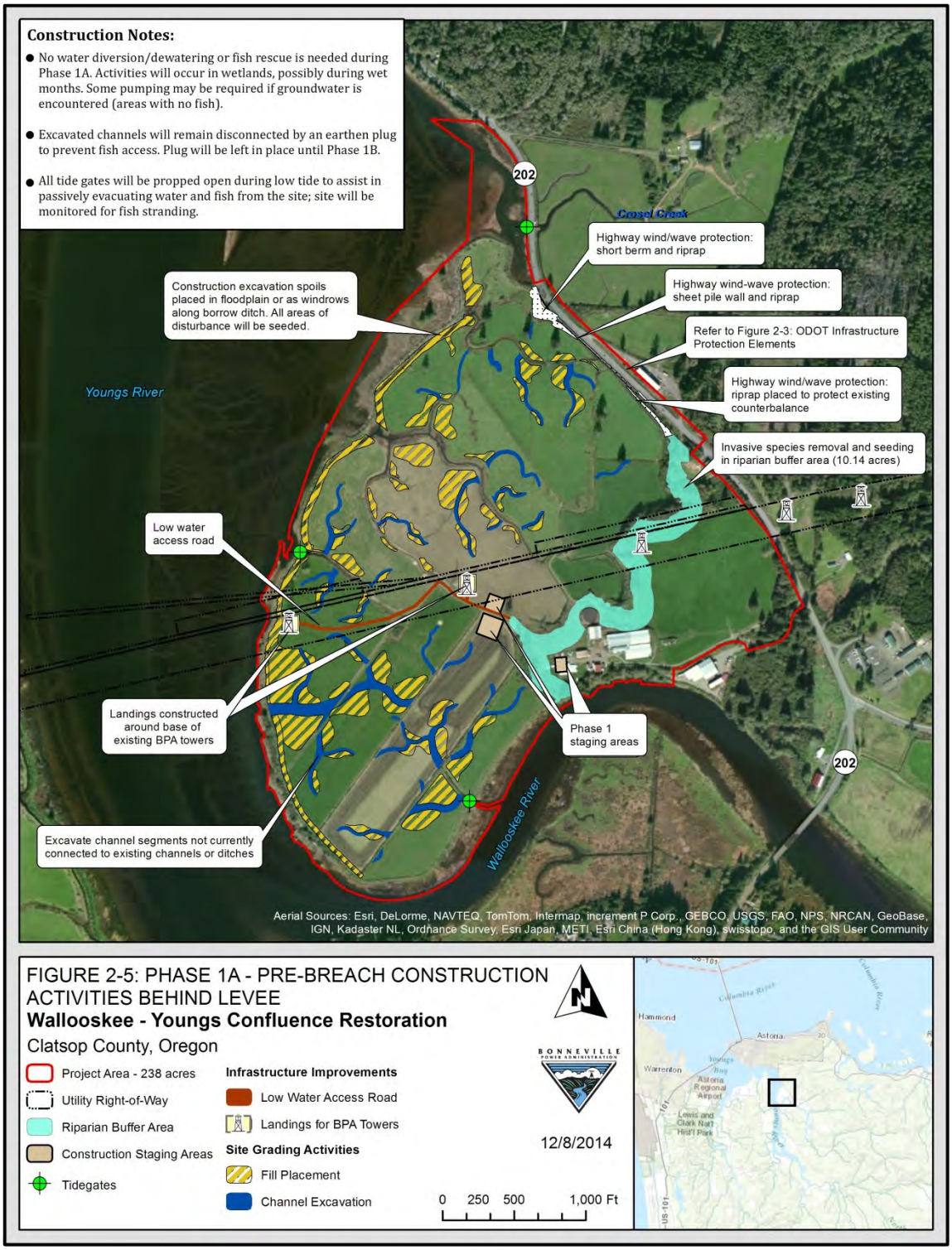
If the project is implemented, construction would likely begin in 2015 and end the spring of the following year. Construction would be phased to accommodate changing water levels

Phase 1A: Entails excavating new channel segments, placing temporary spoils next to the borrow ditches, and placing fill in areas of subsidence in the floodplain. As described in Section 2.1.2.2, all areas of soil disturbance would be seeded when brought to final grade. Workers would clear the riparian buffer, remove invasive species, and apply native grass seed. Phase 1A would also involve building the infrastructure protection elements – including those for the BPA transmission towers, BPA access road, OR 202 wind-wave mitigation and drainage. Figure 2-5 shows the Phase 1A construction activities.

Phase 1B: Entails modifying channels, filling linear ditches and borrow ditches, disking the farm road network, and seeding all areas of soil disturbance with native grass seed as they are brought to final grades (Figure 2-6).

Phase 2A: Entails clearing invasive vegetation from the levee, removing riprap from the levee, placing the cleared plant material and riprap into the bottom of the borrow ditch, and topping it with excess channel spoils from Phases 1A and 1B to bring the ditch to a final grade (Figure 2-7).

Phase 2B: Entails excavating the pilot channel through the vegetated tidal marsh, excavating levees for breaching openings, lowering elevations of the remaining levee sections, and the final filling of the borrow ditch areas. Workers would install plantings within the riparian buffer in the winter or spring following all construction activities (Figure 2-8).


Construction Notes:
● No water diversion/dewatering or fish rescue is needed during Phase 1A. Activities will occur in wetlands, possibly during wet months. Some pumping may be required if groundwater is encountered (areas with no fish).
● Excavated channels will remain disconnected by an earthen plug to prevent fish access. Plug will be left in place until Phase 1B.
● All tide gates will be propped open during low tide to assist in passively evacuating water and fish from the site; site will be monitored for fish stranding.
202
Crozel Creek
Highway wind/wave protection: short berm and riprap
Highway wind-wave protection: sheet pile wall and riprap
Refer to Figure 2-3: ODOT Infrastructure Protection Elements
Highway wind/wave protection: riprap placed to protect existing counterbalance
Invasive species removal and seeding in riparian buffer area (10.14 acres)
Construction excavation spoils placed in floodplain or as windrows along borrow ditch. All areas of disturbance will be seeded.
Youngs River
Low water access road
Landings constructed around base of existing BPA towers
Phase 1 staging areas
Excavate channel segments not currently connected to existing channels or ditches
Wallooskee River
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-5: PHASE 1A - PRE-BREACH CONSTRUCTION ACTIVITIES BEHIND LEVEE
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
Utility Right-of-Way
Riparian Buffer Area
Construction Staging Areas
Tidegates
Infrastructure Improvements
Low Water Access Road
Landings for BPA Towers
Site Grading Activities
Fill Placement
Channel Excavation
BONNEVILLE POWER ADMINISTRATION
12/8/2014
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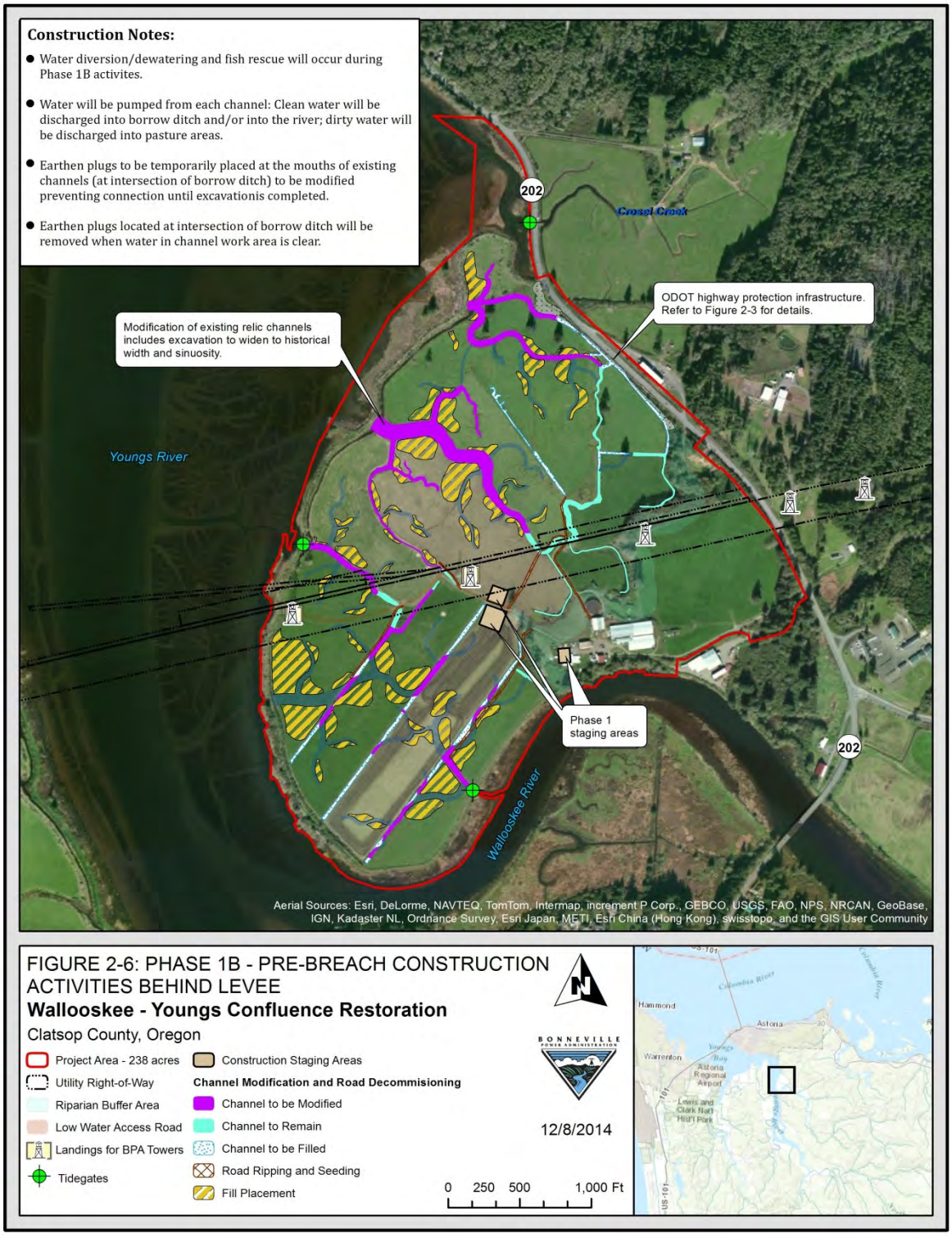
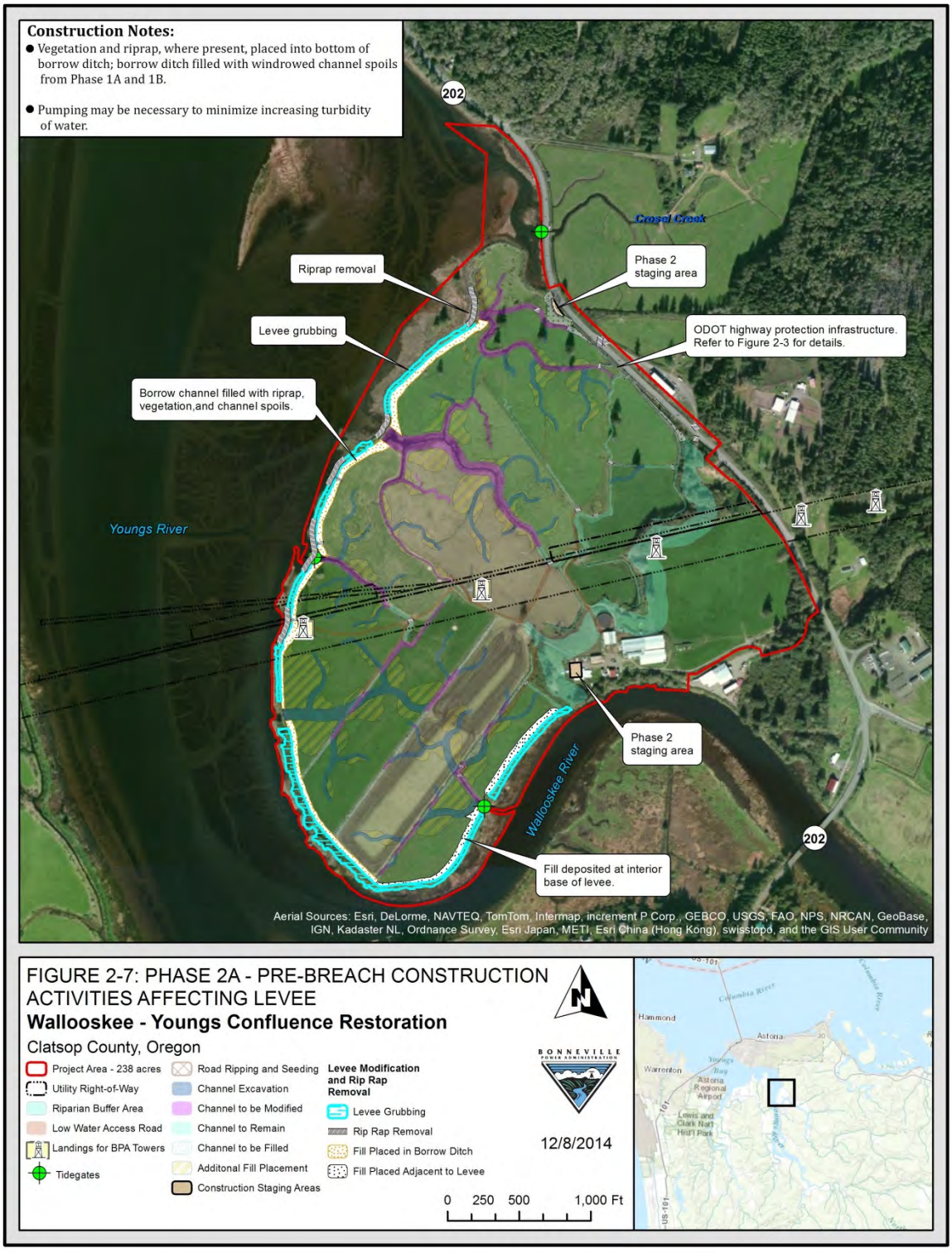
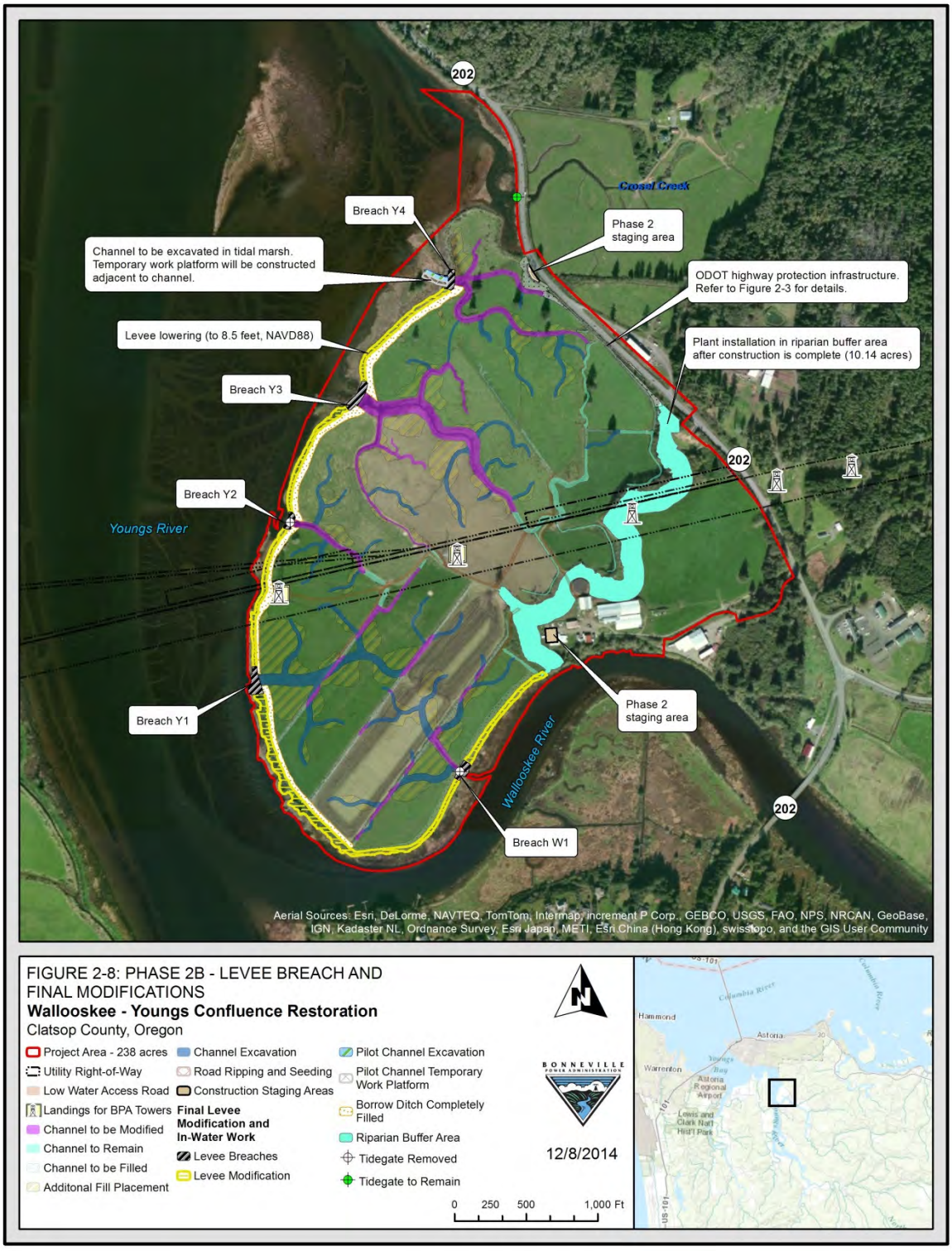
Hammond
Astoria
Warrenton
US-101


Construction Notes:
Water diversion/dewatering and fish rescue will occur during Phase 1B activites.
Water will be pumped from each channel: Clean water will be discharged into borrow ditch and/or into the river; dirty water will be discharged into pasture areas.
Earthen plugs to be temporarily placed at the mouths of existing channels (at intersection of borrow ditch) to be modified preventing connection until excavationis completed.
Earthen plugs located at intersection of borrow ditch will be removed when water in channel work area is clear.
202
Crossel Creek
ODOT highway protection infrastructure. Refer to Figure 2-3 for details.
Modification of existing relic channels includes excavation to widen to historical width and sinuosity.
Youngs River
Phase 1 staging areas
202
Wallooskee River
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-6: PHASE 1B - PRE-BREACH CONSTRUCTION ACTIVITIES BEHIND LEVEE
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
Utility Right-of-Way
Riparian Buffer Area
Low Water Access Road
Landings for BPA Towers
Tidegates
Construction Staging Areas
Channel Modification and Road Decommisioning
Channel to be Modified
Channel to Remain
Channel to be Filled
Road Ripping and Seeding
Fill Placement
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
Columbia River
US-101


Construction Notes:
● Vegetation and riprap, where present, placed into bottom of borrow ditch; borrow ditch filled with windrowed channel spoils from Phase 1A and 1B.
● Pumping may be necessary to minimize increasing turbidity of water.
202
Crosel Creek
Riprap removal
Phase 2 staging area
Levee grubbing
ODOT highway protection infrastructure. Refer to Figure 2-3 for details.
Borrow channel filled with riprap, vegetation,and channel spoils.
Youngs River
Phase 2 staging area
Wallooskee River
202
Fill deposited at interior base of levee.
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-7: PHASE 2A - PRE-BREACH CONSTRUCTION ACTIVITIES AFFECTING LEVEE
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
Utility Right-of-Way
Riparian Buffer Area
Low Water Access Road
Landings for BPA Towers
Tidegates
Road Ripping and Seeding
Channel Excavation
Channel to be Modified
Channel to Remain
Channel to be Filled
Additonal Fill Placement
Construction Staging Areas
Levee Modification and Rip Rap Removal
Levee Grubbing
Rip Rap Removal
Fill Placed in Borrow Ditch
Fill Placed Adjacent to Levee
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
Columbia River
US-101


202
Crosel Creek
Breach Y4
Phase 2 staging area
Channel to be excavated in tidal marsh. Temporary work platform will be constructed adjacent to channel.
ODOT highway protection infrastructure. Refer to Figure 2-3 for details.
Levee lowering (to 8.5 feet, NAVD88)
Plant installation in riparian buffer area after construction is complete (10.14 acres)
Breach Y3
202
Breach Y2
Youngs River
Phase 2 staging area
Breach Y1
Wallooskee River
202
Breach W1
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 2-8: PHASE 2B - LEVEE BREACH AND FINAL MODIFICATIONS
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
Utility Right-of-Way
Low Water Access Road
Landings for BPA Towers
Channel to be Modified
Channel to Remain
Channel to be Filled
Additonal Fill Placement
Channel Excavation
Road Ripping and Seeding
Construction Staging Areas
Final Levee Modification and In-Water Work
Levee Breaches
Levee Modification
Pilot Channel Excavation
Pilot Channel Temporary Work Platform
Borrow Ditch Completely Filled
Riparian Buffer Area
Tidegate Removed
Tidegate to Remain
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
Columbia River
US-101

2.1.3.1 Construction Sequencing

Wetland work (Phase 1A) would begin as soon as permitting is completed. In-water construction would occur during the in-water work windows (June 1-October 15 and again between November 1-February 28) unless a variance is sought and approved by the Oregon Department of Fish and Wildlife (ODFW) and NMFS. In-water construction would be sequenced according to tides to accommodate changing water levels.

No fish salvage would be needed during the construction of the channel segments and other features in Phase 1A because the excavation areas would not be connected to Youngs River or otherwise accessible by fish. This construction could require localized pumping of groundwater to be discharged on the levee-protected floodplain, away from surface waters. During Phase 1A passive evacuation of fish would occur through the tide gate manipulation described below and the ditch network accessible to fish would be monitored to assure there is no fish stranding. Phases 1B, 2A, and 2B would require diversion or dewatering, and fish salvage as described below and in Appendix B (Construction Sequencing Details).

Construction sequencing for the project would preserve and protect as much aquatic life as possible, given the unique site conditions, and provide for optimal construction efficiencies. Construction would use the available site infrastructure as much as possible to encourage fish to leave the project area under their own volition, avoiding human intervention and handling. This would be accomplished by working with the tides to manually open and close the tide gates to maximize the flow of water out of the ditch and channel network to the Youngs and Wallooskee rivers. Some of the benefits of this proposed method include:

- Maximizing the amount of water leaving the site via gravity
- Maximizing outgoing flow duration opportunities for fish to leave the site via the tide gates
- Minimizing fish handling
- Minimizing the need to pump water out of the project area
- Maximizing gravity control of site water table elevations

Construction of the restoration and infrastructure protection elements would be preceded by the following activities:

- Mobilizing equipment
- Designating access road culvert crossings
- Implementing erosion and sediment control BMPs

Earthen plugs would be left in place in the constructed channel segments so that they remain disconnected during subsequent channel modifications and fish cannot access the segments.

Dewatering and fish salvage for all areas with a hydrologic connection to fish bearing waters would occur before construction activities in Phase 1B, 2A, and 2B (Appendix B Construction Sequencing Details).

2.1.4 Environmental Design Features/Mitigation Measures and BMPs Included as Part of the Project

Environmental design features and mitigation measures are incorporated into the project to help avoid and minimize construction impacts (see Table 2-2). Additional BMPs from the NMFS Biological Opinion for the project will be incorporated into Table 2-2 upon completion of the Biological Opinion.

Table 2-2. Environmental Design Features and Mitigation Measures

Resource	Environmental Design Feature-Mitigation Measure
Geology and Soils	• Use sediment barriers such as silt fences, straw matting/bales, or straw wattles, as necessary, to minimize soil loss in all work areas. • Minimize the size of the disturbance area, to the extent practicable. • Use water trucks to apply water as needed to the construction area for dust control. • Track, seed, and mulch disturbed areas immediately as they reach finish grade. • Cover disturbed areas if they are expected to remain inactive for more than 5 days. Seeding would take place only when brought to finish grade. • Final-grade the channel excavation spoils placed in the levee-protected floodplain to promote sheet flow and prevent the creation of rills and gullies. • Phase construction activities so that all infrastructure protection and restoration work is done within the levee-protected floodplain prior to levee breaching. • Monitor, inspect, and daily log erosion control measures and site water management features. • Sequence levee breaching with the tide cycle to minimize erosion potential and direct soils mobilized by water into the site. • Decompact farm roads, staging areas, and haul routes within the project area by ripping or disking these areas after excavation and grading activities are complete. • Deposit non-native soils (crushed rock layer) excavated for the BPA low-water access road within areas of prior soil disturbance in uplands. • Place riprap protection found along the exterior of the levee within the bottom of the borrow ditch prior to ditch filling to effectively remove this material from the site. • Limit the use of non-native material to areas where no other practical alternative exists for infrastructure protection. • Cover the BPA tower pads side slopes with imported soils to allow for vegetation recruitments and limit the exposure of riprap armoring on the surface of the restored area. • Place soil and vegetation removed for OR 202 riprap protections on

Resource	Environmental Design Feature-Mitigation Measure
	top of the riprap to fill voids and encourage vegetation to establishment.
Vegetation and Wetlands	• Inspect equipment and wash as needed to remove vegetation and dirt clods that may contain invasive weed seeds. • Plant the riparian corridor with the riparian seed mix and with native shrubs and trees. • Seed disturbed areas with the floodplain seed mix following construction to the final grades. • Mechanically remove invasive species on the project site. • Treat invasive species with herbicide approved for use in upland or aquatic environments and do so in accordance with label requirements and applicable ESA coverage. • Time construction and manage water to provide dry working conditions to the greatest extent possible. • Seed Wetland 3 with native species upon the completion of construction activities. • Utilize steel plates or wood mats when heavy equipment access into Wetland 2 is required.
Water Resources	• Stage construction equipment (when feasible) and supplies within designated staging areas or in an upland area away from the floodplain, wetland, and other water resources. • Store construction fuel within designated staging areas and refuel equipment within staging areas before departing for the work location. In order to minimize heavy equipment travel through the site and along the levees refueling may occur at the work location via pickup truck with appropriate containment devises. Ensure a spill kit is available, and lay disposable absorbent mat “diapers” on the ground beneath equipment during the fueling operations. • Use water trucks to apply water as needed to the construction area for dust control. • Wash all heavy equipment before it is delivered to the job site. Heavy equipment working below the mean higher high water elevation must be steam or pressure washed to ensure it is free of any chemical, soil, and other potential contaminants. Inspect machinery daily for fuel or lubricant leaks. • Minimize the size of the disturbance area, to the extent practicable. • Use sediment barriers such as silt fences, straw matting/bales, or straw wattles, as necessary to intercept any surface flow that might transport sediment to the Youngs or Wallooskee rivers. Install straw wattles or other filtration BMP along the downgradient toe of

Resource	Environmental Design Feature-Mitigation Measure
	stockpiles adjacent to the borrow ditches to be filled. • Monitor, inspect, and daily log erosion control measures and site water management features. • Track, seed, and mulch disturbed areas immediately as they reach finish grade. • Cover disturbed areas if they are expected to remain inactive for more than 5 days. Seeding would take place only when brought to finish grade. • Final-grade the channel excavation spoils placed in the levee-protectedfloodplain to promote sheet flow and prevent the creation of rills and gullies. • Phase construction activities so that all infrastructure protection and restoration work is done within the levee-protected floodplain prior to levee breaching. • Sequence levee breaching with the tide cycle to minimize erosion potential and direct soils mobilized by water into the site. • Protect and retain native riparian/wetland vegetation, to the extent practicable, by depicting these communities on construction drawings and avoiding construction activities in these areas. Protect and retain native riparian/wetland vegetation, to the extent practicable by depicting these communities on construction drawings and avoiding construction activities in these areas. • Retrofit hydraulically-operated equipment that may work below the mean higher high water with fluids approved for work in aquatic environments.
Fish and - Wildlife -	• Minimize the size of the disturbance area, to the extent practicable. • Seine all existing relic tidal channels twice immediately prior to filling or excavation in order to remove fish and other aquatic species from work areas. • Ensure all fish handling complies with NMFS protocols for handling listed fish species. • Grade channels to avoid and minimize fish stranding during low tide. • Place riprap and invasive vegetation material at the bottom of the borrow ditch prior to filling with native substrate material in order to allow for natural channel forming processes. • In fish-bearing waters, conduct work within the in-water work window from June 1-October 15 and November 1-February 28 unless otherwise approved by ODFW and NMFS. • Operate machinery for in-water work from the top of levee or within adjacent levee-protected floodplain, to the extent practicable. • Protect and retain native riparian/wetland vegetation, to the extent practicable, by depicting these communities on construction drawings and avoiding construction activities in these areas.

Resource	Environmental Design Feature-Mitigation Measure
	• Use a vibratory pile driver to reduce sound levels during sheet pile driving. • Comply with any additional BMPs from the approved Biological Opinion.
Land Use and Recreation	• Post public notifications as needed to inform the public of the potential effects of construction activities.
Cultural Resources	• Identify avoidance areas on plan sets and place "sensitive area" signage adjacent to sensitive resource. • Implement the BPA Inadvertent Discovery Plan if unanticipated archaeological or historical resources are encountered during construction. As required by the plan, halt all ground-disturbing activity in the vicinity of the find and immediately notify BPA cultural resource staff. Implement mitigation measures as required by BPA.
Aesthetics and Visual Resources	• Use water trucks to apply water as needed to the construction area for dust control. • Protect and retain native riparian/wetland vegetation, to the extent practicable, by depicting these communities on construction drawings and avoiding construction activities in these areas. • Minimize the size of the disturbance area, to the extent practicable. • Seed disturbed areas with floodplain seed mix immediately as they reach finish grade.
Air Quality and - Climate Change -	• Use water trucks to apply water as needed to the construction area for dust control. • Reduce the speeds (for example, to 5 mph) of construction vehicles on access roads to minimize dust, if necessary. • Implement idling restrictions during construction to minimize air quality impacts. • Inspect, maintain, and replace (if defective) mufflers and other emission control devices on all equipment.
Noise	• Limit construction activities to normal daytime working hours where feasible. At night, activities generating noise would be limited to only those necessary, such as for dewatering pumps or equipment use when needed to accommodate tidal schedules. •
Hazardous Waste	• Stage construction equipment (when feasible) and supplies within designated staging areas or in an upland area away from the floodplain, wetland and other water resources

Resource	Environmental Design Feature-Mitigation Measure
	• Store construction fuel within designated staging areas and refuel equipment within staging areas before departing for the work location. In order to minimize heavy equipment travel through the site and along the levees refueling may occur at the work location via pickup truck with appropriate containment devises. Ensure a spill kit is available, and lay disposable absorbent mat "diapers" on the ground beneath equipment during the fueling operations. • Retrofit hydraulically-operated equipment that may work below the mean higher high water with fluids approved for work in aquatic environments. • Ensure spill containment and cleanup materials are readily available at the work site and staging areas at all times. • Inspect machinery daily for fuel or lubricant leaks. • Do not perform vehicle and equipment maintenance, other than emergency repair, on the project site unless approved by a BPA environmental representative. • Observe appropriate spill containment measures and buffer distances for fueling and hazardous material storage. • Do not use contaminated sediments in construction activities. • Dispose of non-hazardous wastes in approved landfills. • Dispose of hazardous wastes according to applicable federal and state laws.
Public Health and Safety	• Locate equipment staged adjacent to OR 202 as far as possible from travel lanes, and mark to ensure motorists can readily identify the staging location.
Transportation	• Post traffic control signs on OR 202 to alert motorists of trucks turning to and from Farm Lane. • Use flaggers when needed, in and around the staging area adjacent to OR 202 and during OR 202 lane closures, to direct traffic and avoid vehicle conflicts. • Locate equipment staged adjacent to OR 202 as far as possible from travel lanes, and mark to ensure motorists can readily identify the staging location. • Repair damage to Farm Lane, as needed, after construction is complete.
Socioeconomics	• Use local labor and materials, to the extent practicable. -

2.2 No Action Alternative

Under the No Action Alternative, BPA would not fund the Wallooskee-Youngs Confluence Restoration Project, and the project would not be constructed as described. The conservation easement protecting the property would remain, limiting the uses of the property available to Astoria Wetlands and its successors. The site would remain as levee-protected floodplain, albeit with a degraded levee. Levee maintenance would likely not occur, and the levees would continue to degrade. The BPA towers and access road would not be upgraded unless there became an apparent threat from flooding and reduced access to the towers, and ODOT wind-wave mitigation with subsequent stormwater improvements would not occur. In addition, BPA would not use the project to help it satisfy its fish and wildlife obligations under the Northwest Power Act or FCRPS BiOp obligations under RPA 37. Clatsop County would not quitclaim its right to maintain the levee in favor of the United States. The Cowlitz Indian Tribe would not conduct long-term stewardship and the site would not be maintained to benefit fish and wildlife.

Under the No Action Alternative the levee would continue degrading due to lack of maintenance and natural processes. It would likely breach during a high water or storm event, causing waters to flood into the site. The uncontrolled flooding of the site would put at risk the reliability of the BPA transmission system and prevent land access for maintenance or repairs. OR 202 would also be put at risk through exposure to tidal inundation without appropriate protection measures. If the levees were left to deteriorate and not immediately fixed the site would transition to a tidal marsh although with a degraded ditch network that would not provide habitat value. Emergency actions involving in-water work may be necessary to fix levee breaches. These actions could impact listed fish species through construction activities as well as isolation of fish behind the levee network once the emergency action is completed.

2.3 Alternatives Considered but Eliminated from Detailed Study

2.3.1 Alternate Restoration Configurations and Sites

In general, wide ranging alternative restoration site configurations were not reasonable to consider because the location of the site between two rivers, and the constraints created by the existing highway and utility infrastructure, would have made more active approaches to restoration prohibitively expensive.

One design alternative considered included not breaching the levee at the northernmost proposed breach (Breach Y4; Figure 2-8). This alternative design was considered with the intention of dissipating wave energy resulting from the project to protect OR 202. In consultation with the Corps, which held authority over levee modification activities until the levee was de-authorized under H.R. 3080; this alternative design configuration was determined to be an inappropriate method for road protections because no maintenance mechanisms would be in place for the remaining portions of the levee to assure long-term highway protections. As a result, this design alternative was dismissed.

2.3.2 Alternate BPA Infrastructure Configurations

BPA considered infrastructure alternatives independently from the design process for the project to provide the project team with the design approach described in Section 2.1.3. Several alternatives, including tower relocation and tower pad construction only, were considered but eliminated due to excessive cost or insufficient access. The design alternative chosen by BPA transmission was the lowest cost alternative that allowed for continued safe and reliable access to the transmission system and maximized survival benefits estimated by the Estuary Technical Review Group compared to other project alternatives.

2.3.3 Alternate ODOT Wind-Wave Mitigation Features

Four alternative designs for features that could dissipate wave energy and/or protect OR 202 were considered, but were determined to provide insufficient highway protection:

- Construction of wave break features: Grading within the restored floodplain to establish additional topographic features to dissipate wave energy. This option was determined to not provide sufficient mitigation of wind-wave energy.

- Raising the BPA transmission road: Raising the road elevation to increase wave dissipating effects of the road surface. This option was determined to not provide sufficient mitigation of wind-wave energy.

- Direct protection of the OR 202 embankment: Applying armoring or other modification to the highway embankment to protect the road from wind-wave energy. This option was determined to not provide sufficient protection of the highway for those sections at an elevation of 14 feet or lower since water would still overtop the highway in these areas.

- Construction of a berm parallel to the highway: Constructing a berm southwest and parallel to the highway to dissipate wind-wave energy. Geotechnical analysis (GeoDesign 2014) determined that this option was not a feasible solution because soils under the berm footprint would not adequately support its weight, and the weight of the berm would adversely affect the highway.

2.4 Comparison of Alternatives

Table 2-3 compares how well the alternatives meet the project purposes as defined in Section 1.2. Table 2-4 summarizes and compares the potential environmental consequences of the alternatives. See Chapter 3, *Affected Environment and Environmental Consequences*, for a full discussion of environmental consequences.

Table 2-3. Comparison of the Proposed Action and No Action Alternative

Purpose	Proposed Action	No Action Alternative
Comply with all applicable federal laws, regulations, and policies that guide the agency.	Would be consistent with applicable laws, regulations, and policies.	Would not maintain safe and reliable access to the transmission system in the event of an uncontrolled levee breach and would put the transmission system and access to power at risk.
Support efforts to mitigate for the effects of the FCRPS on fish and wildlife pursuant to the Northwest Power Act (16 U.S.C. 839b(h)(10)(A)).	Would provide fish and wildlife mitigation in a manner consistent with the Council's Program as called for in the Northwest Power Act.	Would not help BPA fulfill its mitigation responsibilities beyond the habitat protection provided by the easement.
Implement RPA (No. 37) in the 2008 FCRPS BiOp, as amended by a Supplemental FCRPS BiOp in 2010 and 2014 (NMFS 2008; 2010; 2014).	Would partially implement RPA (No. 37) in the 2008 FCRPS BiOp by increasing the quality and quantity of naturally-functioning tidally –influenced estuary habitat needed to benefit and improve the survival of ESA-listed salmon and steelhead.	Would not fulfill RPA (No. 37).
Minimize harm to natural or human resources, avoid jeopardy to ESA-listed species, and avoid adverse modification or destruction to designated critical habitat.	Would have temporary impacts associated with construction, but would have long-term beneficial effects on ESA-listed species.	Would not have temporary impacts associated with construction, but habitat restoration would not occur and beneficial effects on ESA-listed species would not be realized.

Table 2-4. Summary of Potential Environmental Consequences of the Alternatives

Environmental Resource	Proposed Action[1]	No Action Alternative
Geology and Soils	• Construction would result in short-term soil erosion, primarily occurring during the levee breach. Soil erosion is expected to rapidly decrease as new flow patterns are established. Erosion is expected to reach nominal levels within weeks of final construction; BMPs would limit impacts of soil erosion. • Vegetation communities would shift to marsh species within 1 year stabilizing soils as post construction elevations would be suitable for immediate colonization by early succession species. • Alluvial processes would be restored leading to sediment accretion and restoration of natural soil development processes.	• Tidal processes would not be restored and the levee would prevent alluvial sediment sources from accreting within the site. • Soil erosion would persist and soils would continue to be lost through channels and tide gates resulting in continued subsidence. • If the levee were to naturally self-breach, the site would be exposed to tidal and river flows, resulting in an unpredictable erosion pattern, prolonged site evolution, and likely prolonged soil instability.
Vegetation and Wetlands	• Construction would impact vegetation communities in the levee-protected floodplain, tidal marsh, and uplands throughout the construction process (9-12 months). BMPs would limit impacts to the existing vegetation and wetlands. • Native vegetation communities would establish within 1 year once tidal processes are restored, replacing the existing pasture grass communities. • Invasive plants would decrease through invasive species control, restoration of tidal processes, and long-term stewardship. • Natural processes would be restored resulting in higher quality wetlands with increased habitat value due to increased vegetation diversity, increased water quality function due to increased biomass for nutrient uptake, and increased flood storage	• Native vegetation would continue to be limited to non-native species and habitat value would not be improved. • Invasive species would not be managed and would likely continue to spread throughout the site. • The water quality function of the wetland would not be improved and sediment and nutrients would continue to be exported through the tide gates. • The water storage ability of the wetland would not be improved as the levee would remain in place. • Potential unplanned levee breach would result in low quality tidal marsh due to presence of the ditch network

Environmental Resource	Proposed Action[1]	No Action Alternative
	capacity due to restoration of the floodplain.	and invasive species management would not occur.
Water Resources	• Construction would generate some turbidity within the site due to new channel excavation, modifications to existing channels, and fill placement. BMPs would be implemented to prevent turbid water from leaving the site. • Construction of the levee breaches would result in a temporary pulse of turbid water into the Youngs and Wallooskee rivers. • Construction of the OR 202 protection measures would match or improve the existing level of protection provided to the highway by the levee. • OR 202 drainage would be re-routed into Crosel Creek but not in quantities that would raise flood elevations as the increase in creek flow is small (1% to 3%). The creek's water quality would not be impacted because highway runoff would be treated. • Construction activities would result in impacts to water quality due to ground disturbance, but levels of phosphorous, nitrogen, and dissolved oxygen concentrations within the Youngs and Wallooskee rivers would quickly return to normal upon the restoration of tidal processes. • By restoring floodplain connection through breaching, the project would result in minor reductions in floodplain water levels within the project area and adjacent areas during a 100-year base flood.	• The floodplain capacity of the Youngs and Walloskee rivers would not be increased through levee breaching. • Water quality would not be improved and erosions within the levee-protected floodplain would continue to export nutrients to the Youngs and Wallooskee Rivers. • The existing levee would erode over time and, without protection measures, OR highway 202, and potentially the land beyond it, would be subject to more frequent flooding. • Highway stormwater improvements would not occur and in the event of a levee self-breach runoff from OR 202 would not be treated prior to entering the tidal wetlands and waters. • If the levee were to self-breach safe and reliable access to the transmission system would not be maintained, due to flooding, and would put the transmission system and access to power at risk.

Environmental Resource	Proposed Action[1]	No Action Alternative
	• Hydraulic modeling results indicate that levees and river bank areas in the vicinity of the project, including those on the south bank of the Wallooskee River, and the pile-supported floating dock south of the project area, are not at risk for increased erosion, sediment deposition, or changes in river channel depths after project implementation.	
Fish and - Wildlife -	• Would have temporary impacts associated with construction; including potential direct take of ESA-listed fish during in-water work activities. BMPs would limit impacts to fish within the project area. • Would have long-term beneficial effects on ESA-listed fish species. • Native emergent vegetation would recolonize the area rapidly, providing refugia, slower backwater, and abundant forage opportunities for juvenile fish. • Would have long-term beneficial effect to all salmon and steelhead from increased availability of intertidal and shallow water rearing and foraging habitat, increased prey base production, and availability of high water refugia, as well as increased detrital and aquatic insect inputs into the estuary.	• Would not provide enhanced fish and wildlife habitat in the Columbia River estuary. • If levee failure occurs (self-breaching), aquatic species would have access to the floodplain including the channelized ditch network; however, the habitat value would be less than the proposed action. • Uncontrolled levee failure could result in temporary aquatic species stranding or blockage of passage. • Emergency actions to repair levee breaches and/or maintain BPA tower access would require in-water work, which would impact listed fish species due to construction activities and fish stranding following construction.

Environmental Resource	Proposed Action[1]	No Action Alternative
Land Use and Recreation	• A stewardship fund would be established and conveyed to the Cowlitz Indian Tribe which would develop a management plan for the property and conduct stewardship in accordance with the conservation easement to maintain the site to benefit fish and wildlife. • Additional protection from tidal flows and wind-wave energy would be provided to utility infrastructure and OR 202. • Improved habitat conditions in the project area could improve fishing and wildlife viewing opportunities. • After approval of the required County land use permits and comprehensive plan amendments, the Proposed Action would be consistent with the Clatsop County Land and Water Development and Use Ordinance and Standards Document.	• No stewardship fund would be established and the property would not be conveyed to the Cowlitz Indian Tribe. The property would remain in private ownership and actions would be limited to those approved under the conservation easement. • Utility infrastructure would remain susceptible to flooding should the unmaintained levee in the project area fail, putting the safety and reliability of the BPA transmission system and other utility infrastructure at risk. • OR 202 would be at risk if exposed to tidal inundation after a levee failure without appropriate protection measures. • Improved habitat conditions, and any resulting fishing or wildlife viewing benefits, would not be realized. • Would be consistent with the Clatsop County Comprehensive Plan, Land and Water Development and Use Ordinance, and Standards Document.

Cultural Resources	• Construction activities would have no impact on cultural resources known to occur within the project area because they would either be avoided or were determined not eligible for listing in the National Register of Historic Places. • Previously undiscovered sites could be impacted by ground disturbing activities during project construction. The BPA Inadvertent Discover Plan would lessen potential impacts to undiscovered cultural resources.	• No construction-related effects on cultural resources would occur.
Aesthetics and Visual Resources	• Construction activities would be visible to the public and would result in temporary degradation of the aesthetic character of the project site. • Long-term effects on visual resources would occur from a change in the aesthetic character of the site from agricultural to undeveloped/natural open space. Although these changes would be moderate, they would not necessarily be adverse. • Modifications to existing onsite infrastructure (towers, roads) would not be noticeable to most viewers due to distance, the limited height of the features, and vegetation. • The sheet pile wall along OR 202 would limit views into the site along approximately 500 feet of road due to the height of the wall.	• No impacts would occur on aesthetics or visual resources due to construction. • Existing aesthetics would remain the same, although the project site could transition to a tidal marsh if the levee were to self-breach during a storm or high-water event and emergency repairs were not implemented.

Air Quality and Climate Change	• Because of the short duration of the project construction activities and relatively low number of vehicles and equipment required for construction and maintenance, the estimated emissions from the project are low for EPA criteria pollutants, greenhouse gases, and other air toxic pollutants. • The proposed action would better position the site to respond to sea level rise since tidal process would be restored and the site would begin to accrete sediment. • The restored tidal wetland would act as a carbon sink and capture carbon through increased vegetation growth and accretion. • Restoration of a functioning wetland plant community would help buffer the effect of rising sea levels by attenuating wave action and storm surges.	• Greenhouse gas emissions associated with the project construction and stewardship actions would not occur. • The site would continue to export carbon through erosion and loss of soils through the tide gates. • Sea-level rise would likely still affect the project area and the likelihood that the site would covert to mud flats or open water, in a self-breaching scenario due to sea level rise, would be much greater since soils would continue to be lost through the tide gates. • Tidal processes and associated soil accretion would not be realized and the subsidence would continue.
Noise	• Noise impacts would be moderate but temporary for sensitive noise receptors within 2,000 feet of construction. • Stewardship and long-term management activities would generate limited and infrequent noise from vehicles used to access the site and equipment used to conduct vegetation and infrastructure maintenance.	• Temporary construction-related noise impacts would not occur, unless emergency repairs of the levee, utility infrastructure, or OR 202 are required.
Hazardous Waste	• Petroleum products (such as gasoline, diesel fuel, motor oil, and hydraulic fluid) and other fluids (such as anti-freeze) may be accidentally released from vehicles and equipment during construction.	• Construction-and maintenance-related, inadvertent releases of hazardous substances would not occur because the p would not be constructed.

Public Health and Safety	• The potential for injuries associated with hazardous construction activities would temporarily increase. • The potential for motor vehicle accidents could temporarily increase due to construction traffic and staging on and adjacent to OR 202. • Infrastructure improvements would protect the segment of OR 202 adjacent to the project site from flooding and provide safe and reliable access to BPA transmission towers. • The potential for increased mosquito populations would be minimized through site design and long-term monitoring. The potential for related mosquito-borne disease would be less, or commensurate with, existing conditions.	• No injuries or motor vehicle accidents due to construction or maintenance would occur. • Utility infrastructure would remain susceptible to flooding should the unmaintained levee in the project area self-breach, putting the safety and reliability of the BPA transmission system and other utility infrastructure at risk. • OR 202 would be at risk if exposed to tidal inundation after a levee failure without appropriate protection measures. • Onsite ponding (and resulting mosquito breeding habitat) could increase if levee were to self-breach.
Transportation	• Construction activities would increase vehicle traffic on OR 202 and Farm Lane during the construction period. • Traffic delays on OR 202 would occur over the short-term during construction (a single lane of traffic would be closed intermittently for 2-3 weeks to facilitate some construction activities). • Farm Lane could be temporarily damaged by heavy equipment during construction. • Existing primitive dirt access roads within the restoration site would be replaced with a low-water access road. • Equipment staged on the west side of OR 202 during the second phase of construction could pose a short term safety hazard. • OR 202 protection measures would improve transportation conditions	• There would be no construction-related increase in traffic or traffic delays. • Infrastructure improvements would not be implemented. Utility infrastructure would remain susceptible to flooding should the unmaintained levee in the project area self-breach, and OR 202 would be at risk if exposed to tidal inundation without appropriate protection measures.

	during high water events. • Transportation BMPs would be implemented to reduce safety risk and damage to roads.	
Socio-economics	• Construction would result in short-term, limited beneficial economic effects through increased labor expenditures, housing needs, and acquisition of construction materials/supplies. • There would not be disproportionate effects on low-income or minority populations.	• No socioeconomic effects would occur.

Note: [1]Level of Impact that would be expected to result after implementation of appropriate mitigation.

Chapter 3
Affected Environment and Environmental Consequences

3.1 Introduction

This chapter includes an analysis of the potential impacts of the Proposed Action, referred to as the project, as well as of the No Action Alternative, on human and natural resources. The chapter first defines the environment that could be affected by the alternatives and then describes the potential environmental consequences of the alternatives are described for each resource topic. Environmental design features and mitigation measures to reduce the effects of the Proposed Action are provided in Section 2.1.5, Table 2-2 (Environmental Design Features/ Mitigation Measures Included as Part of the Proposed Action) and are referenced, as appropriate, in the resource-specific effects analysis below.

Effects or impacts are generally discussed as construction related effects (direct) that would occur during construction and long –term effects (indirect) that would occur as a result of the project being implemented and the associated stewardship actions. Cumulative impacts are also evaluated. Cumulative impacts are impacts that result from the incremental impact of the Proposed Action when added to other past, present, and reasonably foreseeable future actions. Table 2-4 (Summary and Comparison of Potential Environmental Consequences of the Alternatives) summarizes the impacts of the Proposed Action and the No Action Alternative.

The impact analyses used information provided by project designs, previously conducted environmental work at the site, relevant references, technical literature, and subject matter experts. In assessing project impacts, four impact levels were used—high, moderate, low, and no impact. The magnitude and incremental effects of each alternative are disclosed and compared in this EA.

To provide a meaningful explanation of how potential effects were considered in this EA, each section in this chapter describes the general criteria (quantitative and/or qualitative) by which the effects were evaluated. These criteria are considered in assessing the relative magnitude of the potential direct, indirect, and cumulative effects of each alternative, including, where appropriate, determining where the effects are anticipated to be low (i.e., minimal or hardly noticeable), moderate (i.e., above negligible), or high (i.e., very noticeable). These criteria help provide the public and decision makers with a reference for comparing the relative effects of the alternatives.

3.2 Geology and Soils

The following section describes geology and soils and the potential construction-related and long-term effects of the Proposed Action on these resources at the site and on nearby properties. The analysis area for geology and soils coincides with the project area. Effects to geology and soils outside of the project area, such as effects to sedimentation and erosion rates along the Youngs and Wallooskee rivers, are analyzed in the water resources section since changes to hydrology are the driving factors for potential change.

3.2.1 Affected Environment

3.2.1.1 Regional Geology

The site is located on the western margin of the Northern Oregon Coast Range Mountains near the confluence of the Youngs River and the Wallooskee River. The topography is generally flat with broad river terraces formed along the flanks of the coastal mountains. Tectonic uplift of the Coast Range and lower sea levels during the Pleistocene glacial periods resulted in the deep incision of the Youngs River and Wallooskee River along the western edge of the Coast Range. The rise in sea level after the last continental glacial event accumulated thick deposits of river alluvium, broad terraces, and tidal-influenced river floodplains and estuaries. The geologic unit underlying the project site is mapped as Quaternary floodplain alluvium, specifically tidal flat deposits (Schlicker et al. 1972).

3.2.1.2 Soils

Soil survey maps produced by the Natural Resources Conservation Service (NRCS) Soil Survey Geographic Database for Clatsop County show three soils mapped within the study area. Coquille silt-loam occurs throughout the floodplain. This soil is described as very deep and very poorly drained, formed in mixed alluvium along tidally influenced floodplains with slopes of 0 to 1 percent. Unless diked and drained, the soil has a permanent high water table at or near the surface that fluctuates with the tides and is subject to tidal overflow.

Walluski silt loam occurs at the eastern boundary of the study area where the elevation begins to rise steeply. It is described as very deep, moderately well drained soil formed in moderately fine textured alluvium on terraces with slopes of 0 to 20 percent. The soil is usually moist and saturated with water at a depth of 2 to 3 feet unless artificially drained.

A small area of Grindbrook silt loam is mapped at the northeastern edge of the study area, also at the transition of floodplain to hillslope. The Grindbrook series consists of very deep, moderately well drained soils formed in mixed alluvium on old river terraces at elevations of 100 to 500 feet and slopes of 0 to 30 percent. This soil is usually moist with a perched high water table that fluctuates between depths of 2 to 3 feet below the surface from November through May (NRCS 2012).

Soils investigated in soil pits during the wetland determination work generally match the mapped soil types. Soils in the project area have generally been subject to cattle use due to the dairy operations previously in place, but were also subject to tilling, haying, and yearly flooding as part of the farming practices. Soil compaction and areas of “pugging” (tracks left by animal hooves) as a result of extensive livestock use are evident throughout the site.

3.2.2 Environmental Consequences – Action Alternative

3.2.2.1 Construction Effects

Effects to soils and geology as a result of project construction would include increased soil erosion, further soil compaction, and mixing of soil horizons. Non-native material would be imported to construct the infrastructure protection elements and would include subgrade rock, riprap, and imported soil surfacing for the BPA transmission landings and OR 202 protection measures. Effects on soils and geology would be mitigated using BMPs as described below and summarized in Section 2.1.4 and in Table 2-2.

Increases in soil erosion would primarily be caused by soil disturbance from construction access, earthwork, excavation, vegetation removal, and exposing the site to tidal influence. Project construction would occur over a one to two year period and rain events are anticipated that could contribute to soil erosion. The potential for increased soil erosion is also expected during and immediately after levee breaching activities when destabilized soils would be exposed to daily tides. Soil erosion is expected to decrease rapidly over time, reaching nominal levels within a matter of weeks.

All infrastructure protection elements, described in Section 2.1.2.1, would be constructed in advance of levee breaching. Restoration elements, described in section 2.1.2.2, would occur concurrently with, or after, the infrastructure protection construction activities.

Approximately 52 acres of levee-protected floodplain are expected to be impacted through soil disturbance associated with the restoration work. These impacted areas would be seeded upon the completion of construction to finish grade with the seed mix identified in section 2.1.2.2. Within weeks seed would likely stabilize soils from precipitation driven erosion, although the seeded vegetation is not expected to tolerate the exposure to tidal inundation and surface flows moving throughout the site would have a greater likelihood to erode soils until naturally recruited marsh vegetation establishes. Vegetation is expected to colonize the tidal wetland as new tidal conditions are established, occurring as a shift in community composition. Existing elevations are suitable for immediate colonization by early succession species and mud flats or unvegetated areas are not expected to develop; marsh species are expected to out-compete pasture grasses and seeded disturbed areas with the restoration of tidal processes.

The riparian buffer would also be seeded (riparian buffer mix in Section 2.1.2.2) and planted with native trees and shrubs using bare root stock. No soil would be removed for planting; soils would be parted with a shovel blade.

About 16 acres of levee-protected floodplain would be disturbed through the creation or modification of tidal channel networks. In addition 6 acres of levee would also be disturbed through levee lowering and vegetation grubbing. These tidal channel areas and portions of the levee that are lowered would not be revegetated prior to levee breaching. The tidal channels would be frequently inundated, making active planting difficult and the remaining levee is intended to erode over time.

Measures to mitigate the soil erosion potential during construction include:

- Use sediment barriers such as silt fences, straw matting/bales, or straw wattles, as necessary, to minimize soil loss in all work areas.
- Minimize the size of the disturbance area, to the extent practicable.
- Use water trucks to apply water as needed to the construction area for dust control.
- Track, seed, and mulch disturbed areas immediately as they reach finish grade.
- Cover disturbed areas if they are expected to remain inactive for more than 5 days. Seeding would take place only when brought to finish grade.
- Final-grade the channel excavation spoils placed in the levee-protected floodplain to - promote sheet flow and prevent the creation of rills and gullies. -
- Phase construction activities so that all infrastructure protection and restoration work is done within the levee-protected floodplain prior to levee breaching.
- Monitor, inspect, and daily log erosion control measures and site water management - features. -
- Sequence levee breaching with the tide cycle to minimize erosion potential and direct soils mobilized by water into the site.

There is the potential for soil compaction within the project area due to heavy equipment travel through the site. Existing farm roads are also present within the levee-protected floodplain and these roads would be decommissioned by decompacting them during the restoration. Soil compaction has the potential to cause long-term effects by limiting the ability for vegetation to recolonize the site and affecting differential erosion rates upon project completion. Mitigation measures to address the increased soil compaction potential include:

- Decompact farm roads, staging areas, and haul routes within the project area by ripping or disking these areas after excavation and grading activities are complete.

Construction would cause the mixing of soil horizons due to excavation activities associated with the creation of the tidal channel network. Soils would be excavated, graded, and relocated within the restoration areas to restore typical floodplain topography. Soil grading would be balanced on site (soil volumes for removal and fill are the same), requiring no importation of non-native soils for the restoration elements. The top six inches of soil to be excavated for the BPA low-water access road includes some non-native crushed rock. This material would be removed and disposed of behind the earthen berm constructed for OR 202 wind wave mitigation and seeded. Native material excavated for the low-water access road below six inches would be used to fill existing drainage ditches near the ODOT wind wave mitigation areas. Soil horizons would be mixed during construction, resulting in deposition of organic material and mineral fines at greater depths than would typically occur. Mixing of soil horizons is not expected to impede marsh development or otherwise affect site evolution because nutrients would be imported to the site via tidal influx and marsh colonization is expected to occur over time. No topsoil salvage would occur as the site is expected to undergo tidal inundation and accretion immediately following construction and native topsoil is not needed to assist with plant development. As such, no mitigation measures are proposed for mixing soil horizons.

Construction of infrastructure protection elements, described in Section 2.1.2.1, would include use of imported rock, imported soil material, sheet piles, and pre-fabricated articulating concreted block sheeting. This imported material would displace native soils and geology and potentially cause differential erosion rates. The project was designed to limit the need for non-native materials within the project area to the maximum extent practical. The BPA low-water access road would be placed within a high point of the levee-protected floodplain along the watershed boundary between the tidal channel networks as this area is expected to have minimal channel development and erosion potential. ODOT protections include constructing a short berm on top of a historic segment of OR 202, installing a sheet pile wall along the existing road embankment, and riprap armoring of these structures as well as counterbalance fill material that supports the highway as it climbs to the upland knoll. Mitigation measures to address non-native material within the project area include:

- Deposit non-native soils (crushed rock layer) excavated for the BPA low-water access road within areas of prior soil disturbance in uplands.
- Place riprap protection found along the exterior of the levee within the bottom of the borrow ditch prior to ditch filling to effectively remove this material from the site.
- Limit the use of non-native material to areas where no other practical alternative exists for infrastructure protection.
- Cover the BPA tower pads side slopes with imported soils to allow for vegetation recruitments and limit the exposure of riprap armoring on the surface of the restored area.
- Place soil and vegetation removed for OR 202 riprap protections on top of the riprap to fill voids and encourage vegetation to establishment.

The BMPs identified above would be implemented to minimize the effects of the project on soils and geology. Short-term erosion is expected as tidal conditions are restored to the project area. The erosion potential would be mitigated through the use of appropriate BMPs during construction and it is expected that erosion would reduce as soils disturbed during construction are vegetated or eroded through tidal flows. Levee work would occur over about 30 non-consecutive working days when tidal conditions are favorable. Soil erosion would occur as areas are exposed to tidal influence and erosion rates are expected to decrease as vegetation becomes established and the site adjusts to the tidal influence.

Localized soil compaction and disturbance would occur and non-native material would be placed within the floodplain. The areas affected by compaction and soil mixing would be covered as tidal conditions and accretion rates are restored typical marsh soil conditions develop. Non-native material placement would be limited to rock and riprap fill and surfacing of the BPA transmission landings as well as rock fill and articulated concrete surfacing for the low-water access road. A total of 1.31 acres (1.0-acre for landings and 0.31-acre for the road) would be affected by imported non-native material. Riprap surfacing on the access landings would be covered with imported soil and seeded with native grass species. A total of 0.45 acres of non-native material would be placed to protect OR 202 include the sheet pile wall, short berm and riprap armoring to protect these structures and the counterbalance fill material that supports the highway. The OR 202 riprap placement area would be scraped to a depth of 6 inches to remove vegetation. The vegetation and soil material would then be applied to the riprap surface to fill small voids and encourage vegetation

growth on top of the riprap. Impacts to soils and geology as a result of construction of the Proposed Action are considered low to moderate.

3.2.2.2 Long-Term Effects

Potential long-term effects to soils and geology due to project implementation relate to changes in the erosion and sedimentation patterns within and near the project site and the Youngs and Wallooskee rivers. Long-term effects to soils and geology within the project site are discussed below, and effects to sedimentation and erosion patterns within and along the Youngs and Wallooskee rivers are addressed in the water resources section.

Since construction of the levee, the levee-protected floodplain within the project area has subsided up to four feet as accretion (soil deposition) has not occurred due to the removal of tidal influence. Immediately following levee breaching, existing vegetation (pasture grasses) would die back and, based on observations at nearby reference sites, over time it is expected that the site would recolonize with native tidal marsh species as described in Section 2.1.2.2. Soil erosion may occur during this transition period. Observations of nearby levee breach sites have demonstrated that, as native species colonize the site, the soils stabilize and marsh plain elevations rise through accretion; this is expected to occur at the project area following breach activities. This passive recolonization of native tidal marsh species would begin within a year. A property directly across the Wallooskee River from the project self-breached in 2011 and has developed a salt marsh community with no vegetation management. Restoring floodplain marsh surface elevations is a project goal and project design is focused on rapid sediment accretion and tidal channel evolution. Accretion would, over time, balance with erosional forces to establish a self-sustaining marsh ecosystem.

The tidal channel and levee breach configurations were designed based on tidal prism hydraulics to guide site evolution and preclude tidal channel avulsion. The levee would be lowered at or below elevation 8.5 feet elevation to provide opportunities for regular overtopping of the levee and encourage subsequent levee erosion. Grading plans have been designed to provide a relatively low energy environment behind the levee to encourage sediment accretion. Sediment accretion has been measured at several sites in Youngs Bay, with accretion occurring at rates of up to 1 inch per year (Borde et al. 2011). Repeated overtopping of the levee would eventually erode the levee, lowering its elevation as the restored floodplain rises in elevation. Long-term effects to soils and geology are considered low for the Proposed Action.

3.2.3 Environmental Consequences – No Action

Under the No Action Alternative, short-term construction related impacts including the opportunity for increased erosion, compaction, and importation of non-native material would not occur. Soils in the project area would continue to subside and be lost through the tide gates with the levees impeding alluvial processes to import sediment. Without new sources of sediment, soil loss through erosional processes would not be balanced with new inputs. The site would not be subject to alluvial processes and accretion due to tidal inundation would not occur. While the levee may self-breach, accretion rates for the site would not be effectively restored due to the extensive ditch network and lack of appropriately sized tidal channels.

3.3 Vegetation and Wetlands

The following sections describe vegetation communities, species of interest, invasive species, and wetlands. Impacts addressed include both the temporary effects of construction of the Proposed Action and long-term effects as a result of restored tidal hydrology and long-term management. Special-status plant species known to occur within a 5 mile radius of the project area boundary were included in the analysis.

3.3.1 Affected Environment

Vegetation communities and wetlands within the project area were surveyed by botanists and biologists (Cascade Environmental Group) in September 2012. Vegetation communities and wetlands are described below.

3.3.1.1 Vegetation

The entire 5-mile radius analysis area lies within the Coastal Lowland ecoregion. This ecoregion is characterized by low terraces, estuaries, spits, marshes, and hyper-maritime coniferous forests bordered by steep upland slopes which provide sediment and organic material.

Pasture Grass-Dominated Levee-Protected Floodplain - Freshwater Marsh

The project area is primarily comprised of historical tidal wetland modified for use as pastureland. It is protected from tidal inundation by the levee and ditched and tiled to facilitate drainage. It has been used for livestock grazing and hay production for many decades and has been seeded with pasture grass on a semi-annual basis. Species present include perennial ryegrass (*Lolium perenne*), colonial bentgrass (*Agrostis capillaris*), tall fescue (*Festuca arundinacea*), water and meadow foxtail (*Alopecurus geniculatus* and *A. pratensis*), velvet grass (*Holcus lanatus*), white clover (*Trifolium repens*), and creeping buttercup (*Ranunculus repens*). Ryegrass and tall fescue are more prominent in higher areas, while water foxtail and creeping buttercup dominate lower-lying areas and swales. Ditch banks are vegetated with reed canarygrass, soft rush (*Juncus effusus*), and birds-foot trefoil (*Lotus corniculatus*). Scattered throughout the floodplain area are Sitka spruce, red alder (*Alnus rubra*), bull thistle (*Cirsium vulgare*), Himalayan blackberry (*Rubus armeniacus*), and cutleaf blackberry (*Rubus laciniatus*).

Tidal Marsh

A narrow band of emergent tidal marsh exists in the intertidal zone on the waterward side of the levee. This area is subject to daily inundation by brackish waters. The vegetation is mostly native species, and the dominant species include club-rush, Lyngbye's sedge (*Carex lyngbyei*), creeping spikerush (*Eleocharis palustris*), and tufted hairgrass. Non-native species within the tidal marsh occur infrequently and include common reedgrass, purple loosestrife, and yellow flag iris.

Upland Areas

Uplands within the site include the levee (above 8.5 foot elevation) and a knoll to the northeast that rises steeply above the floodplain. Vegetation along the levee predominantly features reed canarygrass and Himalayan and cutleaf blackberry, with occurrences of Scouler's willow, twin berry, and Nootka rose.

Upland vegetation on the knoll includes a small stand of red alder with a dense understory of cutleaf blackberry, Scouler's willow, and red elderberry and an open field dominated by pasture grasses and featuring scattered thickets of blackberry and common turf weeds such as cats-ear (*Hypochaeris radicata*) and oxeye daisy (*Leucanthemum vulgare*). Vegetation within the developed portion of the upland knoll is sparse and is limited to introduced grass species such as barnyard grass (*Echinochloa crusgalli*), orchard grass (*Dactylis glomerata*), and sweet vernalgrass (*Anoxanthum odoratum*), as well as weeds such as plantain (*Plantago lanceolata*), dandelion (*Taraxacum officinale*), prostrate knotweed (*Polygonum aviculare*), and chicory (C*ishorium intybus*) common to roadside/waste areas. Vegetation along OR 202 is sparse and includes turfgrasses and weeds such as Himalayan blackberry and scotch broom (*Cytisus scoparius*) common to waste areas. The roadside ditch is densely vegetated with herbaceous species, such as reed canarygrass, meadow foxtail, common rush, and small-fruited bulrush (*Scirpus microcarpus*) associated with wetter areas.

3.3.1.1.1 Special Status Plants

Special status species are classified at the federal level under the ESA as threatened, endangered, candidate, or species of concern. They also may be listed at the state level by the Oregon Department of Agriculture as threatened, endangered, candidate, or vulnerable. Further, the Oregon Biodiversity Information Center (ORBIC) status includes rankings of List 1, 2, or 3 depending on rarity. Finally, species may also be listed as "strategy species" and habitats may be listed as "strategy habitat" by the Oregon Conservation Strategy.

Information on special status plants was obtained from Portland State University's ORBIC data set. Data was obtained on November 19, 2013, for an analysis area covering a 5-mile radius of the project area and includes state and federally listed species, Oregon Natural Heritage Plan (NHP) listed species, as well as any available associated population or habitat information. The Oregon Conservation Strategy was reviewed for the coast range to determine the presence of strategy species or habitats. Results of the data search are presented below.

Federal and State Listed Plant Species

No federally threatened, endangered, candidate, or species of concern plant species, listed under the ESA, are known to occur within the analysis area. Additionally, no threatened, endangered, candidate, or vulnerable plant species, listed by the Oregon Department of Agriculture, were found to occur within the analysis area.

Natural Heritage Plan Listed Plant Species

Four plant species known to occur in the analysis area are included on List 2, List 3, and List 4 of Oregon's NHP developed by the Natural Heritage Advisory Council to the State Land Board (Oregon National Heritage Program 2003). The lists include at-risk plant species determined to be of significant value as defined in the NHP. List 2 includes taxa that are threatened in Oregon, but more common elsewhere; List 3, the "Review List", includes taxa which may be threatened, but available information is insufficient to determine status; and List 4, the "Watch List", includes taxa which are of conservation concern but do not meet criteria for consideration as threatened or endangered.

Spurless jewelweed (*Impatiens ecornuta*) has been found in several areas within the 5-mile search radius with the closest observation approximately 0.5 mile southeast of the project area boundary. This species is included in List 2 and is found to occur in wet habitats such as wetlands, ditches, and riparian areas in full sun to partial shade (ORBIC 2013).

Fassett's water-starwort (*Callitriche fassettii*) has been found at one location 3.5 miles away from the project area. This plant is on List 3 of the NHP (ORBIC 2013).

Water pimpernel (*Samolus parviflorus*) has been found at two locations approximately 3 miles from the project area. Water pimpernel is included on NHP List 3 and was found to occur in fresh to brackish, tidal, emergent marshes (ORBIC 2013).

Flowering quillwort (*Lilaea scilloides*) has been found within the analysis area along the mainstem of the Columbia River. This plant is a small, annual, semi-aquatic herb which may occur in fresh to intertidal marsh in either sandy or silty substrates (CPNWH 2014; Washington State Department of Ecology 2014). Flowering quillwort is included on the NHP List 4 (ORBIC 2013).

Oregon Conservation Strategy

The Oregon Conservation Strategy has estuaries, freshwater wetlands, and riparian areas listed as strategy habitats for the Coast Region. Only one strategy species is listed as being found in the Coast Region in Clatsop County: Nelson's checker-mallow (*Sidalcea nelsoniana*). This species, also a state and federally listed species, was not observed within the project area and is not mapped in the ORBIC dataset as occurring within the 5 mile radius of the project area.

3.3.1.1.2 Invasive Species

Non-native plant species are defined by the Oregon Department of Agriculture's Oregon State Weed Board as "noxious" if they are considered to be injurious to public health, agriculture, recreation, wildlife, or any public or private property (ODA 2013). Noxious weed species are classified by the Weed Board based on reproduction, distribution, management, and detrimental effects criteria into three lists which include control recommendations. List A weeds occur in small, known infestations and are easily contained. Populations of these weeds are subject to eradication when and where found. List B weeds are regionally abundant, but with limited distribution in some counties. Management is determined on a case-by-case basis and is generally limited to control at the state or county scale. List T weeds are species targeted for prevention and control under a statewide

management plan developed and implemented by the Oregon Department of Agriculture. This assessment includes both invasive vegetation identified by the Oregon Department of Agriculture's Oregon State Weed Board and invasive species which are species known to form stands of one type of vegetation with little to no diversity and limited habitat value. For simplicity both invasive and non-native species are referred to as invasive species in the reminder of this document. Invasive weeds that occur within the project area, their general distributions, and classifications are listed in Table 3-1 below.

Table 3-1. Invasive Plants Occurring within the Project Area

Species	Distribution	Weed List
Himalayan blackberry	Abundant throughout site	B
Scotch broom	Limited – small patch on uplands near OR 202	B
Reed canarygrass	Abundant throughout site in levee-protected floodplain	N/A
Common reedgrass	Occasional - patches scattered throughout tidal marsh	B
English ivy (*Hedera helix*)	Limited – small patch on levee	B
Bull thistle	Common – scattered throughout site	B
Yellow flag iris	Limited – small patch riverside of the levee in the tidal	B
Purple loosestrife	Limited – small patch riverside of the levee in the tidal	B

3.3.1.2 Wetlands

Wetlands occurring within the project area were identified during a site investigation conducted in September 2012 and documented in a wetland determination report produced by Cascade Environmental Group: *Wallooskee – Youngs Confluence Restoration Project Wetland Determination Report – October 2014*. Three wetlands were identified within the project area and are described below and shown in Figure 3-1.

Wetland 1

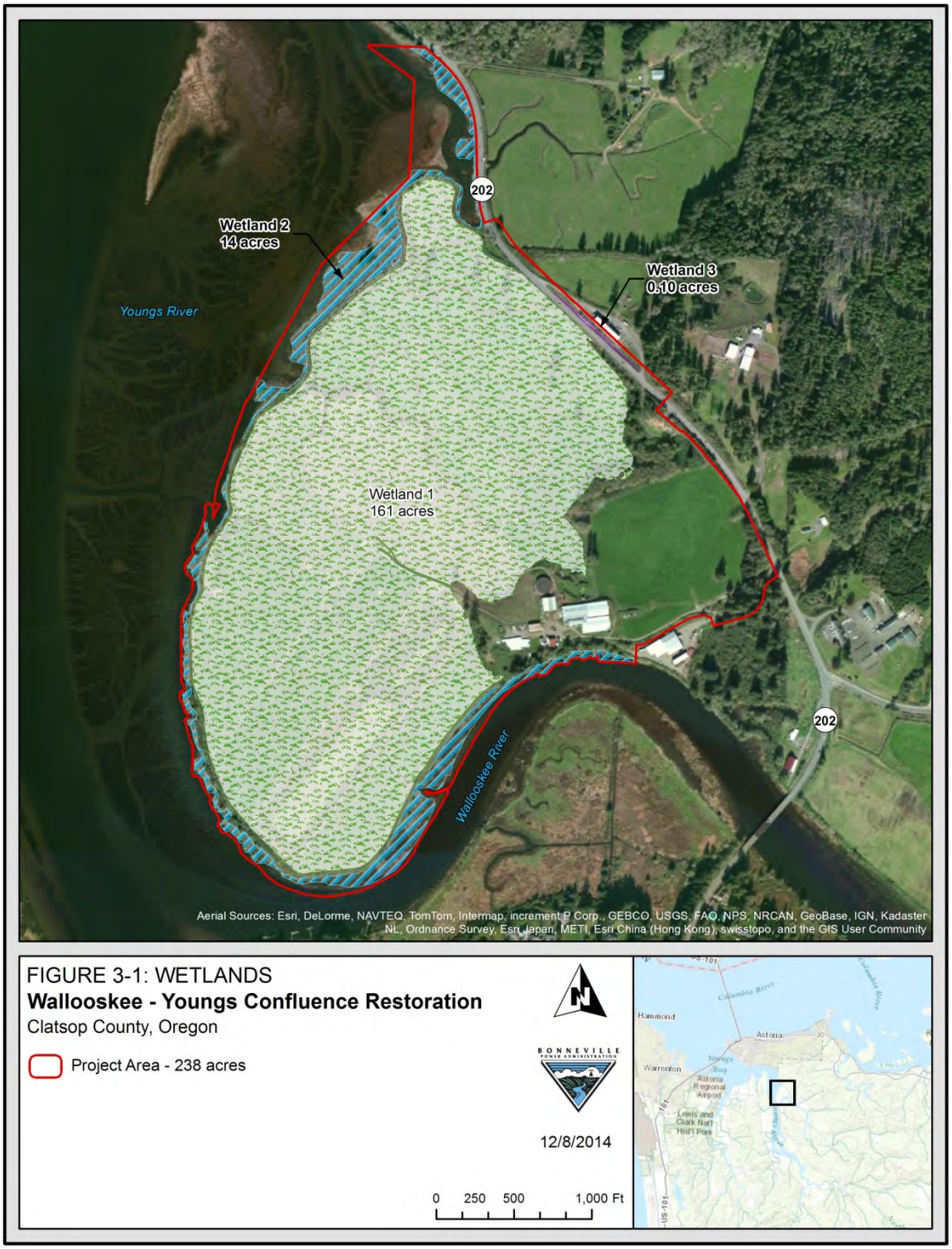
Wetland 1 encompasses most areas of the pasture grass-dominated, levee-protected floodplain located southwest of OR 202 lying within the levee and below 8.5 feet in elevation. The exception is the 12- to 14-foot-wide compacted gravel, unvegetated road prism of Farm Lane that does not meet the wetland criteria. Though the levee-protected floodplain is partially drained by a network of drainage tiles and ditches, soil saturation due to a high groundwater table is present for sufficient duration to support wetland conditions. Soils within the this wetland meet the Corps wetland hydric soil indicator criteria for soils showing depletions, indicating that iron in the soil has been removed or transformed by processes that take place during inundation or saturation. Soil surface layer colors are very dark grayish brown, depleted matrix colors are dark grayish brown to gray with common to many prominent yellow-red redoximorphic features occurring as soft masses and pore linings, and common depletions. Wetland 1 consists largely of a pasture grass–dominated, palustrine emergent vegetation community as described under *Levee-Protected Floodplain- Freshwater Marsh* in Section 3.3.1.1. Wetland 1 is a 161-acre seasonally flooded, levee modified, palustrine emergent freshwater wetland.

Wetland 2

Wetland 2 encompasses the tidal marsh described in Section 3.3.1.1 and is located on the riverward side of the levee below 8.5 feet in elevation. The wetland is separated from Wetland 1 by the tide gates and levee, and slopes down to un-vegetated mudflats within the Youngs and Wallooskee river channels. Wetland 2 receives hydrology from daily tidal fluctuations and river flows and is influenced by minimal salinity. Soils within this wetland meet the Corps wetland hydric soil indicator criteria for soils showing depletions due to inundation or saturation. Soil surface layer colors are very dark grayish brown, depleted matrix colors are dark grayish brown to gray with common to many prominent redoximorphic features. Wetland 2 is comprised of a native tidal marsh vegetation community as described in Section 3.3.1.1. Wetland 2 is a 14-acre, regularly flooded intertidal emergent estuarine wetland with persistent vegetation.

Wetland 3

Wetland 3 is a very narrow, linear wetland occupying the bottom of the ditch along the OR 202 right-of-way. This ditch was excavated in an historical wetland to drain the highway and, though the soils have been disturbed by construction of the highway embankments, the area supports emergent wetland vegetation and appears to experience soil saturation during most months of the year. Wetland 3 is approximately 0.1-acre of seasonally flooded, excavated, palustrine emergent freshwater wetland.


Wetland 2
14 acres
Wetland 3
0.10 acres
Youngs River
Wetland 1
161 acres
202
202
Wallooskee River
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 3-1: WETLANDS
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
Columbia River
US-101

3.3.2 Environmental Consequences – Action Alternative

Construction and long-term effects to vegetation and wetlands would be avoided, minimized, or mitigated to the greatest extent possible. The mitigation measures that would be taken are outlined in Section 2.1.4 and in Table 2-2, as well as described below.

3.3.2.1 Construction Effects

Construction effects include short-term effects associated with removal or disturbance of vegetation that may persist for months to years following construction, until vegetation communities adequately recover. Construction would result in impacts to vegetation throughout the construction process (9-12 months).

Vegetation Communities

Approximately 52 acres of pasture grass-dominated levee-protected floodplain areas are expected to be directly affected by ditch-filling, channel excavation and modification work, road disking, and filling activities to create topographic diversity via placement of soil in areas that have subsided. These actions would result in vegetation disturbance (removal via excavation and burial); however, these areas of disturbance are vegetated with non-native species and would be seeded with a native floodplain seed mix, described in Section 2.1.2.2, as final grades are reached. Vegetation would also be removed from an additional 16 acres associated with the creation or modification of tidal channel networks, and 6 acres of levee associated with lowering and breaching. These areas would not be revegetated as the tidal channels would be frequently inundated, making active planting difficult, and the remaining levee is intended to erode over time. It is expected that the portions of the seeded area and all of the non-native pasture community would exhibit a complete dieback following the introduction of the tidal regime into the site. The conversion of the vegetation community from pasture to tidal marsh is expected to occur over a period of months as vegetation colonizes the site. Vegetation communities would shift to tidal species within the first year and continue to develop over time as vegetation communities mature and accretion increases marsh elevations (Figure 2-4). There is the risk of invasive species colonizing the site. However, the mildly saline conditions that would be introduced would not be conducive to regrowth of species (i.e. reed canarygrass and blackberry) intolerant to those conditions.

The transition of nearly 163 acres of non-native pasture grass community to native tidal marsh following construction is considered a moderately beneficial effect to vegetation communities, as native vegetation would be self-sustaining once established and would support fish populations. The conversion would support the project goals and restore a community type that has been greatly reduced in the Columbia River estuary.

Tidal marsh vegetation communities on the riverward side of the levee are expected to be temporarily affected by levee grading work, which may result in minor vegetation disturbance (removal/trampling) in areas directly adjacent to the levee. Excavation of a pilot channel in the mudflat would also result in vegetation disturbance. It is expected that the tidal marsh vegetation would make a full recovery within months of construction. Furthermore, the Proposed Action would effectively expand the extent of the tidal marsh and thus increase the natural ecological functions of

the tidal marsh vegetation communities as they colonize areas inside the levee. For these reasons, effects to tidal marsh vegetation resources would be low.

Some upland vegetation communities would also be altered by the project. Vegetation along the levee would first be removed through grubbing and then subjected to daily inundation in areas breached or lowered below elevation 8.5 feet (mean higher high water). It is expected that tidal marsh vegetation would colonize the lowered levee replacing the invasive species–dominated community. The alder communities along the upland knoll would be preserved. Following invasive species control within the 10-acre riparian buffer the area would be seeded with the riparian buffer seed mix and planted with native shrubs and trees to provide riparian habitat and large wood recruitment to the restored tidal marsh (described in Section 2.1.2.2). Because of the low, degraded habitat quality of the affected upland vegetation communities and improvements made through controlling invasive weeds and planting native vegetation, environmental effects to upland resources would be low.

Vegetation communities around OR 202 would be temporarily disturbed during the project implementation. It is expected that these communities would become vegetated within a few months of the construction. Effects to this area are also considered low due to the low-grade habitat quality of the area and temporary nature of the impact. Effects on vegetation would be mitigated using the following measures as described below:

- Inspect equipment and wash as needed to remove vegetation and dirt clods that may contain invasive weed seeds.
- Plant the riparian corridor with the riparian seed mix and with native shrubs and trees.
- Seed disturbed areas with the floodplain seed mix following construction to the final grades.

The conversion of pasture grass-dominated farmland to tidal marsh is also discussed in Sections 3.6.1. and 3.6.2.2.

Special Status Plants and Habitats

Strategy habitats (estuaries, freshwater wetlands, and riparian areas) in the project area would be temporarily impacted as described in the vegetation community section above. Field surveys conducted by qualified biologists did not identify any NHP listed plants or strategy species within the project area. It is not expected that construction of the project would cause impacts to special status plants and there are no state or federally listed plant species occurring within 5 miles of the project area. Due to these reasons, effects to special status plants and habitat during construction would be low.

Invasive Plants

Invasive species are expected to decrease in cover as a result of the vegetation clearing during construction. Invasive species control would be achieved via mechanical (levee) and chemical control (tidal marsh outside of the levee), planting of native species, and implementation of a hydrological regime unfavorable to most invasive species in the project area. Existing invasive species present in the tidal marsh outside the levee are limited to less than 1-acre and would be controlled with

herbicide during construction to help prevent these invasive species from colonizing the restored area.

Potential for the project to spread invasive species is low and the following mitigation measures would be used to help prevent the spread of invasive species due to construction:

- Mechanically remove invasive species on the project site.
- Treat invasive species with herbicide approved for use in upland or aquatic environments and do so in accordance with label requirements and applicable ESA coverage.

Upon the completion of the restoration, a management plan would be developed by the Cowlitz Indian Tribe to guide stewardship actions within the site. Typical invasive species stewardship actions that are likely to occur included include:

- Detect, map, and treat invasive species.
- Treat invasive species by mechanical or chemical means; all herbicide application would be conducted in accordance with label requirements and the Biological Assessment approved by NMFS, or via other appropriate ESA compliance mechanisms obtained at a later date.
- Mow and implement other vegetation management.

Wetlands

Wetlands would be temporarily impacted by construction activities in the pasture grass-dominated levee-protected floodplain, tidal marsh, and ditch vegetation communities. Construction impacts would occur within Wetland 1 related to vegetation disturbance from construction of tidal channels, filling ditches, and construction of the infrastructure protections. However, the wetland would ultimately increase in function as it forms a contiguous tidal marsh across the project area after construction is complete. Project implementation would convert 1.31 acres of Wetland 1 to uplands through the development of the BPA low-water access road (0.31-acre) and landings (1-acre). The low-water access road and landings have been designed to avoid and minimize impacts to wetland functions by maintaining hydrologic connectivity across the site, and minimizing the infrastructure footprint. Approximately 0.45 acres of Wetland 1 would be affected by riprap application during the ODOT infrastructure improvement work. In addition, 9,202 linear feet of ditches within Wetland 1 would be filled and restored to tidal marsh.

Disturbance to Wetland 2 from excavation of the pilot channel within the wetland would be minimized to the extent practicable by using a work platform made of steel plates or wood mats for equipment. Approximately 6 acres of uplands would be converted to tidal wetland by lowering the existing levee (which is made of locally sourced soil) to 8.5 feet in elevation to develop wetland conditions.

Wetland 3 would be graded, partially filled, and converted to a flat bottom, low gradient ditch designed to provide water quality treatment. Wetland 3 would be fully converted to “non-wetland ditch”, but the water quality functions would be retained by the broad, flat, low gradient ditch design that would allow for the filtering of runoff.

Wetland functions and values would be greatly improved by the project through the restoration of tidal process and function; the overall area of wetlands and waters would also be increased through lowering the levee to re-establish wetlands in that area. The long-term benefits of the large contiguous area of tidal marsh wetlands that would be restored by the project offset the short-term impacts to wetlands associated with the construction and loss of 1.76-acre of wetland associated with infrastructure protection. Due to these reasons, effects to wetlands during construction would be low.

Effects to wetlands would be mitigated using the measures as described below:

- Time construction and manage water to provide dry working conditions to the greatest extent possible.
- Utilize steel plates or wood mats when heavy equipment access into Wetland 2 is required.

3.3.2.2 Long-Term Effects

Modifications in the hydrological regime would create conditions unsuitable for some vegetation communities and alter the wetland types. Overall, the function of the tidal marsh vegetation community would be increased.

Vegetation Communities

The Proposed Action would convert the pasture grass-dominated levee-protected floodplain to a tidal marsh vegetation community with associated tidal channels. Vegetation communities would shift with exposure to tidal conditions; pasture grasses would begin to die off and tidal species would colonize the site. The site's existing elevations are suitable for marsh species colonization, and transition to tidal species is expected to occur within 1 year (Thom et al. 2012). This conversion would increase the extent and function of the tidal marsh, currently limited to a small area outside of the levee, providing an ecological lift within the project area and surrounding waters. Additional information on the length of time and successional patterns associated with the restoration project are included in the vegetation discussion in Section 2.1.2.2. Impacts to farmland are not included here; they are discussed in the land use section. Upland vegetation communities would also be altered by the project. Upland vegetation along the levee would transition from an invasive plant dominated community to tidal marsh; the riparian buffer area would be planted and long-term stewardship would be provided to ensure the continual development of native plant communities. Long-term effects to vegetation resources would be low.

Wetlands

Wetland function and area would increase as a result of the project. Site restoration would result in higher quality wetlands with increased habitat diversity and access, increased water quality function due to increased biomass for nutrient uptake, and increased water quantity functions due to flood storage capacity. Natural processes would be restored and the site managed to attain typical estuarine conditions. As the restored tidal wetland continues to evolve, habitat complexity and water quality functions would continue to increase (Figure 2-4). The water quality functions of Wetland 3, which occurs within the OR 202 roadside ditch and would be converted to an upland ditch, would be retained. In the long-term, wetland functions and values at the site would be

expected to increase and the long-term effects of the project to the wetland area within the site would be beneficial and moderate.

Invasive Plants

A concerted effort to control invasive plant species as a function of the Proposed Action would continue through long-term site stewardship by the Cowlitz Indian Tribe. Invasive species management would be achieved via mechanical and chemical control methods as outlined in the management plan. The planting of native species and implementation of a hydrological regime unfavorable to most invasive species in the project area during construction would also contribute to the long-term management of invasive species. Potential for the Proposed Action to spread invasive species is low.

Special Status Plants and Habitats

Strategy habitats in the project area (estuaries, freshwater wetlands, and riparian areas) would be affected in the long-term. The freshwater wetland area would be converted to estuarine area (tidal marsh) and the quality of riparian area would be improved through invasive species removal and replanting with native species.

There would be no long-term negative effects to special status plants as a result of the Proposed Action as there are no state or federally listed plant species occurring within 5 miles of the project area. There would be an increased area for the potential colonization of the special status species spurless jewelweed, Fassett's water-starwort, and water pimpernel as a result of the Proposed Action. Long-term effect to special status species would be low.

3.3.3 Environmental Consequences – No Action

Under the No Action Alternative, the vegetation would continue to provide low quality habitat. Invasive species would not be managed and would likely continue to spread throughout the project area. The extent of wetlands would remain the same. Wetland 1 would continue to export sediment and nutrients through the tide gates and degrade water quality. The ability of the wetland to provide flood storage capacity would not be increased. Construction related impacts to wetlands would not occur and the wetland functions and values would not be improved. An unplanned levee breach is possible, which would potentially lead to the development of a tidal wetland with degraded functions due to the presence of the ditch network and limited connectivity to the Wallooskee and Youngs rivers.

3.4 Water Resources

The following section describes water resources and the potential construction-related and long-term effects of the Proposed Action at the site and on nearby properties. Because the project area is located at the confluence of the Wallooskee and Youngs rivers, it is subject to both freshwater river flow and saltwater tides. Factors driven by these water resources, such as erosion and sedimentation patterns along the Youngs and Wallooskee rivers are also analyzed in this chapter. The analysis area for water resources includes the lower Wallooskee and Youngs rivers and Youngs Bay.

3.4.1 Affected Environment

3.4.1.1 Hydrologic Characteristics

The Wallooskee and Youngs rivers begin in the Coast Range near Saddle Mountain and flow north into Youngs Bay. The Wallooskee River drains an area of approximately 24 square miles. The larger Youngs River has a drainage area of over 95 square miles and includes two major tributaries, the South Fork Klaskanine River and North Fork Klaskanine River. Youngs Bay is approximately 7 miles from the Columbia River's entrance into the Pacific Ocean and consequently is influenced by strong tidal cycles.

The project area is subject to variable river flows and tidal fluctuations. The Coast Range generally develops very little snow pack, and consequently rainfall is the primary source of freshwater flow for the Wallooskee and Youngs rivers (E&S Environmental Chemistry 2000). High flows in the two rivers correspond to the period of the year with the highest rainfall (November through March). Corresponding peak flood flows for the Wallooskee and Youngs rivers entering Youngs Bay are estimated at approximately 1,000 cubic feet per second (cfs) and 9,500 cfs, respectively. Conversely, the rivers have very low flow conditions during the summer and early fall periods when there is relatively little rainfall. Freshwater inflows during this dry period of the year range from 2 to 4 cfs for the Wallooskee River and 28 to 36 cfs for the Youngs River (Environmental Science Associates [ESA] 2014).

Due to the relatively small river drainage areas and the project area's proximity to the Pacific Ocean, freshwater contributions from the Youngs and Wallooskee rivers have a relatively small hydrologic influence compared with the saltwater tidal flows from the Pacific Ocean and freshwater contributions from the Columbia River (ESA 2014). Tidal flows and high water levels from the Columbia River move through Youngs Bay and upstream into the Youngs and Wallooskee rivers, particularly during high tides. Due to the reduction of Columbia River flood flows resulting from regulation of upstream dams and the large tidal volumes resulting from the proximity to the Pacific Ocean, tidal flows are the primary cause of both low and high water levels within the study area. Average tide levels vary through daily and monthly cycles and the influence of high flows from the Columbia River, with the normal falling roughly within approximately 0.8 feet to 10 feet (ESA 2014).

3.4.1.2 Floodplains

The Federal Emergency Management Agency (FEMA) has assessed the floodplain for the area and determined the 100-year base flood. The base flood elevation is 12 feet and the FEMA-mapped 100-year floodplain covers the entire portion of the project area and portions of OR 202 adjacent to the area (ESA 2014). Since floods at the site are predominately driven by tides, historical levee-overtopping flood events are short-lived and episodic, lasting for only several hours (ESA 2014). The largest recorded flood event in the area occurred in 1983 and reached an elevation of 12.6 feet (ESA 2014), however, the highest measured tide for this site has been determined to be 11.9 feet.

3.4.1.3 Water Quality

Water quality concerns in Youngs Bay and the Wallooskee and Youngs rivers include temperature, sediment, dissolved oxygen, phosphorous, nitrogen, and bacteria (ODA 2011; Oregon DEQ 2010; E&S Environmental Chemistry 2000). The combination of timber harvest and agricultural activities have reduced streamside vegetation and warmed streams. Roads, particularly gravel-surfaced roads, have contributed to sediments entering the river system and deposition of sediments in Youngs Bay (E&S Environmental Chemistry 2000). Agricultural activities, including dairy operations and cattle grazing, can contribute phosphorous, nitrogen, and bacteria to the river systems and the bay (ODA 2011).

There has been an assessment of water quality within the project area that includes a comparison to adjacent tidal wetlands. Based on data collected within the existing channels, phosphorous and nitrogen levels were much higher and dissolved oxygen concentrations were lower in comparison to data collected in the adjacent tidal wetlands (Kidd, Portland State University, pers. comm. 2014). The site's history as a dairy farm with cattle grazing and the deposition of fecal matter throughout the pasture areas probably account for the higher levels of phosphorous and nitrogen; the decreased dissolved oxygen concentrations are most likely a result of accelerated biological processes from this nutrient loading. Water temperature measurements were nearly identical for both the site and the adjacent tidal wetlands, which is probably a result of the similar solar shading patterns for both areas. The channels on the site and the adjacent tidal wetlands generally do not have larger trees and shrubs that provide shade; thus the temperature patterns are similar.

3.4.2 Environmental Consequences – Action Alternative

This evaluation focuses on the potential effects to water resources (for example, impacts to hydrology, floodplains, and water quality) that could result from implementation of the project, both from short-term construction activities and long-term restoration.

3.4.2.1 Construction Effects

Construction effects to water resources as a result of project construction would include impacts to hydrology and water quality.

Initial construction activities behind the levee, before levee breaching, would result in changes to hydrology. Draining selected channels during construction through the tide gates would contribute some additional freshwater to the Youngs and Wallooskee rivers, but at such very low quantities that

it would not affect the bay's water surface elevations. Similarly, construction of the OR 202 protection measures would result in modifying the drainage that flows under the highway into the site by routing it into the nearby Crosel Creek drainage. Construction would be completed during periods of low precipitation, resulting in minimal additional flow or sediment contribution to Crosel Creek.

These initial construction activities behind the levee would result in changes to water quality. There would be some additional export of phosphorous, nitrogen, and organic matter from the channels into the Youngs and Wallooskee rivers during construction, but at such very low quantities that would not substantially raise levels of these nutrients or lower dissolved oxygen concentrations. At the time of construction, the site would not have been grazed for more than three years, and there would have been periodic haying of the site, both of which would reduce the quantity of phosphorous, nitrogen, and plant material that would be exported through the channels during construction.

Construction activities would generate turbidity within the site as ground disturbance, channel excavation, ditch filling and other fill placement occurs and sediment within the site is mobilized. Construction of the levee breaches would result in a temporary pulse of sediment in the Youngs and Wallooskee rivers. While runoff from these temporarily disturbed areas could also contribute turbid water to the on-site ditch and channel network, on-site water management (pumping to adjacent plugged ditches and/or discharging to grassy pasture areas, with a filter sock as necessary) is planned to prevent discharge of sediment-laden water from the site, to the maximum extent practicable, and to maintain any discharge within allowable limits. Additional erosion and sediment control BMPs such as seeding, straw mulching, or straw wattle installation would also be implemented to stabilize disturbed surfaces as they reach finish grade to prevent sediment from entering the on-site ditch and channel network. Breaches are expected to generate only minor amounts of turbidity due to the relatively low velocities predicted through these openings. Levee breaching would be conducted on an incoming tide to direct turbid waters into the site to the extent possible.

Mitigation measures for construction related impacts to hydrology and water quality included:

- Stage construction equipment (when feasible) and supplies within designated staging areas or in an upland area away from the floodplain, wetland, and other water resources.
- Store construction fuel within designated staging areas and refuel equipment within staging areas before departing for the work location. In order to minimize heavy equipment travel through the site and along the levees refueling may occur at the work location via pickup truck with appropriate containment devises. Ensure a spill kit is available, and lay disposable absorbent mat "diapers" on the ground beneath equipment during the fueling operations.
- Use water trucks to apply water as needed to the construction area for dust control.
- Wash all heavy equipment before it is delivered to the job site. Heavy equipment working below the mean higher high water elevation must be steam or pressure washed to ensure it is free of any chemical, soil, and other potential contaminants. Inspect machinery daily for fuel or lubricant leaks.
- Minimize the size of the disturbance area, to the extent practicable.
- Use sediment barriers such as silt fences, straw matting/bales, or straw wattles, as necessary to intercept any surface flow that might transport sediment to the Youngs or Wallooskee

rivers. Install straw wattles or other filtration BMP along the downgradient toe of stockpiles adjacent to the borrow ditches to be filled.

- Monitor, inspect, and daily log erosion control measures and site water management - features. -
- Track, seed, and mulch disturbed areas immediately as they reach finish grade.
- Cover disturbed areas if they are expected to remain inactive for more than 5 days. Seeding would take place only when brought to finish grade.
- Final-grade the channel excavation spoils placed in the levee-protected floodplain to - promote sheet flow and prevent the creation of rills and gullies. -
- Phase construction activities so that all infrastructure protection and restoration work is done within the levee-protected floodplain prior to levee breaching.
- Sequence levee breaching with the tide cycle to minimize erosion potential and direct soils mobilized by water into the site.
- Protect and retain native riparian/wetland vegetation, to the extent practicable, by depicting these communities on construction drawings and avoiding construction activities in these areas. Protect and retain native riparian/wetland vegetation, to the extent practicable by depicting these communities on construction drawings and avoiding construction activities in these areas.
- Retrofit hydraulically-operated equipment that may work below the mean higher high water with fluids approved for work in aquatic environments.

The BMPs identified above would be implemented to limit the effects of the construction related impacts to water resources. Localized impacts to hydrology are expected to occur as drainage patterns within the site are altered but are not expected to negatively impact the project site or surrounding area. Short-term water quality impacts are expected as a result of construction. Turbid waters leaving the site would be mitigated to the maximum extent practicable through the use of appropriate BMPs during construction and it is expected that turbidity inputs to adjacent waters would normalize over time as the site establishes appropriate vegetation for the restored site conditions. Impacts to water resources as a result of construction of the Proposed Action are considered moderate.

3.4.2.2 Long-Term Effects

The Delft3D hydrodynamic model (Deltares 2011) was used to evaluate how the Proposed Action and levee breaches could affect flooding, erosion, and sedimentation within the project area and adjacent Youngs and Wallooskee rivers. The evaluation found that, because the larger wetland area created by levee breaching and restoration results in additional floodplain capacity and conveyance for flood flows within the Youngs and Wallooskee rivers, the Proposed Action is expected to reduce the local flood profile and associated flooding (ESA 2014). The Proposed Action would result in minor reductions in floodplain water levels within the project area and adjacent areas during a 100-year base flood. No increases in base flood water levels were predicted for the area analyzed, including for adjacent levee systems and areas east of OR 202. Reductions in base flood levels range up to approximately 0.1 feet. Reduced water levels, though minor, would result from the increased hydrologic connectivity of flood conveyance associated with the restored floodplain (ESA 2014).

Overall in the modeling, Wallooskee River flow velocities, under a range of flow levels including extreme flood conditions, did not vary significantly between existing and restored conditions. The levee breaches and restoration actions either resulted in very small or no change in the river's velocity and bank erosion potential. The small changes in river flow dynamics and velocities under restoration suggest that the potential for bank scour, increased erosion, and sediment deposition in the vicinity of the project area is not likely to change much after restoration. Specifically, the adjacent levees and river bank areas, including those on the south bank of the Wallooskee River, and the pile-supported floating dock south of the project area do not appear to be at risk for either increased erosion or sediment deposition in the river channel after implementation. In addition, the Proposed Action is not expected to change flow volumes or depths on the Wallooskee River or other adjacent rivers (ESA 2014).

With the exception of changing the drainage along OR 202, the Proposed Action would not modify drainages or stormwater inputs to areas adjacent to the site. The Proposed Action would change the flow path of an upland area and a small area of OR 202 that currently drains to the site via a ditch along OR 202 and a cattle pass that crosses beneath the highway. The cattle pass would be permanently plugged and abandoned to prevent tidal waters from extending under OR 202 and onto other areas beyond the highway; ODOT has agreed to this approach. The existing ditch would be regraded to convey stormwater northwesterly along the highway past the cattle pass, through a new culvert installed beneath a driveway, and would then discharge to the Crosel Creek basin. The culvert would discharge onto a rock-lined energy dissipation pad, and at high flows could cross overland for approximately 15 feet through a neighboring pasture before entering an existing ditch network that flows into Crosel Creek. This change is not expected to have a negative impact on the downstream creek system because the increase in flow is small (approximately 1% to 3%), and the existing ditch network joins the creek at the upstream side of the tide gate under OR 202, immediately before the creek discharges to the Youngs River. Additionally, the swale would be designed to improve water quality treatment of the highway runoff due to the flat bottom geometry, a shallower longitudinal slope, and a densely vegetated soil surface.

ODOT has reported that OR 202 in the vicinity of Crosel Creek, immediately north of the project area, is impacted by high water levels, wave run-up, and/or debris accumulation at least annually. This section of highway is directly adjacent to the Youngs River. The existing levee provides some protection for the section of OR 202 along the Proposed Action area from high tides, associated flood waters, and wind-wave energy, though the extent of this protection is unclear. The pasture behind the levee, OR 202 in the vicinity of and north of the project, and the entire Crosel Creek floodplain is mapped in the FEMA 100-year hazard zone.

The Proposed Action would include highway protection measures to generally match, if not improve, the existing protection level provided to the highway by the levee. To accomplish this, the Proposed Action would include the following protective measures:

- Approximately 800 linear feet of steel sheet pile wall.
- Approximately 280 linear feet of a short (5 foot high) berm on top of existing fill.
- Riprap protection of existing fill slopes along the highway.
- An interior drainage swale located between the highway and the sheet pile wall to collect and convey highway runoff.

The interior drainage swale is proposed to drain to a culvert that would convey highway runoff to the same rock-lined energy dissipation pad identified earlier for the regarded ditch culvert outfall. The small area of highway pavement contributing additional drainage to the Crosel Creek basin is not expected to have a negative impact on the downstream creek system because the increase in flow is very small (less than 1%), and the existing ditch network joins the creek at the upstream side of the tide gate under OR 202, immediately before the creek discharges to the Youngs River. The swale would be designed to improve water quality treatment of the highway runoff due to a flat bottom geometry, a shallower longitudinal slope, and a densely vegetated soil surface.

The swale would also collect and convey water that overtops the wall due to waves impacting the wall during infrequent, extreme environmental conditions. A combination of high tide and high wind would result in secondary wave-related overtopping of the sheet pile wall between a 50- and 100-year storm. OR 202 outside of the project area would be overtopped during these extreme events. Additional flow directed to the Crosel Creek basin on those rare occasions would be very small (less than 1%), which is not expected to have a negative impact on the downstream creek system for the reasons identified above. The Proposed Action would not increase flood related effects on OR 202 of the Crosel Creek drainage.

Water quality on the site would quickly return to levels found within normal tidal wetland areas. Sediment delivery to the Youngs and Wallooskee rivers; export of phosphorous, nitrogen, and organic matter; and dissolved oxygen concentrations would be restored to levels seen within adjacent wetland areas within two years after construction (Kidd, Portland State University, pers. comm. 2014). The water quality function of the restored tidal marsh would be greater than the existing condition as the site would function to filter and remove pollutants such as nitrogen and phosphorus from the water through productive vegetation growth and sediment accretion (Thom et al. 2012).

Long-term impacts to water resources as a result of the implementation of the Proposed Action are considered low and beneficial since the Proposed Action would restore flood plain connectivity and provide long-term water quality benefits once the site stabilizes and vegetation communities transition to reflect their native conditions.

3.4.3 Environmental Consequences – No Action

Under the No Action Alternative the floodplain capacity would not be increased water quality would not be improved. Current hydrology, floodplain, and onsite degraded water quality conditions would continue. Pasture grasses would dominate the vegetation community, and sediment delivery to the Youngs and Wallooskee rivers and export of phosphorous, nitrogen, and organic matter would remain near current levels. There is the potential that the existing levee would erode over time and, without the OR 202 protection measures proposed in the Action Alternative, the highway and BPA transmissions towers, and potentially the land beyond it, would be subject to more frequent flooding.

Under the No Action Alternative the levee would continue degrading due to lack of maintenance and natural processes. It would likely breach during a high water or storm event, causing waters to flood

into the site and potentially impact OR 202 through flooding, wind-wave erosion, and debris accumulation. If the levee was left to deteriorate and not immediately fixed, impacts to OR 202 would occur on an increasingly more frequent and severe basis until the remnant levee degraded to the point of providing no floodplain protection. Stormwater runoff from adjacent surfaces of OR 202 would continue to flow directly onto the floodplain. Stormwater from the highway would receive essentially no passive treatment during high tides because the runoff would discharge directly to surface waters adjacent to the highway without passing through filtering vegetative cover. Some treatment would occur during lower tides due to longer travel paths through vegetative cover, but additional treatment would not occur once the runoff entered the existing ditch and channel network. If the levee were to self-breach safe and reliable access to the transmission system would not be maintained, due to flooding, and would put the transmission system and access to power at risk.

3.5 Fish and Wildlife

The following sections describe fish and wildlife, including migratory birds and special-status species, as well as wildlife habitat, and address both the temporary and permanent effects of the construction and maintenance of the Proposed Action.

3.5.1 Affected Environment

The analysis area applied to determine the effect of the Proposed Action on fish and wildlife species and habitat all special-status fish and wildlife species and habitats that occur within a 5-mile radius of the exterior limit of the project area boundary.

3.5.1.1 Fish

The Youngs and Wallooskee rivers provide habitat for a variety of native and nonnative fish species. Species present could potentially include thirteen federally-listed salmon and steelhead, the federally-listed Pacific eulachon, green sturgeon, and two species of concern (Table 3-2). Bull trout critical habitat is designated along the lower Columbia River to the Pacific Ocean; however, bull trout have not been documented in the Youngs and Wallooskee rivers. Other salmon and steelhead runs not federally-listed under the ESA may also be present within the Columbia River and tributaries and are included in Table 3-2. The Youngs Bay Watershed Assessment (E&S Environmental Chemistry 2000) documented 77 species of fish representing 28 families as occurring within the Columbia River estuary and tributaries; however, timing, abundance and distribution within each tributary may vary.

Designated Critical Habitat. There is no Designated Critical Habitat for listed salmon or steelhead species within the project area; however, critical habitat is located 1.5 to 5 miles downstream for listed salmon steelhead and bull trout. Critical habitat for the Pacific eulachon and green sturgeon has been designated to the uppermost extent of tidal influence within the Youngs and Wallooskee rivers (including Youngs Bay) for both species. Designated critical habitat for these species does not extend to the landward side of the levee.

Table 3-2 Fish Species with the Potential to Occur in the Project Vicinity

Common Name	Scientific Name	Federal Status	State Status
Lower Columbia River coho	*Oncorhynchus kisutch*	Threatened	Endangered
Columbia River chum	*O. keta*	Threatened	Critical
Lower Columbia River Chinook	*O. tshawytscha*	Threatened	Critical
Lower Columbia River steelhead	*O. mykiss*	Threatened	Critical
Upper Willamette River Chinook	*O. tshawytscha*	Threatened	Critical
Upper Willamette River steelhead	*O. mykiss*	Threatened	Vulnerable
Middle Columbia River steelhead	*O. mykiss*	Threatened	Critical
Upper Columbia River steelhead	*O. mykiss*	Threatened	-
Upper Columbia River spring Chinook	*O. tshawytscha*	Endangered	-
Snake River steelhead	*O. mykiss*	Threatened	Vulnerable
Snake River spring/summer Chinook	*O. tshawytscha*	Threatened	Threatened
Snake River fall Chinook	*O. tshawytscha*	Threatened	Threatened
Snake River sockeye	*O. nerka*	Endangered	-
Bull Trout	*Salvelinus confluentus*	Threatened	Sensitive Critical
Green sturgeon	*Acipenser medirostris*	Threatened	_
Pacific eulachon	*Thaleichthys pacificus*	Threatened	_
Coastal Cutthroat trout	*O. clarki clarki*	Species of Concern	Vulnerable
Pacific Lamprey	*Lampetra tridentata*	Species of Concern	Vulnerable

Common Name	Scientific Name	Federal Status	State Status
Sculpin (several species)	*Cottus spp.*	N/A	_
Northern Pikeminnow	*Ptychocheilus oregonensis*	N/A	_
Longnose Dace	*Rhinichthys cataractae*	N/A	_
Redside Shiner	*Richardsonius balteatus*	N/A	_
Sandroller	*Percopsis transmontana*	N/A	_
Leopard Dace	*Rhinichthys falcatus*	N/A	_
Stickleback	*Gasterosteus spp.*	N/A	_

Source: StreamNet fish distribution data query (2014); Youngs Bay Watershed Assessment (2000); USFWS Official Species List for the Project Area; personal observation of Sage Jensen (2013).

The project area is within the estuary of the Youngs and Wallooskee rivers, a mildly saline mixing zone providing refugia for resident and migrating fish. The project area is within Reach A of the Columbia river estuary. Reach A includes the estuary entrance, Bakers Bay, and Youngs Bay, and is dominated by subtidal habitat, with the highest salinity in the estuary. Historically the estuary entrance was a high-energy area of natural fluvial land forms with a complex of channels, shallow water, and sand bars (NMFS 2011). Youngs Bay has a broad floodplain that historically was abundant in tidal marsh and swamp habitat. Youngs Bay and the lower reaches of the Wallooskee and Youngs rivers have been altered through diking and flood control structures, creating pasture areas disconnected from tidal influence and fish access. A survey of estuarine habitats found that only 10 percent of the historical tidal marsh area remains in Youngs Bay (Thomas 1983).

The impact of these land alterations, combined with changed tidal flow interaction, is particularly significant to salmon and steelhead, which are heavily dependent on estuarine environments during rearing and outmigration. Alterations in land management have reduced and changed the sources of base-level food production, blocked habitat availability and connectivity to other portions of the estuary, and limited habitat diversity and complexity (NMFS 2011). Loss of off-channel floodplain habitats prevents access to rearing, feeding, and refuge habitats critical for salmon and steelhead survival. Habitat forming and maintenance processes, such as sediment dynamics, tidal flow, and food web support, are also affected by simplifications of the fluvial and estuarine systems.

Prior to the building of the levee in the early 19th century the project area provided important shallow water and intertidal refugia for dozens of fish species, including federally-listed salmon and steelhead, throughout the year. Once the levee was completed and the tidal marsh converted to levee-protected farmland the shallow water habitat and intertidal refugee was lost. Shallow water intertidal floodplains offer critical refugia from deeper water flow, seasonal turbidity, and larger predatory species. The emergent vegetation within these inundated floodplains also provides important feeding and rearing grounds for juvenile fish species, including salmon and steelhead. The

federally-listed salmon and steelhead in the project area, and that may use the project area, are discussed below.

There is the potential for federally-listed upper river salmon and steelhead to be present in, and use, the estuarine environments of the lower reaches of the Youngs and Wallooskee river systems (as outmigrating smolts). Upper river stocks include the upper Willamette, Middle Columbia, upper Columbia, and Snake River salmon and steelhead species. Ocean-bound upriver salmon and steelhead smolts spend less time in the estuary than Lower Columbia River stocks before entering the ocean (NMFS 2009, ODFW and NMFS 2011). Upper river juvenile steelhead, for example, spend less residence time in the shallow parts of the estuary than other salmon and steelhead (ODFW and NMFS 2011). The characteristics of the Columbia River plume and the deeper channels of the estuary are more important to smolt survival (NMFS 2009). However, all upper river salmon and steelhead stocks are discussed below. Though unlikely, individual outmigrants from upper river stocks may be affected by the Proposed Action if they are present during construction. It is more likely that populations of upper river stocks would benefit from the proposed restoration action, through an overall increase in estuarine habitat availability and food resource production.

Lower Columbia River Chinook salmon. Oregon Chinook salmon populations have a wider range of life history diversity than coho or chum salmon, with variation in the date, size, and age of ocean entry; in ocean migration patterns; and in adult migration season, spawning habitat selection, age at maturity, and size (E&S Environmental Chemistry 2000). Generally, subyearling juveniles rear in coastal streams for three to six months and in estuaries for one week to five months. Nearly all Oregon coastal Chinook salmon enter the ocean during their first summer or fall. Columbia River fall Chinook show a similar rearing pattern, but Columbia River spring Chinook spend one summer and one winter in freshwater. With a life history of prolonged freshwater rearing, juvenile Chinook tend to move downstream from the area where they hatched into larger rivers such as the Youngs during their first spring. Migration to the ocean occurs during the second spring, with variation in outmigration depending on amount and timing of spring runoff and variations amongst populations.

Lower Columbia fall Chinook evolutionarily significant unit (ESU) enter the Columbia River as mature fish, spawning in tributaries in the lower watershed. These fish are distinctive from other Columbia River Chinook in that they are mature upon river entry, have a short migration more similar to coastal populations, and spawn soon after arrival at spawning grounds (E&S Environmental Chemistry 2000). Their ocean distribution is more southerly, along the Oregon coast, than the north coast populations extending along the coasts of Washington and British Columbia. Chinook in the Youngs Bay watershed are primarily from hatchery stock rather than the depleted wild stock (E&S Environmental Chemistry 2000). Naturally spawning Chinook are still in the lower Clackamas River and in small streams such as Plympton Creek, Gnat Creek, Big Creek, Clatskanie River, Hood River, and in the Youngs Bay and Columbia Gorge areas (E&S Environmental Chemistry 2000). Fall Chinook populations in the Lower Columbia watershed are reduced from historical numbers, with much of the natural spawning dominated by hatchery fish from the 11 Oregon and Washington fall Chinook hatcheries in the Lower Columbia (E&S Environmental Chemistry 2000).

Lower Columbia River coho salmon. Returning adult coho salmon may spend several weeks to several months in freshwater before spawning, depending on the distance they migrate to reach their spawning grounds. Juveniles normally spend 6 to 12 months in freshwater, although they may remain for one or two extra years in the coldest rivers in their range (E&S Environmental Chemistry 2000). They migrate to the ocean in the spring, generally one year after emergence, as silvery smolts about 4 to 5 inches long. Most adults mature at three years (E&S Environmental Chemistry 2000).

Coastal wild coho production has declined from approximately 1.5 million fish in the early 1900s to approximately 70,000 in the 1990s (E&S Environmental Chemistry 2000). Wild populations still exist in most coastal watersheds and in the Clackamas and Sandy rivers in the Columbia River watershed and may exist in some other tributaries of the lower Columbia River watershed. Remaining wild coho populations generally spawn and rear in small, low gradient (less than 3 percent) tributary streams, although rearing may also take place in lakes where available (E&S Environmental Chemistry 2000). Spawning surveys in the Youngs River by ODFW show a diminishing population of wild coho (E&S Environmental Chemistry 2000).

Coho occur in the Lewis and Clark, Youngs, Klaskanine, and Wallooskee rivers. The Lewis and Clark River is the river most heavily used by coho, with distribution extending into the headwaters where a natural waterfall limits passage. Coho use the lower portions of the South Fork Klaskanine, up to the 25 foot waterfall that limits upstream migration. Coho use both the Wallooskee and Little Wallooskee rivers. It is believed that coho in the Youngs Bay watershed are hatchery returns.

Columbia River chum salmon. The majority of the life span of chum salmon is spent in the marine environment. Adults typically enter freshwater natal streams ready to spawn, spawning and dying within two weeks of arrival at freshwater. Most spawning runs are over a short distance within low gradient segments of tributaries close to the mouth of streams, although exceptionally long runs occur in some watersheds in Asia and Alaska (E&S Environmental Chemistry 2000). Adults are poor jumpers and are restricted to spawning areas below barriers, including minor or temporary barriers that are easily passed by other anadromous species such as steelhead. Juveniles do not tolerate prolonged exposure to freshwater and migrate to estuarine waters promptly after emergence (E&S Environmental Chemistry 2000). A brief residence in an estuarine environment appears to be important for smoltification, a series of physiological changes in which juvenile salmon and steelhead adapt from living in fresh water to living in saltwater, and for early feeding and growth. Movement offshore occurs when the juveniles reach full saltwater tolerance and have grown to a size that allows them to feed on larger organisms and avoid predators.

For spawning and rearing, chum salmon require low gradient, gravel-rich, barrier-free freshwater stream reaches and productive estuaries. In Oregon, most chum mature at three to four years. Chum salmon populations are depressed in Oregon subwatersheds of the lower Columbia River. Small numbers of scattered adults still exist, and might provide the means for naturally recolonizing the area if conditions permitted. However, due to human-caused conditions and a larger percentage of higher gradient stream reaches, the Oregon side of the Lower Columbia has lower production of chum.

Currently, chum salmon are limited in the Youngs Bay watershed. Historically, chum salmon existed in almost all of the subwatersheds in the Youngs Bay watershed including the Lewis and Clark, Youngs, Klaskanine, and Wallooskee rivers (E&S Environmental Chemistry 2000).

Lower Columbia River steelhead salmon. Most coastal steelhead in Oregon are winter-run fish, and summer steelhead are present only in a few large watersheds. The subspecies (*O. mykiss irideus*) includes a resident phenotype (rainbow trout) and an anadromous phenotype (coastal steelhead). Steelhead have a varied life history with freshwater and saltwater rearing strategies and various adult spawning migration strategies. Juvenile steelhead may rear for one to four years in freshwater before their first migration to saltwater. They live in saltwater for one to three years. Adult steelhead may enter freshwater on spawning migrations year-round if habitat is available, but generally spawn in the winter and spring. Adults that enter between May and October are called summer-run fish. These fish stay several months in freshwater before spawning. Adults that enter between November and April are called winter-run fish. These fish are more sexually mature when they enter freshwater and stay for a shorter time before spawning. Rainbow trout spawn at three to five years, generally in the winter or spring, although some populations vary from this pattern. Both rainbow and steelhead may spawn more than once. Steelhead attempt to return to saltwater between spawning runs. If there are natural steelhead populations in the Youngs Bay watershed, juveniles would be expected to utilize the estuarine environments, including the project area.

Upper Willamette River Chinook salmon. This ESU includes naturally spawned and hatchery spring-run Chinook salmon originating from the Clackamas River, and from the Willamette River and its tributaries above Willamette Falls. Upper Willamette River Chinook salmon are genetically strongly differentiated from nearby populations, and are considered one of the most genetically distinct groups of Chinook salmon in the Columbia River Basin (ODFW and NMFS 2011). Adult upper Willamette River spring Chinook begin appearing in the lower Willamette River in January, with fish entering the Clackamas River as early as March. The majority of the run ascends Willamette Falls from late April through May, with the run extending into mid-August. Spawning occurs from August to October with fry emergence from December to March. Juvenile rearing in freshwater habitats averages 12 to 14 months, and juveniles may spend several weeks in the estuary. Many Chinook salmon rear in the upper Willamette River subbasins through the year and migrate from March through May, during their second spring as yearling smolts. These fish generally move quickly through the Willamette River mainstem and over Willamette Falls towards the Columbia, entering the estuary April to July (ODFW and NMFS 2011).

Upper Willamette River steelhead trout. This distinct population segment, or DPS, includes naturally spawned anadromous winter-run steelhead originating below natural and manmade impassable barriers from the Willamette River and its tributaries upstream of Willamette Falls, to and including, the Calapooia River. The majority of the upper Willamette River steelhead return to freshwater January through April, pass Willamette Falls from mid-February to mid-May, and spawn in March through June, with peak spawning in late April and early May (ODFW and NMFS 2011). Compared to spring Chinook, upper Willamette River steelhead typically migrate further upstream and can spawn in smaller, higher gradient streams and side channels (ODFW and NMFS 2011). Juvenile steelhead rear in headwater tributaries and upper portions of the sub-basins for one to four

years (most often two years). Then, as smoltification occurs in April through May, they migrate quickly downstream through the mainstem Willamette River and Columbia River estuary and into the ocean, where they spend one to four years (more often two years).

Middle Columbia River steelhead trout. The spawning range of the Middle Columbia River steelhead DPS extends over an area of approximately 35,000 square miles in the Columbia plateau of eastern Washington and eastern Oregon. This DPS includes naturally spawned anadromous steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Wind and Hood rivers (exclusive) to and including the Yakima River, excluding fish originating from the Snake River basin. It also includes hatchery fish. This DPS is widely varied in run timing, and includes a summer and winter run. Because juvenile steelhead spend less time in the shallow parts of the estuary than other salmon and steelhead, the characteristics of the Columbia River plume and the deeper channels of the estuary are more important to their survival (NMFS 2009).

Upper Columbia River steelhead trout. This DPS includes naturally-spawned anadromous steelhead originating below natural and manmade impassable barriers from the Columbia River and its tributaries upstream of the Yakima River to the U.S.-Canada border. This DPS also includes steelhead from six artificial propagation programs. The life-history patterns of upper Columbia River steelhead are complex. Adults return to the Columbia River in the late summer and early fall; most migrate relatively quickly up the mainstem to their natal tributaries. A portion of the returning run overwinters in the mainstem reservoirs, passing over the upper mid-Columbia dams in April and May of the following year (Good et al. 2005). Spawning occurs in the late spring of the calendar year following entry into the river. Juvenile steelhead spend one to seven years rearing in freshwater before migrating to the ocean. Outmigrating smolts are predominately age two and age three juveniles (Good et al. 2005). Most adult steelhead return after one to two years in the ocean.

Upper Columbia River spring Chinook. This endangered ESU includes naturally-spawned spring-run Chinook salmon originating from Columbia River tributaries upstream of the Rock Island Dam and downstream of Chief Joseph Dam (excluding the Okanogan River subbasin). This ESU includes Chinook from six artificial propagation programs. Upper Columbia River Spring Chinook spend less time in the estuary as smolts than the upper Columbia River summer/fall run (NMFS 2011).

Snake River steelhead trout. This DPS includes naturally-spawned anadromous steelhead originating below natural and manmade impassable barriers from the Snake River basin, as well as steelhead from six artificial propagation programs. Although they pass through the estuary on their way to the ocean, Snake River juvenile steelhead are less likely to frequent the shallow parts of the estuary, preferring deeper estuarine waters. Therefore, the characteristics of deeper channels, and the Columbia River plume, may be more important in determining their survival (NMFS 2011).

Snake River spring/summer Chinook. This ESU includes naturally-spawned spring/summer-run Chinook salmon originating from the mainstem Snake River and the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins. It also includes spring/summer-run Chinook salmon from 11 artificial propagation programs (NMFS 2014). Snake River Chinook are typically stream-type migrants, which spend limited time in the estuary.

Snake River fall Chinook. This ESU includes naturally-spawned fall-run Chinook salmon originating from the mainstem Snake River below Hells Canyon Dam and from the Tucannon River, Grande Ronde River, Imnaha River, Salmon River, and Clearwater River subbasins. This ESU includes fall-run Chinook salmon from four artificial propagation programs. Natural juvenile fall Chinook salmon in the Snake and Clearwater rivers have two life history strategies. "Ocean-type" fish migrate to the ocean in their first summer of life as subyearlings, but "reservoir-type" fish delay seaward migration during the summer, and some overwinter in reservoirs before continuing their migration the following spring as yearlings. Earlier emerging fish produced in the Snake River tend to adopt the ocean-type life history whereas many of the later emerging fish from the Clearwater River tend to adopt the reservoir type life history (Tiffan et al. 2012).

Snake River sockeye. A stream-type salmon, Snake River sockeye move relatively quickly through the estuary; however, because of their small numbers, recent data is sparse (NMFS 2014). It may be inferred that these outgoing migrants, like PIT-tagged Chinook salmon and steelhead tracked from below Bonneville Dam to the mouth of the Columbia River, pass through the Columbia River estuary within two to three days (NMFS 2014). Snake River sockeye may stay in the Columbia River plume before moving to the ocean, however, limited information exists regarding this potential habitat use (NMFS 2014).

Green sturgeon. Green sturgeon are long-lived, slow-growing fish, and are the most marine-oriented of the sturgeon species. Green sturgeon do not mature until the age of 15 to 17 (NMFS 2014). Mature fish range from 4.5 to 7 feet, can weigh up to 350 pounds, and are long lived (60-70 years) (NMFS 2014). This species exists along the west coast of Mexico, the United States, and Canada. Green sturgeon are the most broadly distributed, wide-ranging, and most marine-oriented species of the sturgeon family. The green sturgeon ranges from Mexico to at least Alaska in marine waters, and bays and estuaries up and down the west coast of North America (NMFS 2014).

The actual historical and current distribution of where this species spawns is unclear, as green sturgeon make non-spawning movements into coastal lagoons and bays in the late summer to fall, and because their original spawning distribution may have been reduced by harvest and other human effects (NMFS 2014). Green sturgeon use both freshwater and saltwater habitat. The species spawn in deep pools or "holes" in large, turbulent, freshwater river mainstems (NMFS 2014). Specific spawning habitat preferences are unclear, but green sturgeon likely broadcast eggs over large cobble substrates, but range from clean sand to bedrock substrates (NMFS 2014). It is likely that cold, clean water is important for proper embryonic development. Adults live in oceanic waters, bays, and estuaries when not spawning. Green sturgeon forage in estuaries and bays ranging from California (San Francisco Bay) to British Columbia.

Green sturgeon are believed to spend the majority of their lives in near the shores of oceans, bays, and estuaries. Younger green sturgeon live in fresh water, with adults returning to freshwater to spawn when they are about 15 years old, and more than 4 feet long. Spawning is believed to occur every two to five years (NMFS 2014). Adults typically migrate into fresh water beginning in late February. Spawning occurs from March-July, with peak activity from April-June (NMFS 2014) with the females produce 60,000 to 140,000 eggs (NMFS 2014). Juvenile green sturgeon spend a few

years in fresh and estuarine waters before they leave for saltwater, then disperse widely in the ocean. Green sturgeon feed on shrimp, mollusks, and amphipods, as well as small fish (NMFS 2014).

Green sturgeon are believed to spawn in the Rogue River, Klamath River Basin, and the Sacramento River. Spawning appears to occur in the Umpqua River, but rarely. This species is not documented to spawn in the Columbia River, but does exist within the Columbia and larger tributaries such as the Youngs River, and also Youngs Bay. While the green sturgeon may be present in Youngs Bay during parts or all of the year, it is unlikely that these deep-water dwelling fish would use the shallow water estuarine environment of the project area, therefore it is likely that the project would have no effect on this species.

Pacific eulachon. Pacific eulachon (commonly called smelt) are a small anadromous species once abundant in the lower Columbia River. Eulachon are endemic to the eastern Pacific Ocean, ranging from northern California to southwest Alaska and into the southeastern Bering Sea. In the continental United States, most eulachon originate in the Columbia River Basin. Other areas in the United States where eulachon live include the Sacramento River, Russian River, Humboldt Bay and several nearby smaller coastal rivers; and the Klamath River in California; the Rogue River and Umpqua Rivers in Oregon; and infrequently in coastal rivers and tributaries to Puget Sound, Washington (NMFS 2014).

Eulachon typically spend three to five years in saltwater before returning to freshwater to spawn from late winter through mid-spring. They fertilize eggs in the water over sand or coarse gravel river bottoms. After fertilization, the eggs sink and adhere to the river bottom (NMFS 2014). Most eulachon adults die after spawning. Eulachon eggs hatch in 20 to 40 days. The larvae are carried downstream and dispersed by estuarine and ocean currents shortly after hatching. Juvenile eulachon move from shallow nearshore areas to mid-depth areas. Within the Columbia River Basin, the major and most consistent spawning runs occur in the mainstem of the Columbia River as far upstream as Bonneville Dam, and in the Cowlitz River. Eulachon live near the ocean shore, in waters up to 1,000 feet in depth, except for the brief spawning runs into their natal streams (NMFS 2014). Spawning grounds are typically in the lower reaches of larger snowmelt-fed rivers with water temperatures ranging from 39 to 50° Fahrenheit (NMFS 2014).

Eulachon abundance has considerable year-to-year variability. However, nearly all spawning runs from California to southeastern Alaska have declined in the past 20 years, especially since the mid-1990s. From 1938 to 1992, the median commercial catch of eulachon in the Columbia River was approximately 2 million pounds, but from 1993 to 2006, the median catch had declined to approximately 43,000 pounds, representing a nearly 98 percent reduction in catch from the prior period (NMFS 2014). NMFS has found that eulachon by-catch in ocean fisheries is the primary human contribution to eulachon decline (Gustafson et al., 2008).

There are not significant numbers of Pacific eulachon in Youngs Bay and Youngs Bay is not a known spawning area for this species. Tides may carry drifting larvae into Youngs Bay and the project area and transient adults may stray into Youngs Bay. In discussions with NMFS regarding Pacific eulachon, NMFS indicated that the project would warrant a no effect determination for this species.

3.5.1.2 Wildlife

Terrestrial wildlife habitat types within the 5-mile analysis area include the following ecological systems and land cover classes, as defined by the Northwest National Gap Analysis Program (Aycrigg et al. 2013): hay/pasture and irrigated agriculture; harvested/ regenerating forest; low, medium, and high intensity developed lands (including the cities of Astoria and Warrenton); lowland mixed hardwood-conifer forest; mesic-wet Douglas-fir-western hemlock forest; hyper-maritime Sitka spruce forest; lowland riparian forest; broadleaf landslide forest; coastal sand dune and strand; and extensive wetlands, including wet prairie, freshwater emergent marsh, tidal salt and brackish marsh, dune wetland, and conifer swamp.

Open grassy areas, bordered by mixed deciduous and coniferous forests within and next to the project area, provide limited habitat for a number of wildlife species. These include large, grazing mammals such as elk (*Cervus Canadensis*), Columbian black-tailed deer (*Odocoileus hemionus columbianus*), small mammals such the Townsend's mole (*Scapanus townsendii*), Townsend's vole (*Microtus townsendii*), and deer mouse (*Peromyscus maniculatus*). The area also provides hunting ground for predatory mammals such as the long-tailed weasel (*Mustela frenata*), gray fox (*Urocyon cinereoargenteus*), red fox (*Vulpes vulpes*), and coyote (*Canis latrans*); and raptors such as bald eagles (*Haliaeetus leucocephalus*), hawks (*Accipiter* spp.), and owls, including long-eared (*Asio otus*), great horned (*Bubo virginianus*), western screech (*Megascops kennicottii*), and barn (*Tyto alba*). Clatsop County maps major and peripheral deer and elk range in the northeast section of the 5-mile analysis area (but not occurring within the project area). Ditches and remnant tidal channels on the site provide habitat for beaver (*Castor Canadensis*), the introduced and invasive nutria (*Myocastor coypus*), muskrat (*Ondatra zibethicus*), mink (*Neovison vison*), and river otter (*Lontra Canadensis*) as well as a range of waterfowl and shorebirds including ducks, geese, gulls, great blue herons (*Ardea herodias),* and spotted sandpipers (*Actitis macularius*). Open water habitat can also support amphibians, such as frogs and salamanders.

Wildlife species observed during site visits include elk, river otter, beaver, harbor seals (*Phoca vitulina*), nutria, frogs, bald eagle, great blue heron, gulls, red-tail hawk (*Buteo jamaicensis*), northern harrier (*Circus cyaneus*), killdeer (*Charadrius vociferous*), American coot (*Fulica americana*), teal (*Anas spp.),* mallard (*Anas platyrhynchos)*, common raven (*Corvus corax*), American crow (*Corvus brachyrhynchos*), and dark-eyed junco (*Junco hyemalis*). It is assumed that many other passerine bird species common to the estuary, as well as agricultural and human occupied areas nearby, may also, at times, use the site.

Migratory Birds

Many bird species migrate seasonally from breeding to feeding grounds. Neotropical migratory birds are those that use habitats within the U.S. and Canada during spring and summer breeding and nesting season, but winter in Mexico and South America. Many other birds winter along the temperate Pacific coast. The project area lies within the Lower Columbia River Focus Area as defined by the Pacific Coast Venture, a partnership among public and private agencies to promote bird conservation. This area provides key wintering habitat for waterfowl, resting and staging areas for a wide variety of migratory neotropical species, and supports some of the highest concentrations of

bird numbers in the Pacific flyway (Oregon Wetlands Joint Venture 1994). Priority habitat in the Focus Area includes lowland deciduous riparian forest and tidal marsh and freshwater floodplain wetlands. The U.S. Fish and Wildlife Service (USFWS) has identified Youngs Bay as a high priority for protection of waterfowl habitat (Oregon Wetlands Joint Venture 1994). The project area features low-grade modified freshwater wetland areas and a small area of intact tidal wetland, which may provide limited habitat for migratory and wintering birds.

Special Status Species

Information on special status wildlife species was obtained from ORBIC and from USFWS. Data was obtained from ORBIC on November 19, 2013 and October 8, 2014 for the Official Species List from USFWS for the 5-mile analysis area. The combined lists include state and federally listed species, Oregon NHP listed species, as well as any available associated population or habitat information.

No federally listed endangered or threatened wildlife species occur with the 5-mile analysis area; however, several species of concern are documented within the analysis area. The species of concern that occur within the analysis area, and ESA-listed species with the potential to occur in the analysis area, are listed below. None of these species have been observed within the project area.

Table 3-3. ESA Wildlife Species with the Potential to Occur in the Project Vicinity

Common Name	Scientific Name	Federal Status	Critical Habitat
Birds			
marbled murrelet	*Brachyramphus marmoratus*	Threatened	Final Designated
northern spotted owl	*Strix occidentalis caurina*	Threatened	Final Designated
streaked horned lark	*Eremophila alpestris strigata*	Threatened	Final Designated
western snowy plover	*Charadrius nivosus ssp. Nivosus*	Threatened	Final Designated
Mammals			
fisher	*Martes pennant*	Proposed Threatened	--
red tree vole	*Arborimus longicaudus*	Candidate	--

Source: USFWS Official Species List for the Project Area

ESA-Listed Wildlife

Suitable habitat for the streaked horned lark, USFWS threatened, potentially exists within the project area. In the lower Columbia River, this sub-species of the horned lark occurs sporadically throughout open farm fields, lowlands, sand islands and shorelines of the Columbia River and the lower reaches of the main tributaries. This resident species inhabits large tracts of open, sparsely vegetated fields, and areas of exposed sand and dirt, next to large bodies of water. In discussion with USFWS it was

determined that the project area provided some habitat elements attractive to this species, and therefore the species had the potential to occur within the project area (Cat Brown, pers. comm.). USFWS recommended protocol surveys for the streaked horned lark the year before construction to determine if this species was using the site. A qualified project biologist conducted surveys for this species in late April, early July and mid-July of 2014 within the project area. No streaked horned larks were observed. As of the final survey in mid-July, the project site had not been mowed in 2014, the tall thick grass likely making the site unattractive to this species. For these reasons the Proposed Action would be no effect to the streaked horned lark. Appendix A contains both the streaked horned lark and survey results.

Suitable habitats for marbled murrelets, northern spotted owls, western snowy plovers, fishers, and red tree vole are not in the project area.

State Sensitive Species

Both fringed myotis (*Myotis thysanodes*) and long-legged myotis (*Myotis volans*) have been observed 3 miles southwest of the project area. Both of these bat species are listed in Oregon as Sensitive-Critical (SV). *Myotis* species migrate widely throughout western North America, but are generally found in coniferous forested regions, establishing roosts in trees, rock crevices, fissures in stream banks and buildings, as well as caves and mines (Myers et al. 2013). The project area features little, if any, suitable roosting habitat for *Myotis* species.

White-footed vole (*Arborimus albipes*) has also been documented 3 miles southwest of the project area. This species forages in the trees, as well as on the ground, and is often found near fallen trees and small streams in coniferous and, especially, deciduous forest (Myers et al. 2013). The site may provide some habitat for white-footed voles; however, the sparse forest cover would present unfavorable conditions for them.

The purple martin (*Progne subis*), a neotropical migratory bird, has been documented approximately 2.5 miles southwest of the site. The purple martin is also listed in Oregon as SV. These birds eat insects and prefer open spaces near water, such as wetlands, which have many insects. They are adapted to human settlements and often found in urban and agricultural areas, as well as forest edges. While no purple martins have been reported using the site, the open space habitat situated near water may be attractive to the species.

Two American peregrine falcon (*Falco peregrinus anatum;* State Rank: SV) nesting sites are documented 3 miles northwest of the site. Peregrine falcons nest on cliffs or tall, human-made structure and generally prey on birds throughout a range of habitats (Myers et al. 2013). While the BPA transmission towers in the project area are tall human made structures they do not provide suitable nesting habitat due to the open framework of the steel structure. The site does not feature suitable structures for nesting and no sightings of peregrine falcons utilizing the site for hunting or nesting have been reported and the species was not observed during the 2014 bird surveys (Appendix A).

Several bald eagle (State Rank: SV) nesting and roosting sites are documented within the analysis area, with a roosting site documented 0.3 miles south of the project site. Bald eagles typically nest in

tall conifers, but may utilize tall human-made structures, and prefer areas near large water bodies in which to hunt for fish (Myers et al 2013). While bald eagles been observed within the project site, the site does feature limited suitable nesting structures for bald eagles, including limited tall coniferous trees. The large expanse of Youngs Bay, adjacent to the site, would make suitable hunting ground. Bald eagles have been sighted during site visits within the project area.

Natural Heritage Plan Listed Species

One terrestrial wildlife species exists within the 5-mile analysis area that is on List 4 of Oregon's NHP developed by the Natural Heritage Advisory Council to the State Land Board (Oregon Natural Heritage Program 2003). The lists include at-risk species of significant value as defined in the NHP. List 4, the "Watch List," includes populations that are rare but currently stable, or declining, but too abundant to be considered threatened.

The warty jumping-slug (*Hemphillia glandulosa*) has been documented at two locations within the analysis area, the closest occurring 2 miles northeast of the project area, the other 2.5 miles northwest of the project area. The slug inhabits moist, coniferous forest habitat throughout the Northern Oregon Coast Range into Washington and British Columbia. It prefers large decaying wood and deep litter and duff layers (Burke et al. 2005). As this habitat type does not exist on the site, it is highly unlikely that the warty jumping-slug occurs there.

Marine Mammal Protection Act Species
Several marine mammals species live year round in Youngs Bay and the Youngs and Wallooskee rivers. The Marine Mammal Protection Act protects all marine mammals.

Marine mammals would not be expected to occur within the proposed conditions of the site (shallow water habitat) but would be expected to continue to occur in the deeper waters of Youngs Bay and the Youngs and Wallooskee rivers. Harbor seals would be expected to occur in these waters year round. Two sea lion species, Steller sea lion (*Eumetopias jubatus*) and the California sea lion (*Zalophus californianus*), may periodically hunt for prey in waters surrounding the project area, but likely do not occur year round. The Steller sea lion (NMFS threatened) may occasionally occur in deeper waters of Youngs Bay and the Youngs and Wallooskee rivers. As the project does not involve work in deeper water, and would not create in-water noise (such as blasting or pile driving), the project would have no effect on this species.

3.5.2 Environmental Consequences – Action Alternative

The following sections describe any anticipated direct or indirect effects to fish and wildlife, their habitat, or special status species due to the implementation of the Proposed Action.

3.5.2.1 Fish

Although the Proposed Action would improve aquatic habitat conditions for salmon and steelhead over the long-term, short-term adverse effects to fish and other aquatic organisms may occur due to construction activities. A number of federally-listed, and two species of concern, fish have the potential to occur within the project area: Lower Columbia River Chinook, Lower Columbia River coho, Lower Columbia River steelhead, Columbia River chum upper Willamette River Chinook, upper

Willamette River steelhead, Middle Columbia River steelhead, upper Columbia River steelhead, upper Columbia River Spring Chinook, Snake River steelhead, Snake River spring/summer Chinook, Snake River fall Chinook, Snake River sockeye, green sturgeon, Pacific eulachon, coastal cutthroat trout, and Pacific lamprey.

3.5.2.1.1 Construction Effects

Project activities that may adversely affect aquatic species, including listed salmon and steelhead, include the following actions: seining (use of a vertical net to capture or remove fish) the ditch network to herd and remove aquatic species prior to construction; filling of linear ditches including the borrow ditch; stranding from pumping water within proposed channel work areas; excavation of new channels and modification of existing channels; removal of the tide gates and associated culverts; excavation of the levee; and construction related erosion and sedimentation.

The existing tide gates located on the levee that drain the site are aging, and may not seal completely during an incoming tide. Therefore, aquatic species may have access (or intermittent access) to the existing ditch network behind the levee. Stickleback were observed within the southern-most ditch behind the levee by the project biologist in 2013, suggesting that fish can pass through at least one of the tide gates. No fish presence surveys have been conducted behind the levee within the project area, therefore, presence of listed juvenile salmon and steelhead is unknown but assumed. All proposed in water activities may impact individuals present throughout the ditch networks during the time of construction.

Seining would be conducted by a qualified fisheries biologist on an outgoing tide immediately prior to construction activities in the existing tidal channels that may contain aquatic species. Seining is proposed to herd or evacuate fish into Youngs and Wallooskee rivers within the channel network. Seining would be used to direct fish towards the borrow ditch where they would have access to a tide gate and enter the adjacent waterways and/or a completed channel network. Hand netting of fish is proposed in areas that are too small or shallow for a seine, including hand netting of fish during initial drawdown of water via pumps. Seining is likely to harass and displace any aquatic species present, though mortality is expected to be limited. Fish and other aquatic species may become entrained in the nets and may require handling to remove. A minimum of two passes with a seine net would take place prior to construction within tidal channels.

Filling of the linear ditches and borrow ditch would occur from the upper-most point of the ditch towards the open tide gates. In linear ditches including the borrow ditch, aquatic species would be herded out of the work area by placing fill systematically from upstream towards the tide gate opening so that the disturbed aquatic area is minimized and aquatic species are pushed out towards the open tide gate. All existing natural channels with the potential for fish to occur would be seined as described above prior to filling. Any aquatic species remaining in the ditches during fill placement may be directly killed by fill material placement and/or sedimentation.

Excavation and grading of the proposed channel networks may require construction equipment within the channel bottom. For ease of equipment operation, working in the dry or low water is necessary. Generator powered pumps would be utilized to assist in dewatering the channels to

prepare for excavation. Seining would occur prior to pump use; however, some fish may remain in the channels. Pumps may directly entrain aquatic species and/or lead to stranding of aquatic life as the water is drawn down. A qualified fisheries biologist would be present during initial pumping operations to ensure stranding is minimized by netting and removing any trapped aquatic species. The pump itself would be housed in a wire mesh container to reduce velocity at the intake screen, using NMFS approved diameter mesh screens.

Excavation of the proposed channel network has the potential to cause direct mortality to fish and other aquatic organisms from equipment in the channel and sedimentation. Seining and netting prior to excavation would be expected to minimize direct mortality due to in-water construction; however, some mortality is anticipated to occur. Direct mortality would be low.

Removal of the tide gates would require excavation of the levee above the culvert at low tide. If water is present within the culvert or on either side of the levee at the culvert location, removal of the culvert and levee material in-water may directly impact aquatic species. In the case of working in the wetted channel width, seine nets would be placed on the levee, pulled back and set in place to effectively create an isolated in-water work area. Any aquatic species remaining within the work area may be killed by direct impact by equipment, removal of the culvert, or sedimentation. It is not anticipated that a large area of in-water work would take place for each of the 2 tide gate removal work areas, therefore, direct mortality from culvert removal is expected to be low.

Excavation or lowering of the levee is proposed to occur at low tide and no in-water work is anticipated to occur. However, material from the levee may calve or erode into the newly constructed channels, and aquatic species may be impacted through entombment or sedimentation. Direct mortality from this activity is expected to be low.

Critical habitat for the green sturgeon and Pacific eulachon has been designated in the Youngs and Wallooskee rivers waterward of the levee. The Proposed Action would work minimally within the limits of designated critical habitat for these two species in order to lower and breach the levee at points and conduct pilot channel excavation. Work would be conducted in the dry at low tide, having minimal effect on designated critical habitat for these two species. The Proposed Action would have no impact on the habitat availability or suitability for the green sturgeon or Pacific eulachon.

Construction effects on fish would be mitigated using BMPs as described below:

- Minimize the size of the disturbance area, to the extent practicable.
- Seine all existing relic tidal channels twice immediately prior to filling or excavation in order to remove fish and other aquatic species from work areas.
- Ensure all fish handling complies with NMFS protocols for handling listed fish species.
- Grade channels to avoid and minimize fish stranding during low tide.
- Place riprap and invasive vegetation material at the bottom of the borrow ditch prior to filling with native substrate material in order to allow for natural channel forming processes.
- In fish-bearing waters, conduct work within the in-water work window from June 1-October 15 and November 1-February 28 unless otherwise approved by ODFW and NMFS.
- Operate machinery for in-water work from the top of levee or within adjacent levee-protected floodplain, to the extent practicable. -

- Protect and retain native riparian/wetland vegetation, to the extent practicable, by depicting these communities on construction drawings and avoiding construction activities in these areas.
- Use a vibratory pile driver to reduce sound levels during sheet pile driving.
- Comply with any additional BMPs from the approved Biological Opinion.

3.5.2.1.2 Long-Term Effects

Construction related erosion, particularly expected and continued erosion and calving of the levee, may take several weeks to months in order to reach equilibrium. Therefore, effects of sedimentation on aquatic organisms may continue for several months, though it is anticipated that this impact would be localized and intermittent or take place during large storm events where background river turbidity is higher.

The conversion of the levee-protected floodplain to tidal marsh is expected to have a long-term direct and indirect beneficial effect to all salmon and steelhead species within this system, particularly for rearing juvenile salmon and steelhead and smolts of lower river stocks. Pasture grass is expected to quickly die under mildly saline inundation twice daily. It is anticipated that native sedge, rush and other native emergent vegetation would recolonize the area rapidly, providing refugia, slower backwater, and abundant forage opportunities for juvenile fish. This tidal marsh habitat type is limited in the Columbia River estuary, and post-construction use from resident fish as well as listed mainstem and lower river salmon and steelhead juveniles and outmigrating smolts is anticipated to be high.

The conversion of the pasture fields to tidal marsh environment is expected to have a substantial long-term beneficial effect to all salmon and steelhead within the action area from increased availability of intertidal and shallow water rearing and foraging habitat, increased prey base production, and availability of high water refugia within the new channels and newly accessed intertidal floodplain. Additionally, the increased detrital and aquatic insect inputs into the estuary are expected to benefit fish within the lower reaches of the Youngs and Wallooskee rivers and Youngs Bay.

No long-term effects are anticipated to designated critical habitat for the Pacific eulachon or green sturgeon.

3.5.2.2 Wildlife

There would be temporary and permanent effects on wildlife resulting from the Proposed Action. Disturbances would be direct or indirect, depending on the timing and location of the impact. There would be no impacts to ESA-listed wildlife as no federally listed terrestrial species are documented to occur within the project area. However, many resident and migratory wildlife reside within the project area and may be impacted or displaced, temporarily or permanently.

3.5.2.2.1 Construction Effects

Any wildlife within the project area would likely be displaced during construction. Construction associated with the Proposed Action could also result in short-term (temporary) effects on wildlife due to noise and presence of humans which may disturb feeding/breeding activities of wildlife within the immediate vicinity. Sedimentation from grading activities or spills of fuel, oil, or other toxic substances from construction machinery can cause injury to wildlife and affect habitat. To minimize noise effects, most construction is scheduled to occur during the summer, avoiding critical springtime breeding and nesting periods. Measures to prevent sedimentation/erosion and discharge of substances from construction machinery would be implemented as described in Section 2.1.4 and in Table 2.2. It is expected that construction impacts could be largely avoided with implementation of BMPs, thus short-term effects of the Proposed Action on wildlife and habitat would be low.

Non-nesting birds and larger mammals (such as deer, bear, elk and coyote) would be expected to leave the area during construction to avoid human presence and construction activity. If present during construction, any ground and low-lying nesting birds (including their eggs and nestlings), smaller ground-dwelling mammals, and reptiles and amphibians may be harmed or killed incidentally by construction equipment.

3.5.2.2.2 Long-Term Effects

Long-term (permanent) effects on wildlife may result from the conversion of diked and drained pasture habitat to tidal marsh habitat. The conversion of pasture grass to emergent vegetation, intertidal channels and mudflats would be expected to permanently displace most upland species to outside the project area. Large mammals, burrowing mammals, and bird species favoring upland grassland type habitats may find conditions unsuitable following the Proposed Action. However, semi-terrestrial mammals such as beaver, as well as amphibians, waterfowl, shorebirds, and insectivorous birds, would have expanded and much improved wetland and aquatic habitat for breeding and feeding. Species favoring riparian forest would benefit from the planting of native tree and shrub species in areas bordering the restored tidal wetland. Since the Proposed Action would increase the availability of high-quality wetland and riparian habitat and improve conditions for many species, the long-term effects to wildlife are considered to be low.

Migratory Birds

Priority habitat for migratory birds in the Columbia River estuary includes freshwater and tidal marsh wetlands. Wetlands within the project area are either small and fragmented or low-quality due to diking and ditching. While the Proposed Action would have some temporary construction impacts the overall effect of the project would be to increase and enhance wetland area and quality, returning functionality to a large area of levee-protected floodplain and providing high quality habitat for migratory waterfowl and shorebirds. For this reason, impact on migratory birds is considered to be low.

Special Status Species

The Proposed Action is expected to have no effect on purple martins or fringed and long-legged *Myotis*, which have not been documented utilizing the site. The Proposed Action would increase

wetland habitat which supports insect productivity, which would be favorable to these insectivorous animals.

The Proposed Action is expected to have no effect on peregrine falcons, white-footed voles, or warty jumping-slugs which have not been documented utilizing the site, nor is there suitable habitat to support them.

The Proposed Action is expected to have no effect on bald eagles. There are limited nesting opportunities for bald eagles within the project site in the form of scattered, isolated, and small groups of conifer trees. If these trees die as a result of exposure to tidal inundation, it is expected that the trees would remain standing for many years and nesting opportunities would not be reduced. The Proposed Action would increase, not lessen, the area of local open water habitat this species prefers for feeding.

3.5.3 Environmental Consequences – No Action

3.5.3.1 Fish and Wildlife

Under the No Action Alternative, the project area would continue to provide low-quality freshwater wetland habitat, a fragmented deciduous forest, and a limited amount of tidal marsh habitat, for fish and wildlife species. Fish would continue to have intermittent access through the tide gates to the low-quality habitat provided by the ditch network. Species composition would not improve and the non-native species would continue to limit the habitat complexity and value. The available shallow water habitat would continue to be limited to the narrow band of tidal marsh on the outer edge of the levee.

Under the No Action Alternative the levee would continue degrading due to lack of maintenance and natural processes. It would likely breach during a high water or storm event, causing waters to flood into the site. If the levees were left to deteriorate and not immediately fixed the site would transition to a tidal marsh with a degraded ditch network that would not provide limited habitat value. Fish would have access to at least part of the floodplain but would encounter the existing ditch network. This highly channelized ditch network, designed to move water, provides limited habitat for aquatic species and would not serve as ideal habitat for listed fish as the ditches are steeply dug and do not provide gradual sloping sides where aquatic plants and insects provide refugia and foraging opportunities. Erosion of the levee would be unpredictable, and could result in calving of material or accumulated deposits that could block fish passage or potentially trap or strand fish. Emergency actions may be conducted to fix levee breaches or protect infrastructure and would require in-water work and likely impact listed fish species through construction activities. Fish would also likely be isolated behind the levee network if emergency levee repair is conducted. Any emergency actions required for repair of the levee or infrastructure protection would likely have an adverse effect on listed fish species.

3.6 Land Use and Recreation

The following section describes land use and recreation and the potential construction-related and long-term effects of the Proposed Action on these resources. The analysis area for land use and recreation has been expanded to account for land uses adjacent to the project area and recreational opportunities that may occur in the general vicinity of the project site (e.g., the adjacent Youngs and Wallooskee rivers).

3.6.1 Affected Environment

3.6.1.1 Land Ownership

The majority of the project area is privately owned by Astoria Wetlands, LLC. A portion of OR 202 right-of-way, a public road maintained by ODOT, is located along the north and northeastern perimeter of the project area. A cattle pass that runs under OR 202 and routes runoff from the landward side of the highway to the project area is also maintained by ODOT. Several utility easements occur along the OR 202 right-of-way or bisect the project area. A conservation easement held by BPA encompasses the entirety of the restoration and upland conservation area. A private road, jointly owned by Astoria Wetlands, LLC, and the property owner south of the project area, would be used for construction and long-term access.

3.6.1.2 Land Use

The project area has been used as a dairy farm since the 1970s (Willamette Cultural Resources Associates 2013). Dairy farm operations were suspended in 2012 and the site's designation as a Confined Animal Feeding Operation was discontinued in 2013. The site is currently fallow pasture. There are 12 residential and farm-related structures located in the southeast corner of the project area (Figure 2-1). All of these structures are related to the property's use as a dairy farm and are vacant and in various stages of disrepair. As described in Section 2.1, several utilities, including gas, electrical, and communication lines, are also located within the project area. As noted above, OR 202 is located along the north and northeastern perimeter of the project area. Farm Lane, a private one-lane gravel road, leads southwest from OR 202 to the project area, where it connects to two other primitive dirt roads that are also used for farm and utility maintenance.

Land uses adjacent to the project area include open water uses associated with Youngs Bay and the Youngs and Wallooskee rivers and private commercial, residential, and open space uses to the south, east, and north, respectively.

The Clatsop County Comprehensive Plan (Clatsop County 2012) directs land use on private lands in Clatsop County. In general, land use proposals within the County must comply with the 19 county-wide goals identified in the Comprehensive Plan, as well as the provisions of the community plan applicable to the area. The Lewis and Clark, Youngs, and Wallooskee River Valleys Community Plan governs land uses within the project area (Clatsop County 2012).

The zoning and land-division ordinances needed to implement the Comprehensive Plan are provided in the *Clatsop County Land and Water Development and Use Ordinance* (Clatsop County 2013a) and the *Standards Document* (Clatsop County 2013c). In general, the *Land and Water Development and*

Use Ordinance provides the approval criteria county officials use to make decisions about whether and where a certain type of development may be allowed. Standards specific to how development is done are provided in the Standards Document.

The lands within the project area are zoned Exclusive Farm Use and Aquatic Natural (Clatsop County 2013a). Three zoning overlays also apply to the project area: Flood Hazard Overlay, Shorelands Overlay, and Mitigation Site Overlay (Clatsop County 2013a; Bunch, Clatsop County Community Development Department, pers. comm. 2013).

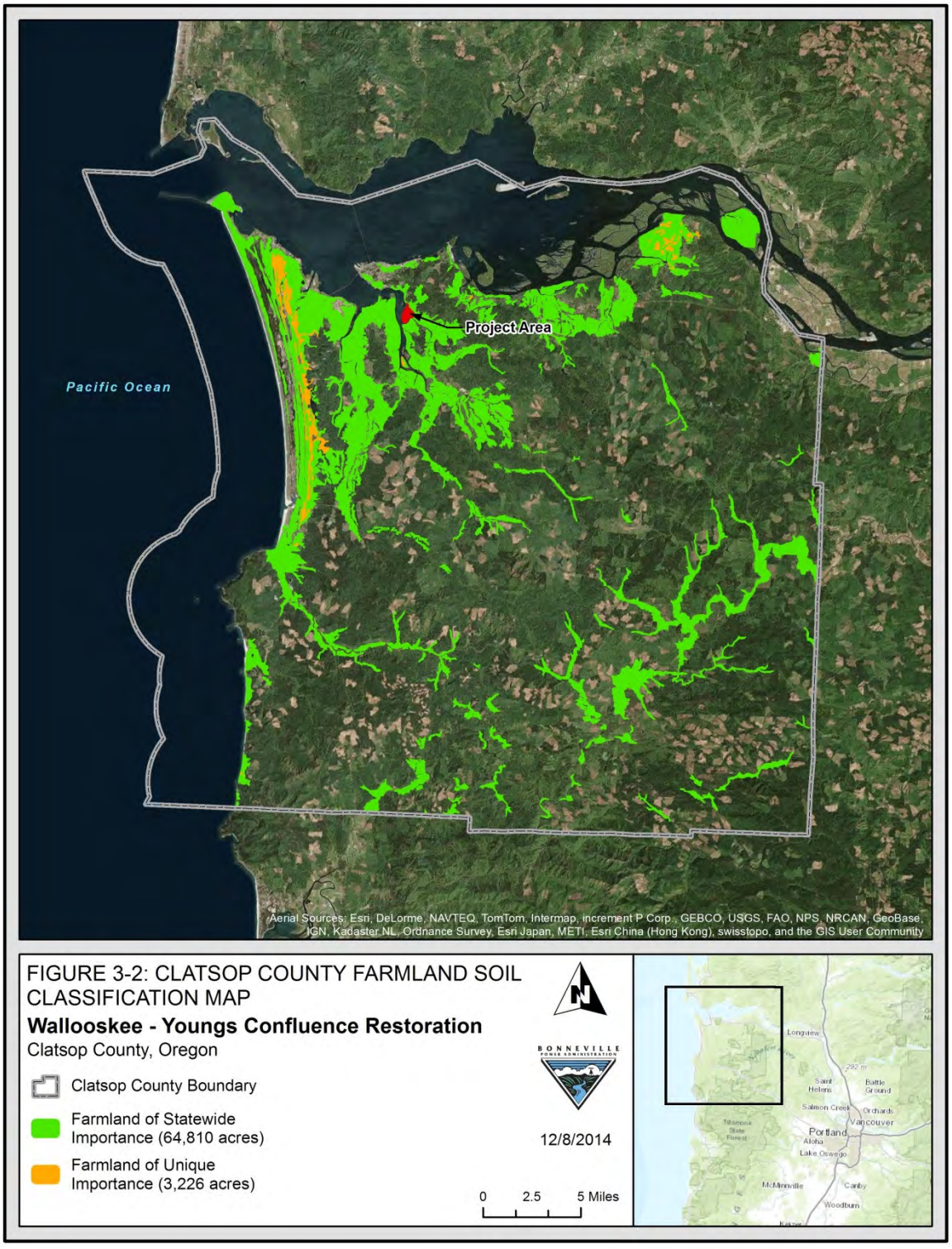
3.6.1.3 Farmland Classification

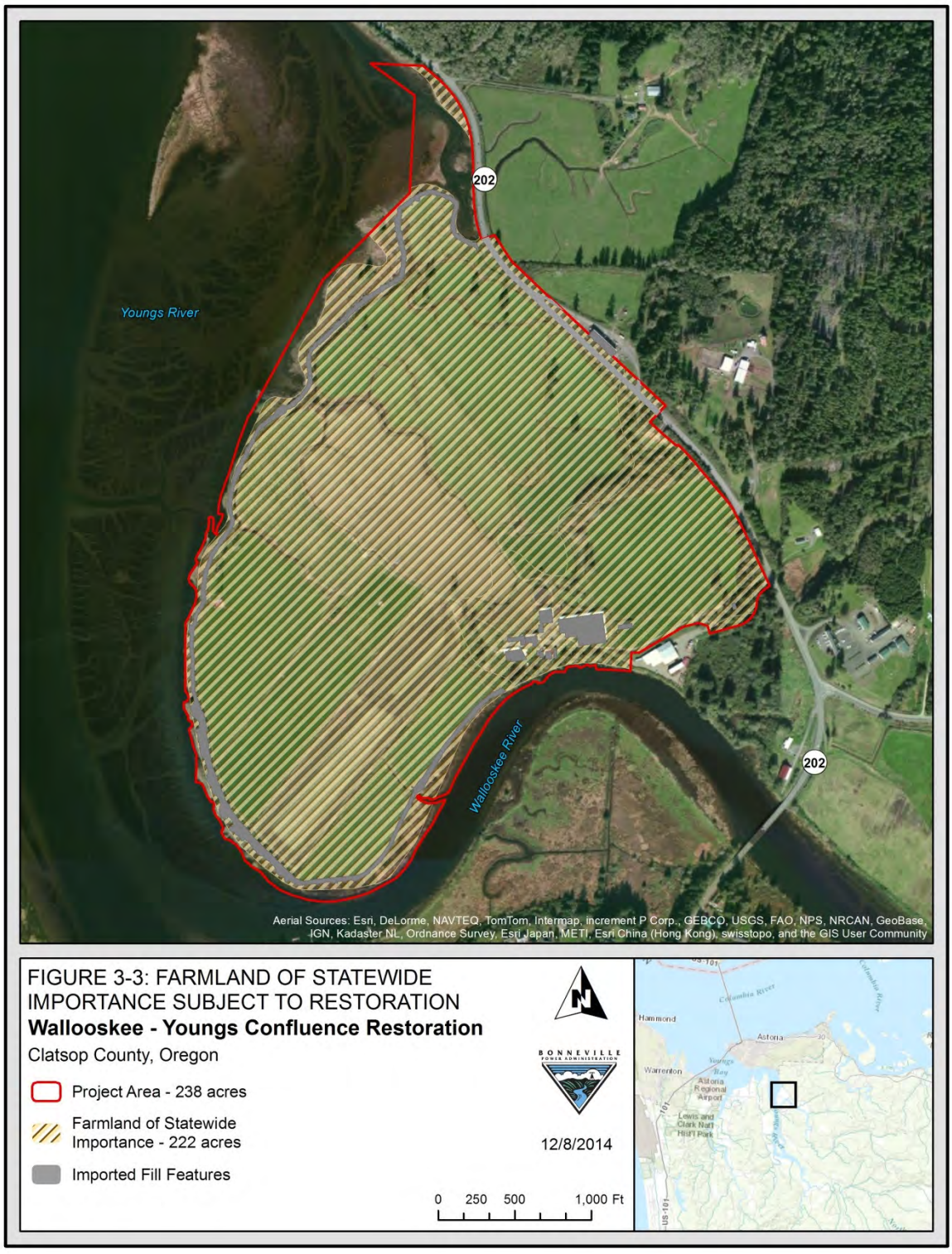
Land classifications, including farmland classifications, are specified land use and management designations that are assigned by NRCS to areas based on soil properties and other factors that directly influence the specific use of the land. Farmland classifications identify the location and extent of soils that are best suited to food, feed, fiber, forage, and oilseed crops by specifying soil map units as prime farmland, unique farmland, farmland of statewide importance, and farmland of local importance, as defined in 7 CFR § 657.5. There are approximately 64,810 acres of farmland of statewide importance and 3,225 acres of farmland of unique importance mapped in Clatsop County (Figure 3-2) by the NRCS.

The majority of the project area (222 acres) is rated by NRCS as farmland of statewide importance (Figures 3-2 and 3-3; USDA, NRCS 2014a). Approximately 49 of the 222 acres is made up of non-native fill (levee, OR 202 road prism, and buildings), is within uplands that would not be directly impacted by the proposed project, or is existing tidal marsh. These areas would generally not be altered by the proposed project. The remaining 173 acres are comprised of the 163-acre levee-protected floodplain and the 10-acre riparian buffer and would be altered by the project. This 173 acres is identified by NRCS as farmland of statewide importance (Figure 3-2; USDA, NRCS 2014a) and represents about 0.3 percent of the 64,810 acres of farmland of statewide importance mapped within Clatsop County by the NRCS (USDA, NRCS 2014b).

3.6.1.4 Recreation

There are no public recreational opportunities provided in the project area, although anecdotal accounts indicate informal recreational hunting may have been allowed in the past by a previous land owner. Open-water recreational experiences, including fishing, boating, kayaking/canoeing, and wildlife viewing, are popular along the Youngs and Wallooskee rivers and OR 202 provides access to recreational opportunities in the general vicinity, including the Clatsop County Fair and Expo Center, which is located about 0.5 miles east of the project area on Walluski Loop Road. The Clatsop State Forest is located northeast of the project area, on the east side of OR 202. Recreation opportunities within the forest include camping, hunting, fishing, and off-highway use (ODF 2014). Public comment during the scoping period indicated there are several popular fishing access points located along OR 202 in the vicinity of the project area, although none are formally designated.


Project Area
Pacific Ocean
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 3-2: CLATSOP COUNTY FARMLAND SOIL CLASSIFICATION MAP
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Clatsop County Boundary
Farmland of Statewide Importance (64,810 acres)
Farmland of Unique Importance (3,226 acres)
N
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 2.5 5 Miles
Longview
Saint Helens
Battle Ground
Salmon Creek
Orchards
Vancouver
Portland
Aloha
Lake Oswego
McMinnville
Canby
Woodburn


Youngs River
202
Wallooskee River
202
Aerial Sources: Esri, DeLorme, NAVTEQ, TomTom, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, and the GIS User Community
FIGURE 3-3: FARMLAND OF STATEWIDE IMPORTANCE SUBJECT TO RESTORATION
Wallooskee - Youngs Confluence Restoration
Clatsop County, Oregon
Project Area - 238 acres
Farmland of Statewide Importance - 222 acres
Imported Fill Features
BONNEVILLE POWER ADMINISTRATION
12/8/2014
0 250 500 1,000 Ft
Hammond
Astoria
Warrenton
Columbia River
US-101

3.6.2 Environmental Consequences – Action Alternative

3.6.2.1 Construction Effects

Construction effects on land use as a result of project implementation would be limited to the use of existing roads for access and staging and work in the fallow pasture to implement the project elements. All construction equipment staging would occur within the project area, and construction traffic would generally be limited to daily worker trips to and from the project site (see Section 3.11, Transportation). Access to utility infrastructure would be maintained during construction via dirt roads established to facilitate equipment staging and access. As a result, construction effects on land use as a result of the Proposed Action would be low.

Mitigation measures to reduce the potential effect on land use include:

- Post public notifications as needed to inform the public of the potential effects of - construction activities. -

There would be no effect on land ownership during construction of the Proposed Action. The restoration site would remain in private ownership until construction is complete. ODOT would continue to manage and maintain OR 202, and the utility providers would remain responsible for their infrastructure and access routes to their respective utilities.

The Proposed Action would have a low effect on recreation during construction. Construction activities would not directly affect any recreational opportunities, including access to the Clatsop County Fair and Expo Center or noted fishing access points, along OR 202, although limited traffic delays during construction could impact recreational users travelling in the vicinity. Construction activities could also be visible from the Youngs and Wallooskee rivers, which could temporarily affect the recreational experience of some water-based recreational uses (e.g., boaters and kayakers).

3.6.2.2 Long-Term Effects

Potential long-term effects on land use and recreation as a result of project implementation would be associated with the conversion of lands from agricultural use to tidal marsh habitat; a change in land ownership (i.e., ownership transferred from Astoria Wetlands to the Cowlitz Indian Tribe); impacts to existing infrastructure as a result of modified land uses; and changes in access to or availability of recreational opportunities within the project vicinity. A discussion of the consistency of the proposed new land use with the Clatsop County Comprehensive Plan, Land and Water Development and Use Ordinance and the Standards Document is provided in Section 3.6.2.3, Consistency with Comprehensive Plans.

As described above, approximately 222 acres of the project area is rated as farmland of statewide importance. Under the Proposed Action, 173 acres (the area associated with proposed levee breaching and riparian enhancements) would be converted from farmland to tidal marsh habitat. The remaining acreage would stay in a similar condition to the existing state. This would result in the conversion farmland of statewide importance to non-agricultural uses, or conversion of about 0.3 percent of the total acreage of farmland of statewide importance identified in Clatsop County (NRCS 2014b).

As described in Section 4.5.1, Farmland Protection Policy Act, the Farmland Protection Policy Act (7 USC 4201 et seq.) directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands, with the goal of ensuring those programs do not contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. The site assessment criteria provided in the Farmland Protection Policy Act were considered in assessing the effects of converting farmland of statewide importance to a non-agricultural use under the Proposed Action. In summary, although surrounding land uses are generally rural, the project area has not been used for agricultural production for over two years. All farm infrastructure in the project area is vacant, and the Confined Animal Feeding Operation designation has been resigned. The flood protection levee that surrounds the north, south, and western portions of the project area has been compromised by a lack of maintenance. In addition, the flood protection levee was deauthorized as a federal levee in June 2014 (H.R. 3080).

The zoning for the project area allows for wetland restoration activities under certain conditions. Preliminary conversations between the land owner and Clatsop County (Bunch, Clatsop County Community Development Department, pers. comm. 2013) have been used to identify the permitting and comprehensive plan amendment processes necessary to complete the local land use review and approval process for the Proposed Action. Approval of the required land use permits and Comprehensive Plan amendments would ensure the Proposed Action complies with local government policies and programs to protect farmland from unnecessary conversion.

Finally, conversion of the project area to non-agricultural use would not reduce the demand for farm support services or otherwise jeopardize the viability of farms remaining in the general vicinity due to the relatively small area of farmland impacted by the proposed project. As noted above, the project area has not been used for agricultural production or contributed revenue or jobs within the farm industry for several years. In addition, proposed restoration activities would not be incompatible with adjacent agricultural uses and would not contribute to the eventual conversion of surrounding farmland to nonagricultural use. Therefore, the effects of farmland conversion under the Proposed Action are considered low.

Ownership of the land covered by the 221-acre BPA conservation easement would be transferred from Astoria Wetlands to the Cowlitz Indian Tribe which would be responsible for the long-term stewardship of the restoration area as provided in a site-specific management plan. Ongoing maintenance and management responsibilities for OR 202 would remain the responsibility of ODOT, and responsibilities for management of utility infrastructure within the project area would remain the responsibility of BPA, NW Natural, and Pacific Power. All changes in land ownership under the Proposed Action are voluntary; accordingly, their effects are considered low.

Utility easements and infrastructure within the project area would generally remain in place. Raised landings would be built around and encasing two BPA transmission tower footings to establish safe working surfaces. Access to these towers would be via a low-water access road which would allow for continued access while maintaining hydrologic connectivity within the restoration area. BPA maintenance would likely be limited to yearly site visits. Transmission access easements would be updated to better suit post-project conditions. BPA is working to vacate an unused right-of-way that crosses a neighboring parcel, east of OR 202, and passes through the project area and update the

transmission access to be via Farm Lane. A sheet pile wall would be placed adjacent to OR 202 to protect the highway from potential wind-wave damage resulting from tidal flows within the project area, and two new culverts would be installed to facilitate drainage around OR 202. These proposed improvements would ensure the effects of the Proposed Action on exiting utilities and OR 202 are low.

It is anticipated that the farm buildings located in the upland portion of the project area would be removed as part of the stewardship management actions. As described in Section 3.7, Cultural Resources, none of these buildings are considered historic, and their removal would be consistent with the conservation easement for the property. As mentioned previously the buildings are dilapidated and are not consistent with the current or proposed land use. Accordingly, the effects of building removal on land use and recreation is considered low.

Impacts on recreational opportunities and use under the Proposed Action would also be low. Fishing from OR 202 adjacent to the project site would not be affected and restored habitat conditions in the project area could improve both fishing and wildlife viewing opportunities over time. Access to the restoration site for recreational purposes, including hunting and wildlife viewing, would require access to privately held property. As required by the BPA conservation easement, a management plan outlining parameters for allowed land use, stewardship, and public access would be drafted upon project completion. Public comment would be sought at that time on the management plan, including possible opportunities of the property for recreational use.

3.6.2.3 Consistency with Comprehensive Plans

Preliminary conversations between the land owner and Clatsop County (Bunch, Clatsop County Community Development Department, pers. comm. 2013) have identified the permitting and comprehensive plan amendment processes necessary to complete the local land use review and approval process for the Proposed Action. As described above, the project area is zoned Exclusive Farm Use and Aquatic Natural. Section 3.564(11) of the Land and Water Development and Use Ordinance allows the "creation, restoration, or enhancement of wetlands" in areas zoned Exclusive Farm Use after successful application for a Type I Development Permit from the County. Similarly, Section 3.808(1) of the Land and Water Development and Use Ordinance allows for "active restoration of fish and wildlife habitat or water quality" in areas zoned Aquatic Natural after successful application for a Type II Conditional Use Permit.

The Proposed Action would also be subject to the requirements of the Flood Hazard Overlay, Shoreland Overlay, and Mitigation Site Overlay (Bunch, Clatsop County Community Development Department, pers. comm. 2013). The Mitigation Site Overlay would need to be removed from the Comprehensive Plan and Plan Map after the Proposed Action is implemented.

Application for, and approval by, the County of the above land use permits and comprehensive plan amendments would ensure the Proposed Action is consistent with the Clatsop County Comprehensive Plan, Land and Water Development and Use Ordinance, and Standards Document.

3.6.3 Environmental Consequences - No Action

There would be no effect on land ownership or recreation under the No Action Alternative. The restoration area would remain in private ownership with a conservation easement protecting it; ODOT would continue to manage and maintain OR 202; and the utility providers would remain responsible for their infrastructure and access routes to their respective utilities. Access to various recreational opportunities in the general vicinity (e.g., Clatsop State Forest, Youngs Bay, and Wallooskee River) would remain the same. Improved habitat conditions anticipated under the Proposed Action, and any resulting fishing or wildlife viewing benefits, would not be realized.

3.7 Cultural Resources

Cultural resources include things and places that demonstrate evidence of human occupation or activity related to history, architecture, archaeology, engineering, and culture. Historic properties, as defined in 36 CFR 800, the implementing regulations of the National Historic Preservation Act (NHPA; 16 USC 470 *et. seq*.), are a subset of cultural resources that consist of any prehistoric or historic district, site, building, structure, or object, and associated artifacts, records, and remains, that are significant to human history and meet defined eligibility criteria for the National Register of Historic Places.

The National Historic Preservation Act requires that federal agencies identify historic properties within a project area and consider the effects of their actions on these properties. Cultural resources are evaluated for eligibility for inclusion in the National Register of Historic Places using four criteria commonly known as Criterion A, B, C, and D, as identified in 36 CFR Part 60.4(a–d). These criteria include an examination of the cultural resource's age, integrity (of location, design, setting, materials, workmanship, feeling, and association), and significance in American history, among other things. A cultural resource must meet at least one criterion and retain integrity to be considered eligible for listing in the National Register of Historic Places. The area of potential effect , as defined in 36 CFR 800.16(d), for the Proposed Action coincides with the project area.

3.7.1 Affected Environment

3.7.1.1 Cultural Resources Surveys and Consultation

Cultural resource identification efforts within the project area were completed by Willamette Cultural Resources Associates, Ltd. in April 2013 and January 2014. These efforts included a review of records on file with the Oregon State Historic Preservation Office, historic maps and archival research, archaeological surveys of the project area. A complete account of the pre-field research conducted in support of the project, as well as a detailed description of the regional prehistoric background and historic context in the vicinity of the project area, is provided in Paraso et al. (2013) and Goodwin (2014). Section 3.7.1.2 summarizes the cultural setting provided in those reports.

BPA identified seven federally recognized tribes that have a potential interest in the project based on their historic or current use of land in the project area: the Cowlitz Indian Tribe, the Confederated Tribes and Bands of the Yakama Indian Nation, the Confederated Tribes of the Siletz Reservation, the

Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Nez Perce Tribe of Idaho, and the Confederated Tribes of the Grand Ronde Community of Oregon. BPA provided project information to and requested information from the consulting tribes, including information on potential cultural resources in the project area. BPA received comments from the Confederated Tribes of the Grand Ronde Community of Oregon only. The comments did not raise concerns related to cultural resources.

Consistent with the National Historic Preservation Act, BPA identified cultural resources in the study area and evaluated them for eligibility for listing in the National Register of Historic Places. Based on the results of the cultural resource survey, BPA completed a cultural resource consultation with the Oregon State Historic Preservation Office, National Park Service - Lewis and Clark National Historic Trail, and the seven federally recognized tribes with a potential interest in the project area. The Oregon State Historic Preservation Office concurred with the determinations of eligibility for cultural resources identified in the project area, which is presented below in Section 3.7.1.3.

3.7.1.2 Affected Historical Communities

Historical accounts and ethnographic data indicate the Chinookan peoples would have been the most likely native Americans to occupy the area at the time of Euro-American contact (Paraso et al. 2013). Principal villages were located around Youngs Bay and the present-day Seaside and Gearhart, primarily near rivers where fish were accessible. The Chinookans relied heavily on fish as a food staple, although game, waterfowl, and roots, fruits, and berries were also collected from the marshes, lakes, and streams in the vicinity (Suphan 1974 *in* Paraso et al. 2013).

The character of native settlements throughout the Columbia River estuary was heavily affected by Euro-American settlement and disease. Epidemics associated with smallpox, measles, and malaria killed large portions of the native populations and the major expansions of Euro-American settlements beginning in the 1840s further displaced native peoples from their historic lands (Paraso et al. 2013).

Early Euro-American visitors to the area included the Lewis and Clark Expedition, which established Fort Clatsop on the Lewis and Clark River in 1805, and the Pacific Fur Company, which established a post in present-day Astoria in 1811 (Paraso et al. 2013). Astoria's importance as a port city grew as the population grew, with industry largely focused on commercial fishing and fish processing. Logging also emerged as a prominent local industry in the late nineteenth century, with rail and local mills providing service for forestry operations throughout Clatsop County (Paraso et al. 2013).

Declines in the fishing and canning industries in Astoria began in the early twentieth century, coinciding with the decline of salmon and steelhead runs. Declines in the timber industry were evident by the latter half of the twentieth century (Paraso et al. 2013). The Bumble Bee Seafood Company closed its last Astoria cannery in 1980 (Martin 2013 *in* Paraso et al. 2013). The Astoria Plywood Mill ceased operations in 1989, bringing an end to major wood products operations in Astoria (Paraso et al. 2013).

More detailed descriptions of historic land uses within the project area are also provided in Paraso et al. (2013). For approximately 100 years, the project area has been used as cattle pasture and as a dairy. Early (1865) Government Land Office maps show most of the project area as marshland, with

one structure situated near the Wallooskee River. Minimal infrastructure – roads and small structures - were established within the project area between the time it was settled (around 1851) and when it began operation as a dairy farm (early 1970s). A human-made dike was constructed to separate the floodplain from the Youngs and Wallooskee rivers in the early 1900s, and farm buildings and utility infrastructure were added during the 1970s and 1980s to support dairy operations (Paraso et al. 2014).

3.7.1.3 Archaeological Resources

Oregon State Historic Preservation Office records indicate that five previous archeological studies lie within 1.6 kilometers of the project area, including one study which crossed through the project area. Two previously recorded archaeological sites occur within approximately 1 mile of the project area (Paraso et al. 2013). Archaeologists have also documented several prehistoric sites on landforms similar to those found in the project area along other portions of the Youngs River. These sites are typically situated on high terraces on the eastern side of the river and consist of shallow or surface scatters comprised of lithic tools and debitage, fire-cracked rock, and sometimes early historic trade items (Paraso et al. 2013).

Pedestrian surveys and subsurface testing conducted in January and December 2013 identified three archeological resources in the project area: a historic isolate consisting of a single bottle (12-40-1); a multicomponent site consisting of historic refuse scatter along the Wallooskee River and subsurface prehistoric and historic material on the terrace above (12-40-2); and a potentially historic refuse dump composed of agricultural and structure materials (12-40-3) (Paraso et al. 2013). Two of these resources were located in, or in close proximity to, the upland portions of the project area, in the general vicinity of the farm and residential structures. One resource, 12-40-1, was found floating in the channel along the inside of the dike adjacent to Youngs River. BPA determined that the isolate bottle (12-40-1) and the multi-component site (12-40-2) would be avoided and therefore did not make a determination of eligibility for these items. Because the agricultural/structural refuse scatter (12-40-3) is of non-definitive age and is probably associated with an isolated dumping episode, BPA determined that the site is not eligible for listing in the National Register of Historic Places.

Structures related to the property's use as a dairy farm are located in the southeast corner of the project area, on a high point above a bend in the Wallooskee River. Most of these structures were constructed within the last 35 years. All are similar to other farm buildings and residences in the project vicinity and lack distinction in design and construction. The oldest structure within the project area is a residence built in the 1940s. Although over 50 years old, the house is ineligible for listing in the National Register of Historic Places because it lacks integrity in setting and condition due to several modifications and the fact that it has been moved from its original setting. Based on the above, none of the structures within the project area are eligible for listing in the National Register of Historic Places. Removal of all the buildings was included in the consultation with the Oregon State Historic Preservation Office and determined to have no effect on cultural resources provided that the foundations are left in place.

The dike fronting the Youngs and Wallooskee rivers, was originally constructed in the early 1900s and was improved and expanded by the Corps in the 1930s. The dike is similar to many dikes in the

vicinity and is not unique in its design or construction (Paraso et al. 2013). Given that the dike lacks - any significant historical association, it was determined not eligible for listing in the National Register of Historic Places. -

Finally, there are two historic highway features in the vicinity of OR 202, including a historic-period - segment of OR 202, located to the east of the highway current alignment, and a circa 1940s concrete - cattle pass (Goodwin 2014). The historic segment of OR 202 is discontinuous, lacks integrity and - does not contribute to the potential eligibility of the historic-period highway as a whole. The - culvert/cattle pass represents a standard design from this time period and is not a unique example of this type of highway feature. Neither feature is eligible for listing in the National Register of Historic - Places. -

As described above none of the structures that occur within the project area, including the farm-related buildings, the dike along the Youngs Wallooskee river, or the historic highway features - associated with OR 202, are eligible for listing in the National Register of Historic Places. - Concurrence from the Oregon State Historic Preservation Office on these determinations of eligibility - and the effect of the Proposed Action was provided in letters dated June 13, 2013 and March 3, - 2014. -

3.7.2 Environmental Consequences – Action Alternative

3.7.2.1 Construction Effects

Potential construction effects on cultural resources would be associated with the disturbance of a known archaeological or historic resource, or disturbance of a previously unknown cultural resource as a result of ground disturbing activities.

As described above, two archeological resources potentially eligible for inclusion in the National Register of Historic Places were identified within the project area: a historic isolate consisting of a single bottle (12-40-1) and a multicomponent site consisting of both historic and prehistoric materials (12-40-2). Given the nature of isolate 12-40-1 (i.e., a single bottle floating in the drainage channel), BPA determined that there would be no effect to this resource because it can be easily avoided if still present within the project area. Resource 12-40-2 would not be affected during construction of the Proposed Action because it occurs within an upland area on the southeastern portion of the project area where ground-disturbing activities would not occur. To ensure this area is not accidently disturbed during construction, the following mitigation measure would be implemented to ensure impacts to archaeological resources are low:

- Identify avoidance areas on plan sets and place “sensitive area” signage adjacent to sensitive resource.

Ground disturbing activities have the potential to disturb previously unknown cultural resources. As summarized in Table 2-2, the following mitigation measure would be implemented to ensure impacts to cultural sites inadvertently discovered during construction are low.

- Implement the BPA Inadvertent Discovery Plan if unanticipated archaeological or historical resources are encountered during construction. As required by the plan, halt all ground-

disturbing activity in the vicinity of the find and immediately notify BPA cultural resource staff. Implement mitigation measures as required by BPA.

3.7.2.2 Long-Term Effects

The buildings in the upland portion of the project area may be removed as part of stewardship management actions. These buildings were determined not to be eligible for listing in the National Register of Historic Places. In addition, in consultation with the Oregon State Office of Historic Preservation, BPA determined that removal of the buildings would have no effect on cultural resources provided the foundations are left in place. Future stewardship actions are not expected to have impacts to cultural resources due to the limited potential for ground disturbance and general lack of cultural resources within the project area. Therefore, there would be no long-term effects on cultural resources under the Proposed Action.

3.7.3 Environmental Consequences – No Action

Outside of minor utility and road maintenance activities within the project area, no ground disturbing activities would occur under the No Action Alternative and no reasonably foreseeable impacts to cultural resources are anticipated. Therefore, there would be no impacts to cultural resources under the No Action Alternative.

3.8 Aesthetics and Visual Resources

3.8.1 Affected Environment

Visual resources consist of natural and human-made features that give a particular environment its aesthetic qualities. Landscape character is evaluated to assess whether a project would appear compatible with existing features or would contrast noticeably with the setting and appear out of place. Visual sensitivity includes public values, goals, awareness, and concern regarding visual quality.

The analysis area for aesthetics and visual resources includes areas from which actions associated with the project would be seen by the general public or nearby residents. This area (the viewshed) extends approximately 0.25 mile beyond the project site, although it also includes views from the Astoria Column (approximately 1.5 miles from the site). The viewshed includes the portion of OR 202 that passes along the northern edge of the project site; the small residential area to the south of the site, across the Walloskee River; the single residence to the north of the site; the stone and tile business on the northeast side of OR 202 (north of the site); boaters on the Youngs and Wallooskee Rivers to the west and south of the site; and the Astoria Column viewpoint to the northwest of the project site.

Generally, the action area has a rural/agricultural appearance and character, with some undeveloped/natural areas as well as some small-town and residential areas.

3.8.1.1 Visual Sensitivity

Views are considered sensitive when they have high scenic quality and are experienced by relatively large numbers of people (i.e., views from publicly accessible areas). Scenic quality is a measure of the overall impression or appeal of an area created by the physical features of the landscape, such as natural features (landforms, vegetation, water, color, adjacent scenery, and scarcity) and human-made features (roads, buildings, railroads, other built elements, and agricultural patterns).

In general, the aesthetic characteristics of the project site, which is similar to other rural agricultural grazing land in the region, make views of the site not particularly unique. The topography and vegetation are fairly uniform. All views into the site also include the BPA towers and associated transmission lines that cross the site.

3.8.1.2 Viewer Groups

Potential viewers of the project site include tourists to the Astoria Column; local residents with homes to the south, across the Wallooskee River, and one residence north of the site; employees and patrons of the stone and tile shop north of OR 202 (this business has no outdoor use area other than a parking lot); recreational and commercial boaters and kayakers on the adjacent rivers; and motorists on OR 202, including local commuters, tourists, motorcyclists, and automobile drivers (sightseers) out for scenic rides, and commercial vehicles passing through the area. These different groups all have different viewing sensitivities.

3.8.1.3 Views Assessment

Views from OR 202 into the site are limited to moving views or views available from a small pull off along OR 202 at the northern portion of the site. Apart from sightseers (who are assumed to have high viewing sensitivity), motorists are considered to have moderate to low sensitivity to the aesthetic or visual environment because they are focused on the road and have short viewing durations of an area as they pass by. Viewers from the residence to the north, across OR 202, and the residences to the south, across the Wallooskee River, would be considered to have high viewing sensitivity, although their views are from a distance because of the highway and river that separate them from the site. Residents are considered to have high viewing sensitivity because of their familiarity with the landscape and long viewing duration.

Viewers from the Astoria Column, approximately two miles away, would also be expected to have moderate sensitivity since they travel to that location specifically to take in the view and are likely to spend some time looking over the landscape. Views into the site from the Astoria Column would be considered relatively sensitive because of the large number of people, including many tourists, who view the site from this location. Viewers from commercial fishing boats on the Youngs and Wallooskee Rivers would have a low viewing sensitivity because they would be focused on their work, but recreational boaters would have a higher viewing sensitivity since they would spend time looking over the landscape.

Photograph 3. View across OR 202 from the tile shop looking south into site. BPA towers are visible in background. The sheet pile wall along OR 202 will extend approximately five feet above the road surface elevation in this area.

Photograph 4. View of project area from Astoria Column. BPA tower is visible on right side of photo

3.8.2 Environmental Consequences – Action Alternative

The Proposed Action would alter the physical landscape of the site through the removal of sections of the existing levee and construction of tidal channels throughout the site. The aesthetic characteristic of the site would change from agricultural to undeveloped/natural open space.

3.8.2.1 Construction Effects

Construction effects on visual resources as a result of project implementation would be associated with the use and staging of construction equipment on-site and large-scale ground disturbance. Views of the site during construction would be characterized by large equipment moving within the site, and bare, exposed ground, including muddy areas, before vegetation establishes. In addition, dust may be visible in the air during construction.

As summarized in Table 2-2, the following mitigation measures would be implemented to reduce construction effects on visual resources:

- Use water trucks to apply water as needed to the construction area for dust control.
- Protect and retain native riparian/wetland vegetation, to the extent practicable, by depicting these communities on construction drawings and avoiding construction activities in these areas.
- Minimize the size of the disturbance area, to the extent practicable.
- Seed disturbed areas with floodplain seed mix immediately as they reach finish grade.

With implementation of these mitigation measures, construction impacts on sensitive viewsheds are anticipated to be moderate, but short-term and temporary.

3.8.2.2 Long-Term Effects

Long-term effects on visual resources from implementation of the project would occur from a change in the aesthetic character of the site from agricultural to undeveloped/natural open space; modifications to existing on site infrastructure (towers, roads); and installation of a sheet pile wall adjacent to portions of OR 202.

The Proposed Action would alter the physical landscape of the site through the removal of sections of the existing levee and construction of tidal channels and small mounded areas throughout the site. While some viewer groups may prefer the aesthetics of agricultural land to natural areas, many prefer the vegetative, topographic, and hydrologic diversity of natural landscapes, as well as the increased wildlife on view. The project design would be consistent with the historical, natural aesthetics of the site, and restoring habitat diversity would result in visual conditions more typical of the historical landscape. Viewers most sensitive to these changes include recreational viewers from the Astoria Column and recreational boaters, for whom views into the site from the water would increase as the levee is breached in place and lowered throughout most of its length. These changes are expected to be low due to the distance of the viewer from the site and would not necessarily be adverse.

Construction of the Proposed Action would also create elevated gravel covered BPA tower landings and a low-water access road. The landings side slopes would be covered in soil and planted with native grasses (i.e., floodplain seed mix) to minimize visual impacts. The low-water access road would have an articulated concrete surface. The BPA towers would be slightly more visually intrusive after construction due to color and material differences of the raised graveled landings and the low-water access road. However, since the views of the transmission towers are generally from a distance (0.5 mile or greater), the visual impact of the new tower landings and road would generally

be low. In addition, the grasses planted on the sides of the new tower landings would soften their appearance and help them to blend with the aesthetics of the site. To viewers from the Astoria Column and the residences to the north and south of the site, the proposed larger tower footings and access road would not be more visually intrusive than the existing condition due to the viewing distance, limited height of the features, and vegetated sides. The effects of the transmission tower pads and low-water access road on visual resources and sensitive viewer groups would be low due to the distance of the viewer from the site.

The sheet pile wall would add an industrial element to the northern border of the site, visible as a long, but narrow, linear feature adjacent to the site. The sheet pile wall would be adjacent to OR 202, an existing linear manmade landscape feature and would blend into this feature when viewed from a distance. The properties to the south and west of OR 202, on the other side of the Wallooskee and Youngs rivers, would not likely be impacted due to the distance (0.8 mile) from the sheet pile wall. The exposed portion of the sheet pile wall, below OR 202, would be visible from within the project area or the Youngs River (greater than 0.3 mile away). The wall would also be visible from OR 202, and may block views for some motorists into the project site as it would extend up to five feet above the road surface elevation along approximately 500 linear feet of OR 202. Photograph 3 shows the view from the tile shop along OR 202 into the project area. This is the low point of OR 202 and in this area the sheet pile wall would extend 4 to 5 feet above the pavement. A portion of the sheet pile wall would be screened by a guard rail; however, it is expected that the wall will limit the views into the site for some motorists and patrons of the tile shop. The potential visual impacts of the sheet pile wall are considered moderate, since views of the wall are limited due to distances but views into the site from OR 202 would be impaired.

3.8.3 Environmental Consequences – No Action

Under the No Action Alternative, no restoration would occur and the project site would remain as levee-protected floodplain. Baseline aesthetics would remain the same under this alternative. The levee-protected floodplain would remain a monoculture of pasture grasses, although it may become weedier over time due to the suspension of agricultural activities and vegetation control. No changes to OR 202 or BPA towers, landings, or access would occur.

3.9 Air Quality and Climate Change

The following section describes air quality and climate change and the potential construction-related and long-term effects of the Proposed Action on these resources. The analysis area for air quality and climate change been expanded to account for regional air quality concerns and global climate change implications.

3.9.1 Air Quality

3.9.1.1 Affected Environment

The Oregon Department of Environmental Quality (DEQ) has responsibility for air quality in Oregon. Under Sections 108 and 109 of the Clean Air Act (42 USC 4701 *et seq.*), EPA has established National Ambient Air Quality Standards to protect the public from air pollution. These standards focus on criteria pollutants, which are pollutants of particular concern for human health and the environment.

DEQ's monitoring network measures the levels of six ambient air criteria pollutants identified by the Clean Air Act (lead is not monitored). These six criteria pollutants are:

- Particulate matter
- Carbon monoxide
- Nitrogen dioxide
- Sulfur dioxide
- Ozone
- Lead

There are no air quality monitoring sites near the project area. The nearest air quality monitoring site for which DEQ establishes a daily air quality index number is Sauvie Island, upstream on the Columbia River near Portland (DEQ 2014). DEQ does not monitor air quality along the Oregon coast because there is generally good air quality coming off the Pacific Ocean (Geiser and Neitlich 2007). There are also no major emissions sources in the immediate vicinity. As a consequence, there are no pollutants of concern in the area.

Greenhouse gases are chemical compounds found in the earth's atmosphere that absorb and trap long-wave thermal radiation emitted by the land and ocean, and radiate it back to earth. The resulting retention and build-up of heat in the atmosphere increases temperatures, which causes warming of the planet through a greenhouse-like effect (EIA 2009b). This effect is commonly referred to as "global warming." Global warming has occurred in the past from natural processes, but evidence shows that it has accelerated in the past few centuries, especially since the Industrial Revolution, as a result of increased anthropogenic (caused or produced by humans) emissions of greenhouse gasses. For example, atmospheric concentrations of carbon dioxide, a primary greenhouse gas, have continuously increased from about 280 parts per million in preindustrial times to 379 parts per million in 2005, a 35 percent increase (IPCC 2007). Anthropogenic activities are increasing atmospheric concentrations of greenhouse gases to levels that could increase the earth's temperature up to 7.2F by the end of the 21st century (EPA 2010b).

3.9.1.2 Environmental Consequences – Action Alternative

3.9.1.2.1 Construction Effects

Construction equipment would emit greenhouse gases and particulates as a result of tailpipe emissions and cause dust during ground disturbance and along unpaved access roads that could affect air quality.

Greenhouse gas emissions focus on carbon dioxide, methane, and nitrous oxide. The emissions associated with the project are expected to be localized and temporary as a result of construction emissions, off-road vehicles, on-road vehicles (including worker commuting and material delivery), and dust from ground disturbing activities. The estimated emissions from greenhouse gases were determined using fuel type, fuel usage, and emission factors from a variety of sources (U.S. EPA 2014; EIA 2013). The emission estimates from on-road vehicles include haul trucks bringing materials to the site and workers commuting to the project area. For on-road vehicles, the distance for each trip was estimated and the assumed miles per gallon for the vehicle were used to determine the emissions. Commuter emissions were calculated using the same emission factors as on-road vehicles. The total commuter miles traveled were estimated for six employees making a 10-mile round trip twice daily. To account for ride sharing, the total commuter mileage was multiplied by 0.8. For vehicles operating on-site, the same method as off-road construction vehicles was applied because the emissions for these trucks are based on horsepower rather than vehicle miles traveled.

Because each greenhouse gas has a different global warming potential, the carbon dioxide equivalent (CO_2e) is reported. The CO_2e was determined by multiplying the sum of all of the greenhouse gas emissions by the global warming potential for the gas (carbon dioxide = 1, methane = 21, and nitrous oxide = 310). Greenhouse gas emissions from on-road and on-site construction-related activities are estimated at,1,385 metric tons of carbon dioxide; 28 metric tons of methane (CO_2e); 131 metric tons of nitrous oxide (CO_2e); for a total of 1,544metric tons of CO_2e. When the project is complete, all construction related emissions of greenhouse gases and other air pollutants are expected to cease. The Environmental Protection Agency requires mandatory reporting for greenhouse gas emissions in excess of 25,000 metric tons of CO_2e and considers emissions below this threshold to be low impact. Because of the short duration of the project construction, low number of vehicles and equipment, and estimate of emissions well below the reporting threshold the impact from greenhouse gas emissions would be low.

Particulate matter, such as dust, would impact air quality during the ground disturbing activities and travel along unpaved access roads. Mitigation measures, such as use of water trucks to reduce dust, would be applied, to maintain air quality standards. Because project emissions would be temporary and localized in nature, they are not expected to have an adverse impact on air quality. Therefore, the impacts on air quality from the project would be low.

Mitigation measures to reduce the potential impacts on air quality include the following:

- Use water trucks to apply water as needed to the construction area for dust control.
- Reduce the speeds (for example, to 5 mph) of construction vehicles on access roads to minimize dust, if necessary.

- Implement idling restrictions during construction to minimize air quality impacts.
- Inspect, maintain, and replace (if defective) mufflers and other emission control devices on all equipment.

3.9.1.2.2 Long-Term Effects

The project is not expected to have long-term adverse air quality impacts. Annual impacts to air quality from stewardship actions would be well below those for construction and are expected to be minimal and consist primarily of emissions related to travel to and from the site for maintenance purposes. Therefore, long-term impacts on air quality would be low.

3.9.1.3 Environmental Consequences – No Action

Under the No Action Alternative the site would remain as levee-protected floodplain and air quality impacts associated with construction, including emissions of greenhouse gases which would contribute to climate change, would not occur. Actions may later become necessary to repair levees or protect infrastructure within the levee-protected floodplain potentially impacting air quality.

3.9.2 Climate Change

Both the effect climate change would have on the proposed project (sea level rise) and the affect the project would have on climate change (carbon sequestration) are discussed in this section. Impacts to climate change from the emissions associated with project construction are discussed above in the air quality section.

3.9.2.1 Affected Environment

Recent climate change studies indicate that global warming trends will accelerate the melting of polar ice sheets and sub-polar glaciers, both of which will contribute to sea level rise. While there is considerable uncertainty about the short-term estimates of sea level rise, most studies point to a long-term trend that will result in considerable sea level increases by 2100. The National Research Council has estimated that the for the Washington and Oregon coast, sea level is projected to change between falling 1.6 inches to rising 9.0 inches by 2030, falling 1.2 inches to rising 18.9 inches by 2050, and rising between 3.9 and 56.3 inches by 2100 (NRC 2012). Sea-level rise is uneven and varies from place to place and depends on regional factors, such as ocean and atmospheric circulation patterns, and tectonic plate movements associated with earthquakes. The committee noted that as the forecasted period lengthens, uncertainties, and thus ranges, increase (NRC 2012). Earthquakes have affected sea levels in the vicinity of the project area and could dramatically change sea levels in the future. An earthquake of magnitude 8 or greater, which occurs in this area every several hundred to 1,000 years with the most recent in 1700, could cause parts of the coast to subside immediately and the relative sea level to rise suddenly by a meter or more (NRC 2012).

3.9.2.2 Environmental Consequences – Action Alternative

3.9.2.2.1 Construction Effects

Greenhouse gas emissions associated with project construction are discussed in the air quality section above. As discussed above due to the short construction duration, low number of vehicles and equipment, and estimate of emissions well below the reporting threshold the impact from greenhouse gas emissions would be low and therefore the potential for the project to accelerate climate change would be low.

3.9.2.2.2 Long-Term Effects

Sea-level rise could affect the project area by inundating plant communities and changing water depths to a level that does not support tidal wetland plant communities. A rise of more than several feet could transition the site from tidal wetlands to mud flats and open water in 30 to 100 years. In addition, sea-level rise of this magnitude would increase flood elevations, threatening adjacent infrastructure, including OR 202 and the BPA transmission towers. As discussed in the Soils and Geology section, implementation of the restoration project would prevent further loss of soil through the tide gates and allow the site to build soils within the site through accretion. The implementation of this project would allow for the site to better respond to a rise in sea level and lessen the potential for the site to convert to open water or mudflats associated with future sea level rise. Additionally the restoration of a functioning wetland plant community would help buffer the effect of rising sea levels by attenuating wave action and storm surges. For these reasons the long-term effect to the proposed action would beneficial and low in anticipation of sea level rise.

Stewardship actions causing greenhouse gas emissions are discussed above in the air quality section and are expected to be minimal and consist primarily of emissions related to travel to and from the site for maintenance purposes. The creation of tidal wetlands proposed by the project would help to mitigate increases in greenhouse gases and associated climate change. Tidal wetland restoration creates a sink for carbon due to absorption of carbon dioxide by the restored plant community. A study of both restored and existing Oregon tidal wetland systems found that tidal wetlands can sequester an order of magnitude more carbon than any other type of wetland community and emit only a negligible amount of methane compared to freshwater wetlands (MacClellan 2011). The drainage and agricultural use of former tidal wetlands caused a loss of stored soil carbon (MacClellan 2011). By increasing stored carbon through the creation of tidal wetlands, the Proposed Action would help mitigate for both the release of greenhouse gases and land conversion to agricultural activities. For these reasons, effects on climate change as a result of the project are beneficial and low.

3.9.2.3 Environmental Consequences – No Action

Under the No Action Alternative the site would remain as levee-protected floodplain and soil accretion associated with the return of tidal influence would not occur. Greenhouse gas emissions associated with the project construction and stewardship actions would not occur. The increase in the carbon storage potential, discussed above, associated with converting the freshwater wetland to a tidal wetland would not occur and the site would continue to export carbon. Sea-level rise would

likely still affect the project area and the levee would eventually be overtopped and put at risk infrastructure within and adjacent to the site. The likelihood that the site would covert to mud flats or open water, in a self-breaching scenario due to sea level rise, would be much greater since soils would continue to be lost through the tide gates. Tidal processes and associated soil accretion rates would not be realized and the levee-protected floodplain elevation upon site inundation would likely be greater. Under the No Action Alternative a self-sustaining tidal marsh would not be developed and the site would likely convert to open water or mudflats in response to sea level rise and levee breaching.

3.10 Noise, Hazardous Waste, and Public Health and Safety

3.10.1 Noise

This section describes existing noise sources in the project vicinity, and receptors that may be sensitive to increases in noise as a result of project construction. The analysis area includes any area within the vicinity that could be affected by noise from construction. There would be no noise generated at the project site after the Proposed Action is implemented with the exception of those activities required for monitoring or stewardship.

3.10.1.1 Affected Environment

Noise is defined as unwanted sound. Airborne sound is a rapid fluctuation of air pressure above and below atmospheric pressure. Noise can be measured in several different ways depending on the source of the noise, the receiver, and the reason for the noise measurement.

Audible noise is measured in decibels on the A-weighted scale. The A-weighted sound pressure level on a decibel (dBA) scale describes sound that corresponds to human perception. Table 3-4 shows the relative A-weighted sound pressure levels of common sounds measured in the environment and in industry for various sound levels.

Decibels on the A-weighted scale cannot be directly added arithmetically; that is, 50 dBA + 50 dBA does not equal 100 dBA. When two sources of equal level are added together the result will always be 3 dB greater; that is 50 dBA + 50 dBA = 53 dBA and 70 dBA + 70 dBA = 73 dBA. If the difference between the two sources is 10 dBA, the level (when rounded to the nearest whole decibel) will not increase; that is 40 dBA + 50 dBA = 50 dBA and 60 dBA + 70 dBA = 70 dBA.

Sensitive noise receptors in the analysis area include a commercial farm equipment manufacturing company located on the south side of Farm Lane; several homes and a stone and tile business on the east side of OR 202; and a residential development located south of the project area, on the south side of the Wallooskee River. The manufacturing company located on the south side of Farm Lane abuts the project area and shares a common access road with the proposed restoration site. The closest home within the residential development on the south side of the Wallooskee River is located less than 0.10 mile (528 feet) away from the southern tip of the project area. The sensitive receptors on the east side of OR 202 are similarly located in close proximity (less than 550 feet) to the project area, although are likely less sensitive to noise given their proximity to OR 202. Additional sensitive

noise receptors in the analysis area could include recreational users, such as boaters, kayakers, and fishermen, or persons viewing wildlife on the Youngs or Wallooskee rivers.

Existing noise sources consist primarily of traffic along OR 202. Background noise levels in rural areas such as those in the analysis area are roughly 45 dBA during the day and 35 dBA at night (EPA 1971).

No federal regulations apply to noise generated by the Proposed Action. Construction noise is exempt from state regulation in Oregon. Similarly, Clatsop County has not established a noise control ordinance that limits noise emissions except for qualitative limits on noise associated with public disturbances (e.g., firearms, explosives, other loud or boisterous noises) (Clatsop County Code 8.12).

Table 3-4. Common Activities and Associated Noise Levels

Noise Source at a Given Distance	Sound Level (dBA)[1]
Civil defense siren (100 feet)	130
Jet takeoff (200 feet)	120
	110
Pile driver (50 feet)	100
Ambulance (100 feet)	90
Freight cars (50 feet)	84
Pneumatic drill (50 feet)	80
Freeway (100 feet)	70
Vacuum cleaner (10 feet)	60
Department store; light traffic (100 feet)	50
Large transformer (200 feet)	40
Soft whisper (5 feet)	<30

Source: Beranek 1988 *in* BPA et. al. 2014

[1]A-Weighted sound level in decibels (dBA)

3.10.1.2 Environmental Consequences – Action Alternative

3.10.1.2.1 Construction Effects

Noise-related construction effects resulting from the project would be associated with the use of construction equipment on site. One of the more recent and complete compilations of construction equipment noise is the Roadway Construction Noise Model (FHWA 2006). Noise levels from Table 1 in the *Roadway Construction Noise Model User's Guide* are shown in Table 3-5 for the equipment anticipated to be used during construction of the Proposed Action. All listed noise levels are maximum A-weighted sound pressure levels at a reference distance of 50 feet.

Table 3-5. Construction Equipment Noise Levels

Construction Equipment	Noise Level (dBA)[1]
Backhoe	80
Compactor (ground)	80
Compressor (air)	80
Crane	85
Dozer	85
Dump truck	84
Excavator	85
Generator	82
Grader	85
Loader	80
Pickup truck	55
Pumps	77
Tractor	84
Scraper	85
Vibratory pile driver	95

Source: FHWA 2006

[1] Specified A-weighted sound pressure level (L_{max}) at 50 feet.

The intensity of sound attenuates, or diminishes, by about 6 dBA as distance doubles (FTA 2006). Review of the table of construction equipment noise levels indicates that, with the exception of pile driving, the loudest equipment generally emits noise in the range of 80 to 90 dBA at 50 feet. The types and numbers of construction equipment near any specific receptor location would vary over time. Individual equipment operating in the construction zone could be discernible above ambient noise up to 2,000 feet away from the construction zone. The closest sensitive noise receptor (the commercial farm equipment manufacturing company located south of Farm Lane) would abut the construction zone; other sensitive receptors (stone and tile business and several homes) would be located on the east side of OR 202, and on the south side of the Wallooskee River (with residences as close as about 530 feet from the construction zone). Therefore, temporary construction noise would be discernible to most sensitive receptors within the analysis area, and noise impacts would be moderate. As summarized in Table 2-2, the following mitigation measure would be implemented to reduce construction-related noise impacts.

- Limit construction activities to normal daytime working hours where feasible. At night, activities generating noise would be limited to only those necessary, such as for dewatering pumps or equipment use when needed to accommodate tidal schedules.

With implementation of this mitigation measure, noise-related construction effects would primarily be limited to daytime hours, when sensitive receptors are less likely to be affected by construction noise, either because they are working and otherwise exposed to work-related noise (e.g., stone and tile business), or are not at home (e.g., residents away at work). Nighttime noise effects could be more substantial, but would be temporary and limited to dewatering pumps, and only to the extent pumps are necessary to maintain the construction site in a dewatered condition. There may be occasional use of equipment that needs to remain running after daytime hours to accommodate tidal schedules, but this would be infrequent to take advantage of tide levels. As a result, construction-related noise impacts under the Proposed Action would be moderate but temporary.

3.10.1.2.1 Long-Term Effects

Once implemented, the Proposed Action would generate no noise, with the exception of noise associated with limited vehicle access to the site to conduct monitoring or maintenance. Stewardship actions generating noise would likely be limited to infrequent use of equipment to conduct vegetation maintenance.

3.10.1.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the Proposed Action and construction-related noise impacts would not occur. Emergency repair of a self-breach in the levee, if undertaken, could generate temporary noise, although the nature and duration of that noise would depend on the repair. There would be no change from current levels of noise under the No Action Alternative.

3.10.2 Hazardous Waste

This section describes potential hazardous materials and substances that may be generated or encountered during the construction of the Proposed Action.

3.10.2.1 Affected Environment

A Phase I Environmental Site Assessment of the restoration site was completed in February 2012 (Alpha Environmental Services, Inc. 2012). The purpose of the Phase I Environmental Site Assessment was to identify existing or potential hazardous waste concerns within the restoration site. This assessment revealed no evidence of "recognized environmental concerns" in connection with the property, and there is no evidence of any unacceptable levels of contaminants located in, on, under, or adjacent to the property that would interfere with the construction, operation, or maintenance of the Proposed Action. Unlabeled drums of used motor oil were observed on-site and stained soil was found outside an outbuilding in the general vicinity of some of the drums. Aerosol paint cans, solvents, and car batteries were found on top of and around the work benches inside the main outbuilding. In addition, a 275-gallon diesel above ground storage tank, used to fuel farm vehicles and machinery, was located on-site (Alpha Environmental Services, Inc. 2012). All of these items were located on the uplands at the central/southern portion of the property, and outside of the area where earthwork and tidal process restoration activities are proposed. Subsequent to the Phase I assessment, the unlabeled drums, other hazardous waste, and the above ground storage tank were removed.

3.10.2.2 Environmental Consequences – Action Alternative

3.10.2.2.1 Construction Effects

The use of hazardous materials or substances during construction of the project has the potential to result in the contamination of soil, surface water, or groundwater if they are inadvertently released into the construction site, and/or injury to personnel during transport, storage, use, or disposal of hazardous substances.

Construction equipment contains petroleum products, such as gasoline, diesel fuel, motor oil, and hydraulic fluid, and other hazardous fluids, such as anti-freeze. Equipment leakage may lead to the release of small quantities of these substances into the environment. Releases of hazardous substances to the environment may also occur when contaminated media, such as soil and gravel, are used for construction or backfill materials, or if existing sites of contamination (e.g., underground storage tanks) are encountered during construction. Hazardous materials can also be released into the environment if work containment structures, such as temporary dams or earthen plugs, fail.

As described above, soils within the project area are not known or expected to be contaminated, and other imported construction materials (e.g., rock) would be sourced to ensure they are free of contaminants. In addition, no existing sites of environmental concern have been identified where construction activities would occur.

The following mitigation measures would be implemented to reduce the potential for leaks or spills of hazardous materials from equipment during construction, and to reduce the potential for construction workers to be injured in the event of an inadvertent release of a hazardous substance:

- Stage construction equipment (when feasible) and supplies within designated staging areas or in an upland area away from the floodplain, wetland and other water resources
- Store construction fuel within designated staging areas and refuel equipment within staging areas before departing for the work location. In order to minimize heavy equipment travel through the site and along the levees refueling may occur at the work location via pickup truck with appropriate containment devises. Ensure a spill kit is available, and lay disposable absorbent mat "diapers" on the ground beneath equipment during the fueling operations.
- Retrofit hydraulically-operated equipment that may work below the mean higher high water with fluids approved for work in aquatic environments.
- Ensure spill containment and cleanup materials are readily available at the work site and staging areas at all times.
- Inspect machinery daily for fuel or lubricant leaks.
- Do not perform vehicle and equipment maintenance, other than emergency repair, on the project site unless approved by a BPA environmental representative.
- Observe appropriate spill containment measures and buffer distances for fueling and - hazardous material storage. -
- Do not use contaminated sediments in construction activities.
- Dispose of non-hazardous wastes in approved landfills.
- Dispose of hazardous wastes according to applicable federal and state laws.

Herbicide treatment may be required to remove invasive species during construction of the Proposed Action. Herbicide treatment can result in the release of toxic substances into the soil, surface water, and groundwater, and can expose wildlife and project personnel to the herbicide during application and run-off. Herbicides utilized for control of invasive species would include glyphosate or other products labeled for use in or near waters as appropriate. Pursuant to the requirements of Section 7(c) of the ESA, BPA would prepare a biological assessment to submit to NMFS that would include restrictions on herbicide application methods and appropriate conservation measures to assure protection of ESA-listed fish species. All herbicide applications would be conducted in accordance with the biological assessment requirements and application methods would be utilized that eliminate drift to neighboring properties.

Implementation of the mitigation measures described above would reduce the potential impacts associated with the potential release of hazardous materials during construction of the Proposed Action, including herbicides. The effect of the proposed action would be low.

3.10.2.2.2 Long-Term Effects

Herbicide application may be used over the long-term to control invasive vegetation within the restoration site as part of the site stewardship. As noted above, herbicides utilized for control of invasive species would include glyphosate or other products labeled for use in or near waters as appropriate. All herbicide applications would be conducted in accordance with the biological opinion

requirements and application methods would be utilized that eliminate drift to neighboring properties. No other hazardous materials or substances would be used on-site, and this impact would be low.

3.10.2.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the Proposed Action, so no use or generation of hazardous substances or waste would occur from construction activities or long-term management of the site (i.e., herbicide application).

3.10.3 Public Health and Safety

This section describes potential public health and safety concerns that may occur during construction of the Proposed Action or as a result of long-term management of the site as tidal marsh and estuarine habitat. The analysis area for public health and safety coincides with the project area and general vicinity, where construction activity hazards (e.g., construction-related traffic) and/or restoration benefits (e.g., reduced mosquito breeding habitat) could occur.

3.10.3.1 Affected Environment

Access to the proposed restoration site is limited to the current owner and guests, as well as utility (BPA, NW Natural, and Pacific Power & Light) staff responsible for maintaining infrastructure located within their easements on the property. With the exception of OR 202, roads within the project area are private. The Youngs and Wallooskee rivers are open to public recreational uses, including boating, kayaking, fishing, and wildlife viewing.

3.10.3.2 Environmental Consequences – Action Alternative

3.10.3.2.1 Construction Effects

Construction activities, including operation of heavy equipment and work in hazardous environments (e.g., adjacent to water) and increased construction traffic, have the potential to impact public health and safety during implementation of the Proposed Action.

Construction activity hazards. Risk of injury to workers would be associated with the use of heavy equipment, working near high-voltage lines, working in water, earthwork in general, and exposure to hazardous materials (such as petroleum products and other hazardous fluids), or dust during construction. In particular, work around water would involves the risk of drowning, particularly while in-water equipment is moving, and work in saturated soils could lead to unplanned equipment movement where soils lack the strength to support heavy loads.

Traffic entering and leaving the project area. Construction trucks and vehicles entering or leaving the project area could increase safety hazards for vehicles and travelers using OR 202. Similarly, equipment staged on the west side of OR 202 during the second phase of construction (Figure 2-7) could present a safety hazard as equipment is moved from the staging area to the construction site. Safety hazards related to staging or construction traffic on OR 202 would be greatest during the summer months when highway use is heavier. However, this impact would be low because road use would be within the design capacity of the roadway, and the level of daily vehicle trips would be

primarily contained within the project area during construction (see Section 3.11, Transportation). In addition, all equipment staged adjacent to OR 202 would be located as far as possible from travel lanes, and marked to ensure motorists can readily identify its location (Table 2-2).

These short-term impacts would not be expected to overburden the existing health and safety infrastructure in Clatsop County or Astoria or greatly increase risks to recreationists in the vicinity. The potential health and safety risks to workers and the public during construction of the Proposed Action would not be greater than a standard construction project and therefore the impact of the project to health and safety would be low.

3.10.3.2.2 Long-Term Effects

The Proposed Action would reestablish tidal marsh habitats at the restoration site by creating a network of tidal channels, modifying (breaching) an existing levee, and restoring native vegetation. If poorly designed or constructed, the restored site could create low lying or poorly drained areas which could pond water for sustained periods of time. Under some circumstances, ponded water can provide breeding habitat for mosquitoes, which are considered both a nuisance and a public health threat, since they can serve as vectors for diseases such as West Nile virus.

The restoration site would be subject to regular tidal inundation under the Proposed Action, and the restoration elements have been designed to ensure adequate drainage within the site, both to prevent fish stranding as tide waters recede and to ensure mosquito breeding habitat is not inadvertently created. In addition, the restoration site would be monitored over the long-term to ensure restoration objectives, including proper site drainage, are met. As a result, the long-term effects on public health and safety from mosquito-borne disease would be low (and commensurate with existing levels).

Drainage improvements along OR 202 would protect the segment of the highway adjacent to the restoration site from inadvertent flooding during storm or high tide events by providing a barrier to wave action during large storm events and facilitating drainage of the roadway. Access to the BPA transmission towers would be maintained through the development of a low-water access road and a safe work platform surrounding each tower, allowing the continued safe and reliable operation of the transmission system. Accordingly, infrastructure improvements under the Proposed Action would improve the safety and reliability of utilities and roads on and adjacent to the project area, and would represent a low beneficial impact.

3.10.3.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the Proposed Action and potential construction-related risks to public health and safety (e.g., traffic accidents, exposure to construction-related hazardous materials) would not occur. Utility infrastructure would remain susceptible to flooding should the unmaintained levee in the project area self-breach during a storm or high water event, putting the safety and reliability of the BPA transmission system at risk. Similarly, OR 202 would be at risk if exposed to tidal inundation after a levee failure without appropriate protection measures. Finally, should the levee self-breach, it is possible that low portions of the project area would pond water given the degraded condition (limited drainage) of the

existing ditch network. Onsite ponding could increase mosquito breeding habitat, and increase the potential for mosquito-borne disease.

3.11 Transportation

This section describes the potential effects of the Proposed Action on transportation. The analysis area for transportation includes all roads within the project area and roads that would be used to access the project area.

3.11.1 Affected Environment

Two roads are located within the analysis area: OR 202 and Farm Lane.

3.11.1.1 Oregon Route 202

OR 202 is located along the northeastern boundary of the project area and is managed and maintained by ODOT. Part of Nehalem Highway 102, this 46-mile-long two-lane highway connects the towns of Astoria and Mist. Within the analysis area, OR 202 includes two 12-foot travel lanes with shoulder widths of 1 to 5 feet. No center turn lane or median is present.

The Federal Functional Classification for OR 202 is "Rural Major Collector / Urban Collector" (ODOT 2013). This classification system is used to group roads into functional systems according to the type of service and amount of traffic the facility carries and to determine design standards and Federal aid funding eligibility (ODOT 2014a). The Federal Highway Administration (FHWA) defines a "collector" functional system as one that "provides a less highly developed level of service at a lower speed for shorter distances by collecting traffic from local roads and connecting them with arterials" (FHWA 2012). The rural and urban characterizations within the classification system inform the design speed of the roadway. The speed limit on OR 202 is 55 miles per hour.

OR 202 is not part of the National Highway System or Strategic Highway Network and is not designated as a National Scenic Byway by the U.S. Department of Transportation.

There are no permanent Automatic Traffic Recorder stations located on OR 202, so monthly traffic trends are not available. Annual Average Daily Traffic estimates on OR 202 in the vicinity of the project area for the previous five years are summarized in Table 3-6. Average daily traffic volumes on OR 202 in the analysis area generally increased from about 3,400 in 2008 to 4,000 in 2012 (ODOT 2014b).

Table 3-6. OR 202 - Annual Average Daily Traffic – Milepost 4.34[1]

Year	Annual Average Daily Traffic
2012	4000
2011	3800
2010	3900
2009	3700
2008	3400

Source: ODOT 2014b

[1] Annual Average Daily Traffic measured at Milepost 4.34, or 0.2 mile north of Walluski Loop Road, on Nehalem Highway No. 102.

3.11.1.2 Farm Lane

Farm Lane is a private one-lane gravel road that leads southwest from OR 202 and provides access to both the restoration site and the property located south of the restoration site (a commercial farm equipment manufacturing company). Within the restoration site, Farm Lane connects to two other primitive dirt roads that are used for farm and utility maintenance.

3.11.2 Environmental Consequences – Action Alternative

The Proposed Action would not require additional rights-of-way or permitted access to accommodate construction or long-term management of the Proposed Action. ODOT wind wave mitigation measures occur both within the existing right-of-way and on the restoration project property. ODOT would be granted the ability to maintain these areas by either land donation or maintenance access easement, as determined by ODOT and the Cowlitz Indian Tribe.

3.11.2.1 Construction Effects

Construction of the Proposed Action has the potential to temporarily increase traffic volumes on both OR 202 and Farm Lane, as described below. In addition, the existing primitive dirt road on the restoration site that provides access to existing infrastructure would be replaced with a low-water access road.

3.11.2.1.1 Oregon Route 202

General use of OR 202 would not be limited during construction of the Proposed Action. However, traffic volumes on OR 202 would increase during the construction period from the delivery of construction equipment and materials and access to the project area by construction workers. The number of daily construction-related trips generated by the Proposed Action would vary throughout the construction period. During the peak construction period (May to September 2015), up to six

construction-related vehicles would access the project area from OR 202 during working hours (generally 7 a.m. to 6 p.m.). Dump trucks and flatbed trucks would also infrequently delver construction equipment and materials (ie, riprap, articulated concrete sheet, sheet pile) to the site as needed. Relative to the 2012 Annual Average Daily Traffic for OR 202 in the vicinity of the project area, this would represent an approximate 0.15 percent increase in total daily traffic (Table 3-7).

The increased use of OR 202 by construction-related vehicles could have a short-term direct effect on highway travelers from infrequent traffic delays and an increase in daily traffic volumes compared to its existing use. However, the increase is not expected to adversely degrade traffic operations or safety, and the roadway condition would not be degraded because construction-related trips would be spread throughout the workday. There would be short-term closures of a single traffic lane on OR 202 for work associated with filling the concrete cattle pass, for installation of the sheet pile wall, and for associated drainage improvements. These closures would be of limited duration (intermittently for 2-3 weeks) and would be managed by the construction contractor to minimize disruptions in traffic flow (Table 2-2). Most vehicular traffic associated with restoration elements would be contained within the project area and not on OR 202.

Table 3-7. OR 202 Traffic Impacts During Peak Construction Period

2012 Annual Average Daily Traffic[1]	**Approximately 4,000 vehicles**
Approximate Increase in Daily Traffic from Construction Activities	Approximately 6 vehicles
Approximate Percent Increase in Daily Traffic from Construction Activities	Approximately 0.15 percent

[1] ODOT 2014b; Annual Average Daily Traffic measured at Milepost 4.34, or 0.2 mile north of Walluski Loop Road, on Nehalem Highway No. 102.

Finally, equipment would be staged on the west side of OR 202 during the second phase of construction (Figure 2-7), which could present a safety hazard or traffic impediment as equipment is moved from the staging area to the construction site. As described above, impacts to traffic would be low because the use of OR 202 to transfer equipment from the staging area to the project site would be limited. In addition, all equipment staged adjacent to OR 202 would be located as far as possible from travel lanes, and marked to ensure motorists can readily identify its location (Table 2-2).

The following mitigation measures would be implemented to minimize potential transportation effects on OR 202 during construction:

- Post traffic control signs on OR 202 to alert motorists of trucks turning to and from Farm Lane.
- Use flaggers when needed, in and around the staging area adjacent to OR 202 and during OR 202 lane closures, to direct traffic and avoid vehicle conflicts.
- Locate equipment staged adjacent to OR 202 as far as possible from travel lanes, and mark

to ensure motorists can readily identify the staging location.

These mitigation measures would reduce the potential for traffic conflicts during construction of the Proposed Action by providing adequate signage, notification, and oversight of construction-related traffic in the project vicinity. When considered in combination with the relatively low level of work trips that would occur, transportation impacts during construction of the Proposed Action would be low.

3.11.2.1.2 Farm Lane

As noted above, Farm Lane is a gravel-surfaced road that provides access to the center of the levee-protected floodplain. From that point it transitions to informal overland travel routes to access the southwest BPA tower next to the Youngs River and the remainder of the pasture area. Although construction-related traffic would represent a short-term increase in the use of this private road, access to the commercial property south of the project area would not be affected as the road would remain open and able to accommodate existing levels of traffic to the commercial property, and traffic-related delays would be minimal, if any.

It is possible that the use of large or heavy construction equipment could damage Farm Lane (e.g., compress the road prism, create ruts or potholes, and damage the road shoulders). The following mitigation measure would be implemented to mitigate any damage to Farm Lane from construction activities:

- Repair damage to Farm Lane, as needed, after construction is complete.

Given that the Proposed Action would not affect access to the commercial property south of Farm Lane, and because any damage to Farm Lane would be repaired after construction activities are complete, it is expected that construction-related traffic impacts to Farm Lane would be low.

3.11.2.1.3 Existing Primitive Dirt Roads

Access to utility infrastructure on the restoration site during construction, including the BPA transmission towers and buried gas and electrical lines, would be provided on existing primitive dirt roads and overland travel.

As the project is constructed primitive roads within the restoration site would be removed or modified to support the restoration elements of the Proposed Action. Specifically, the existing access roads within the levee-protected floodplain would be removed and replaced with a low-water access road constructed to withstand tidal inundation and provide access to BPA tower pads during low tides. This new road would be designed to minimize effects on site hydrology and tidal channel evolution, and would not include any culverts or other structures to convey water. From a transportation perspective, the new low-water access road would provide more reliable and safe access to existing infrastructure and would result in a beneficial impact.

3.11.2.2 Long-Term Effects

Long-term stewardship of the restoration site and maintenance activities associated with existing infrastructure would result in infrequent vehicle trips and would not contribute substantially to traffic volumes on OR 202 or Farm Lane. In addition, the proposed drainage improvements and wind-wave energy mitigation at OR 202 would minimize the potential for damage to this roadway through erosion or flooding during high tide or storm events. These improvements would maintain the current level of protections during flood events. Overall, these low traffic levels and proposed protections for OR 202 during extreme weather events would make the long-term effects of the Proposed Action on transportation resources low.

3.11.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not provide funding for the Proposed Action and no construction-related transportation impacts would occur. In addition, infrastructure improvements, including the construction of a low-water access road, raised BPA tower pads, and a sheet pile wall adjacent to OR 202, would not occur. If the levee were to self-breach the segment of OR 202 behind the levee would experience flooding at a greater frequency than the segment located north of the project area in the vicinity of Crosel Creek, because the road surface is approximately 18 inches lower in the project area. In the event of a levee self-breach the OR 202 would have greater service impacts due to flooding then under the existing condition or proposed action. It is possible that infrastructure could be inundated or otherwise damaged, which could affect the reliability of BPA transmission system, prevent land access for maintenance or repairs, and interfere with the safe operation of OR 202.

3.12 Socioeconomics

The following section describes the socioeconomic conditions in Clatsop County, as well as the nearby community of Astoria, where socioeconomic effects resulting from the Proposed Action, including potential effects on population, housing, employment, and income, would likely occur.

3.12.1 Affected Environment

The project area is located within unincorporated Clatsop County, about 2 miles southeast of Astoria. With the exception of a small residential development located south of the project area, only a few scattered residential properties are located in close proximity (within 0.5 mile) to the project area. An Oregon Department of Forestry office is located southeast of the project area, on the east side of OR 202, and the Clatsop County Fair and Expo Center is located about 0.5 mile east of the project area, on Walluski Loop Road. Several businesses are located within about 0.5 mile, including a stone and tile business on the east side of OR 202, a commercial farm equipment manufacturing company located on Farm Lane south of the project area, and the Station Thirty Heliport located off Walluski Loop Road.

3.12.1.1 Population and Housing

Table 3-8 summarizes demographic information for Oregon, Clatsop County, and Astoria. Between 2010 and 2013, the U.S. Census Bureau estimates the populations of Astoria and Clatsop County grew 0.4 percent and 0.5 percent, respectively, which is less than the statewide population growth estimate of 2.6 percent (U.S. Census Bureau 2013). The average household size was slightly smaller in Astoria (2.15) compared to Clatsop County (2.29), and both were smaller than the statewide average of 2.47.

Table 3-8. Demographic Characteristics

Geographic Area	Population	Median Age	Number of Households	Average Household Size	Median Household Income	Persons Below Poverty Level[1]	Minority Population[2]
State of Oregon	3,831,074	38.4	1,518,938	2.47	$50,036	10.8%	21.4%
Clatsop County	37,039	43.2	15,742	2.29	$44,330	12.6%	12.7%
Astoria	9,477	41.9	4,288	2.15	$40,603	17.1%	15.7%

Source: U.S. Census Bureau 2010, U.S. Census Bureau 2013 -
[1]As established by the U.S. Department of Health and Human Services. -
[2]Minority populations include all persons identifying as Black or African-American, American Indian and Alaskan Native, - Asian, Native Hawaiian or Other Pacific Islander, Some Other Race, Two or More Races, and Hispanic (of any race). -

3.12.1.2 Employment and Income

The major employment centers in the vicinity are located within or around Astoria, as well as the nearby communities of Warrenton, Gearhart, Seaside, and Cannon Beach. In 2013, the Leisure and Hospitality industry represented 23.1 percent of the jobs in Clatsop County, followed by Trade, Transportation, and Utilities (17.3 percent); Government (16.5 percent); Manufacturing (12.7 percent); and Education and Health Services (12.6 percent) (Oregon Employment Department 2014a). Tourism is a particularly important year-round industry within the County given its proximity to forested, tidal marsh, and coastal areas and their associated opportunities for hunting, fishing, boating, hiking, and wildlife viewing.

As shown in Table 3-8, the median household income for residents in Astoria ($40,603) is lower than the County median ($44,330), which in turn is lower than the median household income for the state ($50,036). The most recent (October 2014) unemployment rate in Clatsop County is 6.0 percent, which is slightly lower than the statewide unemployment rate of 7.0 percent (Oregon Employment Department 2014b). These rates are lower than 2010 unemployment rates of 9.3 percent in Clatsop County and 10.8 percent in Oregon (Oregon Employment Department 2014b).

3.12.1.3 Environmental Justice

Executive Order 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-income Populations, collectively, environmental justice populations, states that each federal agency should identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The Executive Order further stipulates that agencies conduct their programs and activities in a manner that does not have the effect of excluding persons from participation in, denying persons the benefits of, or subjecting persons to discrimination because of their race, color, or national origin.

Table 3-8 provides information on the minority and low-income populations in Oregon, Clatsop County, and Astoria. The minority population concentrations in Clatsop County (12.7 percent) are lower than those identified in both Astoria (15.7 percent) and Oregon (21.4 percent). The low-income population concentrations are highest in Astoria (17.1 percent), followed by Clatsop County (12.6 percent) and Oregon (10.8 percent).

3.12.2 Environmental Consequences – Action Alternative

BPA would contribute funding towards the Proposed Action, which could cost approximately $10 million.

3.12.2.1 Construction Effects

Construction of the Proposed Action would likely result in short-term beneficial economic effects within Clatsop County and Astoria and could result in limited, short-duration increases in the local population and demand for housing. Some materials necessary to construct the project may be sourced locally (e.g., riprap, soils) and lodging, food, and other services would be required to support construction workers traveling from outside of the immediate area. Although beneficial, the positive impact of constructing the Proposed Action would be small and temporary, and potential increases in population or housing demand would subside after construction is complete. The construction related impacts to socioeconomics are considered low due to the minimal amount of goods and services that are expected to be required during construction.

To the extent practicable, local labor and material would be used to construct the project, resulting in a low, beneficial impact to socioeconomics.

3.12.2.2 Long-Term Effects

The Proposed Action would have no long-term effect on population, housing, or employment. The project area has not been used for agricultural production for over two years, and all farm infrastructure is vacant. Transitioning the project area from a past agricultural use to an open space use would have no impact on residents or employment, and no businesses or community resources would be displaced. Property taxes would continue to be paid by the Cowlitz Indian Tribe, as required by the County.

After completion of construction, activities within the project area would be limited to maintenance and monitoring, which would occur on a relatively infrequent basis and would not generate a substantial demand for housing or provide notable opportunities for employment. BPA transmission line work would likely be limited to semi-annual transmission system inspections.

3.12.2.3 Environmental Justice

As shown in Table 3-8, the minority population concentrations in Clatsop County (12.7 percent) and Astoria (15.7 percent) are relatively low. Low-income populations in the County (12.6 percent) are comparable to those in the state (10.8 percent), although Astoria's low-income population is notably higher (17.1 percent). In general, very few people live in the immediate vicinity of the project area, with the majority of residential properties located to the south of the project area, in a moderately affluent subdivision.[6]

During construction, the areas adjacent to the project area would experience short-term disturbances, including noise from construction equipment and activities, and traffic delays from construction traffic and work along OR 202. However, these impacts would be low because they would be limited in duration and because very few residences and businesses are located in the general vicinity. Moreover, all persons, regardless of race or income, would experience the same impacts associated with construction activities. As a result, construction of the Proposed Action would not result in disproportionately high or adverse effects on environmental justice populations.

3.12.3 Environmental Consequences – No Action

Under the No Action Alternative, BPA would not fund the Proposed Action and no socioeconomic impacts from BPA-funded construction would occur.

[6]Zillow reported that three 3-bedroom homes were sold in this subdivision in 2014 for prices ranging from $240,000 to $400,000. In Astoria, 3-bedroom single family residences sold for between $145,000 and $320,000 in 2014. Although clearly a rough metric for measuring income, housing prices provide an indication that that residents within this subdivision are not likely low-income.

3.13 Cumulative Impacts Analysis

Cumulative impacts are the impacts on the environment that result from the incremental impact of the project when added to other past, present, and reasonably foreseeable future actions, regardless of what agencies (federal or non-federal) or persons undertake such other actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over a period of time.

This section describes existing development from past actions in the vicinity of the proposed project, as well as present and reasonably foreseeable future developments. The past, present, and reasonably foreseeable future actions provide the context in which to assess the cumulative impacts of these actions in combination with the project. The geographic area considered for cumulative impacts to natural and physical resources includes the Columbia River estuary, primarily the lower portion of the Columbia River estuary; Youngs Bay; the Youngs and Wallooskee rivers; and wetland, riparian, and upland areas adjacent to these water bodies. In some cases, the area considered for cumulative impacts may be broader (e.g., the cumulative effects analysis area for fish and wildlife is the Columbia River Basin).

3.13.1 Past Actions

Past actions that have affected natural and human resources in the Columbia River estuary include the construction of the dams and urbanization within the Columbia River Basin, timber harvest, diking, dredging, commercial fishing, hatchery production, aquaculture, agriculture, road development, commercial and port development, and residential development, as well as sand and gravel mining in the lower Columbia River. The Columbia River estuary and the salmon and steelhead that utilize it have been adversely affected for well over a century by a range of human and natural environmental impacts. These impacts include urbanization, forest practices, aquiculture, agriculture, the introduction of non-native species, adverse ocean and climate conditions, overfishing, mining, diking, dredging, predation, hatchery practices, toxic pollutants, as well as the impacts from dams and water diversions. Since 2007, the FCRPS Action Agencies have protected and restored more than 5,000 acres of estuary habitat, greatly increasing the survival benefits for salmon and steelhead in the Columbia River estuary. A number of tidal restoration projects have been recently implemented near the project area. These projects include Otter Point and Colwort Creek, within the floodplain of the lower Lewis and Clark River, and Haven Island, located within the Youngs River floodplain. Several land acquisitions have also occurred along the Wallooskee River to protect existing tidal habitat or to secure locations where future restoration projects are planned.

3.13.2 Current and Reasonably Foreseeable Future Actions

Current actions are those projects, developments, and other actions that are currently underway because they are either under construction or occurring on an ongoing basis. Reasonably foreseeable future actions generally include those actions formally proposed or in the planning stages. In determining the present and reasonably foreseeable actions with the potential, when combined with the effects of the alternatives, to result in cumulative effects, BPA considered other planning efforts, large-scale projects, and restoration actions within the Columbia River estuary.

The following current and reasonably foreseeable projects are included in the analysis of cumulative effects considered in this section. The amount of detail available for these projects varies, so the assessment in this EA only presents the degree of specificity supported by the available information:

1. - Since 2008, the FCRPS Action Agencies have greatly expanded their efforts in the Columbia River estuary, implementing numerous "on the ground" actions, including land acquisitions and restoration actions such as breaching levees to restore tidal influence (FCRPS 2013). Tidal wetland restoration projects within Youngs Bay and its tributaries as well as the larger Columbia River Estuary are currently being developed and implemented. Organizations planning restoration projects in the estuary in coordination with BPA and the Corps include the Cowlitz Indian Tribe, Columbia River Estuary Study Task Force, Columbia Land Trust, Washington Department of Fish and Wildlife, and Lower Columbia Estuary Partnership. Several other tidal wetland restoration projects in the vicinity of the project area are in the planning stages, including sites along the Youngs and Wallooskee rivers. The Fee Simon tidal wetland restoration project is being implemented upstream along the Youngs River.

2. - The Youngs Bay terminal fishery uses existing hatchery facilities to spawn, hatch, and conduct initial rearing of juvenile salmon for subsequent out-planting to the Youngs Bay net pens where the fish are reared through to smolt stage and then released. The retuning fish provide commercial and recreational fishing opportunities, helping to minimize the catch of ESA-listed fish stocks. Fish reared in the Youngs Bay net pens include spring and fall Chinook and coho. These facilities can affect the environment by degrading water quality and by releasing fish, including smolts and subsequent adults, that compete with ESA-listed salmon and steelhead stocks.

3. - Timber harvesting activities contribute sediment to the rivers and streams that flow into Youngs Bay and the lower Columbia River. The Oregon Department of Forestry's Astoria District office manages Oregon State-owned timber lands in the watersheds contributing to Youngs Bay. The district clearcut harvested 253 acres in 2014, and plans to clearcut 123 acres and construct 1.1 miles of associated roads in 2015 (ODF 2013 and 2014). In addition to timber harvest activities in the Youngs Bay watershed, timber harvest activities and associated road building would continue to occur for the foreseeable future on state and private lands around the Columbia River estuary and its tributaries.

4. - The Corps removes sediment from the mouth of the Columbia River and the river's navigation channel. Sediment dredging is part of the Corps' annual river maintenance and is intended to keep the federal navigation channel safe for commercial shipping (USACE 2013). Material from the sediment dredging is deposited in various locations within the lower Columbia River, expanding sand areas along shorelines and islands.

   Additionally, Caspian terns and double -crested cormorants, native bird species that nest in the Columbia River estuary, are present on islands used to dispose of dredged material. A recent increase in the number of Caspian terns and double-crested cormorants has led to concerns over their potential impact on the recovery of threatened and endangered Columbia River salmon and steelhead. In an effort to reduce predation on juvenile salmon

and steelhead, the Corps has implemented a management plan for Caspian terns (USFWS 2005) and is proposing a management plan for double-crested cormorants established on East Sand Island near the mouth of the Columbia River estuary (USACE 2013).

5. - The Farm Bill, implemented in the Youngs Bay Area by the NRCS and the Clatsop Soil and Water Conservation District, is also likely to result in complementary actions that improve the environment on agricultural lands. These programs modify agricultural production on wetlands or lands near streams and rivers to promote conservation or habitat preservation:

    - Wildlife Habitat Improvement Program
    - Conservation Reserve Program
    - Environmental Quality Incentive Program
    - Wetland Reserve Program

3.13.3 Cumulative Impacts Analysis

The following subsections describe the cumulative effects that the project, in combination with the past, present, and reasonably foreseeable future actions outlined above, would have on the environmental resources discussed in this EA. Cumulative effects from the combination of these actions could occur for each of the environmental resources. Overall, the project, in combination with past, present, and reasonably foreseeable future actions would result in low to moderate cumulative impacts to all assessed resources.

3.13.3.1 Vegetation and Wetlands

Reasonably foreseeable future actions that could have vegetation and wetland impacts include timber harvest and construction of associated roads, agricultural activities, vegetation control along roads and utility corridors, commercial and residential development, and wetland habitat restoration. Levee construction, filling of historic wetlands, and other forms of development over the last century have reduced some Columbia River estuary wetland habitats by nearly 70 percent from historical levels (Marcoe 2013). These past actions cumulatively affected wetland functions (i.e., water quality, hydrology, and wildlife habitat).

Planned large scale restoration of wetland habitats in the Columbia River estuary would help to reverse many of the impacts from past wetland and floodplain development. The implementation of the project, in combination with other restoration actions in the estuary, would cumulatively benefit floodplain vegetation and wetland habitats.

3.13.3.2 Water Resources and Geology and Soils

The past, present, and reasonably foreseeable future actions that could cumulatively affect water resources and soils in the Columbia River estuary include timber harvest, road construction, agricultural activities, commercial and residential development , and habitat restoration projects. These actions all affect flooding, soil erosion, sediment runoff to the river system, and water quality.

The long-term project effects, in combination with other Columbia River estuary restoration projects, would cumulatively benefit water resources through enhanced floodplain function. Restoring tidal

inundation to floodplains through levee breaching and other actions increases flood storage capacity, reducing flood risk to nearby communities (USACE and BPA 2013). Estuary restoration improves floodplain sediment storage as part of the natural process of building tidal marshes. Studies of Columbia River estuary restoration sites show very rapid sediment accumulation, which benefits the establishment of wetland plant communities and channel development (Thom et al. 2013). Estuary habitat actions also improve water quality because wetland vegetation restores natural filtering processes that remove sediments, nitrogen, phosphorous, and other nutrients (Thom et al. 2013). Implementation of the project, in combination with past, present, and future restoration actions in the Columbia River estuary would cumulatively benefit flood storage, sediment accumulation and associated wetland habitat development, and water quality.

3.13.3.3 Fish and Wildlife

Past, present, and future estuary restoration efforts benefit a variety of fish and wildlife species and help to assure the success for the Action Agencies' habitat restoration projects implemented in the upper portions of the Columbia River. It is the intent of BPA to provide a region-wide approach for providing habitat for salmon and steelhead. This approach includes tidal restoration projects throughout the Columbia River estuary as well as mitigation at hydroelectric dams and restoration within tributary habitats. Preliminary results indicate that the implemented habitat actions in the upper Columbia River system are improving spawning habitat as well as juvenile salmon and steelhead growth and survival, and that further improvements in the condition of the habitat and fish growth and survival should continue to occur over time and as additional actions are implemented (FCRPS 2013). Additionally, hatchery programs throughout the Columbia River Basin are producing increasing numbers of salmon and steelhead adding to the need for habitat in the Columbia River Estuary. These actions are resulting in increased numbers of juvenile salmon and steelhead from the upper basin entering and residing in the Columbia River estuary for varying amounts of time during all months of the year.

The estuary's diverse habitats provide food and refuge for rearing and migrating juvenile salmon as they make their critical transition from fresh water to productive marine feeding grounds (FCRPS 2013). The Action Agencies' projects in the estuary are focused on expanding and restoring this critical estuarine habitat for the benefit of listed juvenile salmon and steelhead. The habitat actions within the estuary have taken an ecosystem approach to restoration, seeking to improve not only the physical habitat but also ecosystem processes, including restoring tidal cycles to floodplain areas that create and sustain habitat types and functions important to salmon and steelhead (Johnson et al. 2003). Habitat actions such as dike breaches that provide the greatest hydrologic reconnection generally also produce the greatest benefits for fish (FCRPS 2013b). The restoration of wetlands also improves ecosystem processes such as the export of food material from the wetlands into the rest of the estuary, where it benefits salmon and steelhead, as well as other fish and wildlife.

While future restoration projects would address habitat that is limited throughout the estuary, including Youngs Bay, the majority of restoration sites would be located along the mainstem of the Columbia River further away from operations such as the Youngs Bay gillnet fishery and net pens. Restoration actions that benefit salmon and steelhead throughout the Columbia River estuary would help reduce the fish densities within available tidal marsh shallow water habitat as well as water

quality affects associated with the Youngs Bay terminal fishery. Similarly, additional restoration sites are being pursued in areas further from known populations of Caspian terns, double -crested cormorants and other predatory birds.

Over time, the implementation of the project, in combination with other restoration actions in the estuary, would cumulatively benefit wetland habitats, improving salmon and steelhead survival rates, the carrying capacity for juvenile salmon and steelhead within the estuary, and ultimately the number of fish returning to the Columbia River system to spawn. In addition, restoring tidal wetland habitats would benefit a variety of wildlife, including migratory birds and other mammals.

3.13.3.4 Land Use and Recreation

Current and reasonably foreseeable future projects that may impact land use and recreation within the Columbia River estuary include commercial and residential development and other activities that change or modify land uses, including tidal and floodplain restoration projects implemented to provide improved salmon and steelhead habitat. These restoration or conservation actions often require existing land uses, including agricultural uses, to be discontinued or modified to support fish and wildlife restoration objectives. Similarly, Farm Bill programs, such as the Conservation Reserve Program and the Wetland Reserve Program, affect land uses (at least temporarily) by modifying agricultural production on wetlands or lands near streams and rivers to focus on conservation or habitat preservation purposes.

When considered in combination with other tidal wetland restoration projects and conservation programs, the Proposed Action would contribute to the conversion of agricultural lands located within historic tidal marsh areas to functioning tidal marsh and other habitats. Agricultural production within these floodplain areas is often limited to grazing and haying operations due to wet and unproductive soils. Agricultural production in these areas also requires extensive drainage and levee networks that are subject to routine maintenance and often active pumping to remove water from the site. The removal of tidal processes and associated land subsidence often decreases the productivity of these agricultural lands over time, and may increase their susceptibility to sea level rise. While restoration projects within bottomland agricultural areas may remove lands from agricultural production, these lands are often the least productive agricultural lands available, and the most likely to become unsustainable in the future due to maintenance costs or sea level rise. Because the lands potentially affected by tidal restoration or conservation projects are situated in levee-protected floodplains and land use is generally limited to grazing or haying operations, which may ultimately become unsustainable over the long-term, cumulative impacts to land use would be low.

The Proposed Action would not adversely affect recreational opportunities because it would not limit access to or use of any existing recreational areas although past informal recreational use of the property may be affected pending the outcome of the management plan that will be developed for the site. When considered in combination with other tidal wetland restoration projects and conservation programs land based recreational opportunities may be affected due to the restoration of tidal processes to areas traditionally utilized for passive recreational opportunities such as hiking. The loss of existing recreational opportunities would be offset by the increase in other recreational opportunities such as wildlife viewing or exploring intertidal habitats via kayaking or boating. In the

long-term, while recreational opportunities may change in response to tidal wetland restoration projects in the Columbia River estuary the effect to recreation is considered low and potentially beneficial as opportunities for recreation would still be available and may improve as natural area are restored.

3.13.3.5 Cultural Resources

The Proposed Action would have no impact on known archaeological or historic resources, and mitigation measures would be implemented to avoid adverse effects on previously unknown cultural resources should they be discovered during ground disturbing activities. Cultural resources are typically located in the upland areas near water bodies. Tidal restoration projects have a limited potential to encounter cultural resources as project areas are typically too low in elevation to have intact cultural resources. However, the use of bottomlands for tidal restoration may inadvertently cause impacts to the uplands either associated with work in uplands adjacent to the project areas or due to the relocation of activities (such as grazing or haying) from the bottomlands to nearby uplands. Due to the potential for cultural resources to be inadvertently impacted due to the potential relocation of activities from restoration sites to unused uplands the cumulative effects to cultural resources are considered low.

3.13.3.6 Aesthetics and Visual Resources

Agricultural activities, logging, road construction, and commercial and residential development are responsible for most of the past and ongoing impacts to visual resources in the vicinity of the project area. In addition, BPA-funded restoration projects and other conservation and restoration activities in the Columbia River estuary would continue to contribute to the modification of agricultural lands (including the removal of visible infrastructure, such as levees and farm buildings) to create habitats dominated by tidal marsh and other restored habitats. While some viewer groups may prefer the aesthetics of agricultural land to restored habitats, many prefer the vegetative, topographic, and hydrologic diversity of natural landscapes, as well as the increased wildlife on view. Overall, cumulative impacts to visual resources from the combined impact of the Proposed Action and other reasonably foreseeable projects, particularly other restoration projects, would be moderate but not necessarily adverse.

No other reasonably foreseeable future projects that would alter the viewshed are planned in or near the project area during the same period the Proposed Action would be constructed. As a result, the Proposed Action would have a low cumulative impact on visual resources for sensitive viewers in the project vicinity.

3.13.3.7 Air Quality and Climate Change

Vehicular traffic, agricultural activities, timber harvesting, and commercial and residential facilities in the project area have all contributed to air quality impacts for the Youngs Bay area, the City of Astoria, and the Columbia River estuary. These emission sources would continue to occur. The combustion emissions and dust generation from the project are expected to have a temporary and localized air quality impact. Given the temporary nature and low level of emissions from the project, in addition to the region's generally high air quality, the cumulative impact on air quality would be

low. Project construction activities, in combination with non-project related activities, including vehicular traffic, agricultural uses, timber harvesting, and commercial and residential facilities in the Columbia River estuary all contribute to greenhouse gas emissions. These emissions contribute to climate change, global warming and anticipated sea level rise. However, the project would help to mitigate for increases in greenhouse gases and associated climate change through increased absorption of greenhouse gases resulting from tidal wetland restoration. In addition, as discussed in the Soils and Geology section, implementation of tidal restoration projects that restore tidal processes and sediment accretion would help build soils within once leveed the tidal wetlands better positioning the tidal wetlands to respond to sea-level rise associated with climate change.

Implementation of the Proposed Action, in combination with other restoration actions in the estuary, would cumulatively help to mitigate the effects of climate change.

3.13.3.8 Noise

Cumulative noise impacts occur when there is noise from more than one noise source at approximately the same time, and within an area where a common sensitive noise receptor could hear it. Within the project area, the predominant source of noise is associated with vehicular traffic on OR 202. Noise associated with the Proposed Action would only occur during construction, and there are no other reasonably foreseeable projects proposed in the project vicinity during the period when the Proposed Action would be constructed. As a result, the Proposed Action is expected to have a low cumulative impact on noise.

3.13.3.9 Hazardous Waste

As described in Section 3.10.2, Hazardous Waste, there are no known hazardous waste sites within the project area, and potential impacts from hazardous wastes would be limited to inadvertent or unintentional hazardous material spills or hazardous conditions during construction of the Proposed Action. Because construction-related hazardous waste effects would be minimized through mitigation measures (Table 2-2) aimed at reducing the risks from exposure to and release of hazardous materials and because no other construction projects are anticipated in the project vicinity concurrent with the Proposed Action, the cumulative impacts from hazardous waste are expected to be low.

Herbicides would also be applied during construction and long-term management of the restoration site to control invasive vegetation, as needed. Application of herbicides (and other chemicals) in similar applications in the vicinity of the project area has the potential to result in cumulative adverse impacts on wildlife, water quality, and public health, assuming herbicide applications may be associated with other reasonably foreseeable projects, such as timber harvest or other restoration projects. These cumulative impacts would be reduced by ensuring that all pesticide applications are made in accordance with the EPA-approved label and that only herbicides labeled for aquatic use are used in and around water bodies.

3.13.3.10 Public Health and Safety

Past, present, and reasonably foreseeable future actions that could cumulatively affect public health and safety are associated with logging, agriculture, construction, residential and commercial development, dredging, and use and maintenance of roads within the project vicinity. Similar to the Proposed Action, these actions can put workers at risk when they operate heavy machinery or work around dangerous environs (e.g., waterways, forests), and can increase safety risks to the public if exposed to construction traffic or hazardous materials. Since the construction-related effects of the Proposed Action would be mitigated through safety measures aimed at reducing risks associated with operating heavy equipment and vehicles and exposure to hazardous materials, and because no other construction projects are anticipated in the vicinity concurrent with the Proposed Action, cumulative impacts on public health and safety are expected to be low. Over the long-term, it is anticipated the Proposed Action would have a beneficial impact on public safety by improving the reliability of, and safe access to, BPA and other utility infrastructure on the project site, and by better protecting OR 202 from tidal inundation during a storm or high water event. When considered in combination with other restoration projects in the Columbia River estuary, the Proposed Action would also likely reduce mosquito breeding habitat, particularly where restoration designs target shallow ponded areas where mosquitoes are likely to occur.

3.13.3.11 Transportation

The main sources of traffic in the project area, primarily on OR 202, are residential, recreational, and commercial and are expected to continue. Because the effects of the Proposed Action would be mitigated through safety and mitigation measures aimed at reducing the impacts from increased traffic and traffic delays within the area (see Table 2-2), and because no other reasonably foreseeable projects are anticipated in the project vicinity concurrent with the Proposed Action, the cumulative impacts on transportation are expected to be low.

3.13.3.12 Socioeconomics

Current and reasonably foreseeable future actions that may contribute to a cumulative impact on socioeconomics are associated with projects that would change the tax base or employment rate within Clatsop County, including BPA-funded restoration projects that convert agricultural land to tidal marsh habitat. As described in Section 3.13.3.4., Land Use and Recreation, restoration projects often require existing land uses, including agricultural uses, to be discontinued to support fish and wildlife restoration objectives. Although agricultural lands targeted for restoration are often located on wet and unproductive soils that are subject to extensive drainage and maintenance, and that are often susceptible to sea level rise due to subsidence, their removal from agricultural production can reduce the amount of property tax paid by the land owner, and impact tax revenue generated by the county to fund school districts, public transportation, infrastructure, and other municipal government projects.

Under the Proposed Action, the Cowlitz Indian Tribe would continue to pay property taxes for the restoration site at levels comparable to existing conditions, so a loss of tax revenue is not anticipated. The cumulative impact to tax revenue as a result of other reasonably foreseeable restoration

projects in the County would vary depending on project and appraisal process used to assess property value, as well as the final use and tax status of the land after restoration. In general, limitations of use created by conservation easements or other encumbrances reduce the taxable value of a property, and would contribute to an adverse cumulative impact on tax revenues. Although difficult to predict, cumulative socioeconomic impacts on tax revenues from restoration projects would likely be low given that many counties, including Clatsop County, often reduce taxes for properties that are used in agricultural production. Overall, reductions in tax revenue as a result of a restoration project on agricultural lands would be less substantial than removing a property from commercial development, for example.

There would be no cumulative impact on population levels, public facilities, and social services (outside of those associated with the low changes in tax revenue discussed above). Because the employment and income associated with construction of the Proposed Action would be temporary and limited in duration, the Proposed Action would likely not contribute to noticeable long-term economic benefits (employment, income) or demand for housing in communities near the project area. In addition, because the Proposed Action would not disproportionately affect any low-income or minority populations, there would be no cumulative impacts on environmental justice populations.

Finally, restoration projects in the Columbia River estuary would increase steelhead and salmon populations, which could increase fishing opportunities and the associated economic benefits for recreational and commercial fisheries. The increased number of restoration sites could also benefit schools by provided educational opportunities focused on studying the natural environment and the recovery of wetland systems.

Chapter 4 Environmental Consultation, Review and Permit Requirements

This chapter addressed statutes, implementing regulations, and executive orders applicable to the project.

This EA is being sent to tribes, federal agencies, state agencies, and state and local governments as part of the consultation process for the project. Persons, tribes, organizations, and agencies consulted are included in the list in Chapter 5, *Tribes, Individuals, Organizations, and Agencies Consulted*.

4.1 National Environmental Policy Act

This EA was prepared pursuant to regulations implementing NEPA (42 USC 4321 *et seq*.), which requires federal agencies to assess the impacts that their actions may have on the environment. NEPA requires preparation of an environmental impact statement for major federal actions significantly affecting the quality of the human environment. BPA prepared this draft EA to determine if the project would create any significant environmental impacts that would warrant preparing an environmental impact statement, or whether it is appropriate to prepare a finding of no significant impact.

4.2 Northwest Electric Power Planning and Conservation Act of 1980

This project support efforts to mitigate for the effects of the Federal Columbia River Power System (FCRPS) on fish and wildlife in the mainstem Columbia River and its tributaries, pursuant to the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (Northwest Power Act) (16 U.S.C. 839b(h)(10)(A)).

BPA's operations are governed by several statutes, including the Northwest Power Act which directs BPA to protect, mitigate, and enhance fish and wildlife affected by the development and operation of the FCRPS. To assist in accomplishing this, the Northwest Power Act requires BPA to fund fish and wildlife protection, mitigation, and enhancement actions consistent with the purposes of the Act and the Northwest Power and Conservation Council's Fish and Wildlife Program.

4.3 Wetlands, Floodplains and Water Resources

As part of the NEPA review, U.S. Department of Energy NEPA regulations require that impacts on floodplains and wetlands be assessed and alternatives for protection of these resources be evaluated in accordance with Compliance with Floodplain/Wetlands Environmental Review Requirements (10 CFR 1022.12) and Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). An evaluation of impacts of the project on floodplains and wetlands is discussed briefly below and in more detail in Section 3.4, *Water Resources*, of this EA.

Wetland and waterway management, regulation, and protection are addressed in several sections of the Clean Water Act, including Sections 401, 402, and 404. The various sections applicable to the project are discussed below.

4.3.1 Clean Water Act Section 401

A federal permit to conduct an activity that causes discharges into navigable waters is issued only after Oregon DEQ certifies that existing water quality standards would not be violated if a permit were issued. 401 Certification may be included within a Programmatic Permit for 404 work.

4.3.2 Clean Water Act Section 402

Section 402 of the Clean Water Act authorizes National Pollutant Discharge Elimination System permits for the discharge of pollutants, such as stormwater. The EPA, Region 10, has a general permit for discharges from construction activities. The National Pollutant Discharge Elimination System 1200-C general permits apply to construction activities including clearing, grading, excavation, materials or equipment staging and stockpiling that would disturb one or more acres of land. The 1200-C would include an Ero*sion and Sediment Control Plan* for the Proposed Action. The Plan would be designed and implemented to meet or exceed DEQ's permit requirements and prevent sediment-laden water from leaving the project area.

4.3.3 Clean Water Act Section 404

Authorization from the Corps is required in accordance with the provisions of Section 404 of the Clean Water Act when dredged or fill material is discharged into waters of the United States, including wetlands. The project sponsor would coordinate with the Corps to obtain a Section 404 permit for any fill placed in wetlands or non-wetland waters, and work with DEQ to obtain Section 401 water quality certification (see Section 4.3.1). Potential impacts on wetlands and other waters are described in Sections 3.3, *Vegetation and Wetlands*, and 3.4, *Water Resources*, of this EA.

4.3.4 Oregon's Removal-Fill Law (ORS 196.795-990) of 1967

The State of Oregon requires entities that plan to remove or fill material in waters of the state to obtain a permit from the Oregon Department of State Lands. The purpose of the law, enacted in 1967, is to protect public navigation, fishery, and recreational uses of the waters. "Waters of the state" are defined as "natural waterways including all tidal and nontidal bays, intermittent streams,

constantly flowing streams, lakes, wetlands, and other bodies of water in this state, navigable and non-navigable, including that portion of the Pacific Ocean that is in the boundaries of this state."

A removal-fill permit would be obtained from the Oregon Department of State Lands for the removal and fill work within wetlands and waters for the Proposed Action.

4.3.5 Wild and Scenic Rivers Act, 1968

The Wild and Scenic Rivers Act of 1968 applies only to rivers designated by Congress as "wild and scenic," in order to safeguard the special character of these rivers.

The project area is not within a designated Wild and Scenic River. Therefore, this Act is not applicable to the Proposed Action.

4.3.6 Rivers and Harbors Act

The Rivers and Harbors Act regulates project activities in navigable waters and harbors, including river improvements. Specifically, Section 10 of the Rivers and Harbors Act regulates structures in or over any navigable waters of the U.S., the excavating from or depositing of material into any such waters, or the accomplishment of any other work affecting the course, location, condition, or capacity of such waters. The Corps would evaluate compliance with Section 10 of the Rivers and Harbors Act during its evaluation of the Clean Water Act Section 404 permit.

4.3.7 Coastal Zone Management Act, 1972

The Coastal Zone Management Act was enacted to preserve, protect, develop, and where possible, restore or enhance the resources of the Nation's coastal zone for this and succeeding generations. Section 307 of the Coastal Zone Management Act specifies that actions or activities within the coastal zone done by a Federal agency or on behalf of or through a Federal agency must be consistent with the State's coastal zone management plan.

Clatsop County would issue the project a Conditional Use Permit that serves as the local land use compatibility statement. Additionally, the project must comply with Department of Land Conservation and Development concurrence conditions that are associated with the Corps' consistency determination and State concurrence included in the 404 permit.

4.4 Fish and Wildlife

4.4.1 Endangered Species Act, 1973

The ESA (16 USC 1531 et seq.) establishes a national program for the conservation of threatened and endangered species of fish, wildlife, and plants, and the preservation of the ecosystems on which they depend. The ESA is administered by UWFWS for terrestrial and freshwater species, and by NMFS for anadromous fish and marine species.

Section 7(a) of the ESA requires federal agencies to ensure that the actions they authorize, fund, and carry out do not jeopardize the continued existence of any endangered or threatened species or result in the destruction or adverse modification of designated critical habitat. Section 7(c) of the ESA and other federal regulations require that federal agencies prepare a biological assessment addressing the potential effects of their actions on listed or proposed threatened and endangered species and designated critical habitat.

BPA used the following resources to determine which endangered and threatened species and critical habitat occur in the study area as defined in Sections 3.3, Vegetation and Wetlands, and 3.5, Fish and Wildlife, of this EA:

- USFWS lists of fish, wildlife, and plant species in Clatsop County that are protected under the ESA (U.S. Fish and Wildlife Service 2014);
- NMFS list of fish species protected under the ESA (National Marine Fisheries Service 2014); and
- Oregon Natural Heritage database records of known special status species locations in the study area (Oregon Natural Heritage Information Center 2013 and 2014.)

Based on the background research and reconnaissance-level surveys by Cascade Environmental Group, it was determined that a number of federally listed and two species of concern fish species have the potential to occur and be affected by the Proposed Action: Lower Columbia River Chinook, Lower Columbia River coho, Lower Columbia River steelhead, Columbia River chum, upper Willamette River Chinook, upper Willamette River steelhead, Middle Columbia River steelhead, upper Columbia River steelhead, upper Columbia River spring Chinook, Snake River steelhead, Snake River spring/summer Chinook, Snake River fall Chinook, Snake River sockeye, green sturgeon, Pacific eulachon, Pacific lamprey, and, coastal cutthroat trout.

Based on the results of the background research and reconnaissance-level surveys, including those for streaked horned lark, no federal listed plant, terrestrial wildlife species, or freshwater fish species (bull trout) under the jurisdiction of USFWS were found or are known to occur within the 5-mile radius analysis area. Due to the lack of USFWS listed species within or near the project site and lack of suitable habitat within the project site for these listed species there would be no effect to species under the jurisdiction of USFWS.

Pursuant to the requirements of Section 7(c) of the ESA, BPA is preparing a biological assessment for submission to NMFS. The biological assessment address effects of the project on federally listed

species under the jurisdiction of NMFS listed above. Coordination with NMFS was conducted on April 17, July 14, and October 21 of 2014 during the preparation of the biological assessment to discuss the project and mitigation measures to help reduce impacts to listed fish species. Coordination with USFWS was conducted on February 1 and April 29 to discuss listed USFWS species listed under the ESA with the potential to occur within the project area, such as streak horned lark, and survey needs.

Based on the likely presence of juvenile salmon and steelhead smolts within the work area during construction, and potential for take during project activities, a preliminary effect determination has been made of may affect, likely to adversely affect the four federally listed Lower Columbia River and Columbia River salmon and steelhead. BPA is reviewing the final determination of effect for upper river stocks, but a preliminary determination of may affect, not likely to adversely affect has been made for all upper river stock species as well as green sturgeon and Pacific eulachon. A final determination of effect would be made within the biological opinion issued for the project by NMFS. Effects to designated critical habitat for the green sturgeon and Pacific eulachon are anticipated to be insignificant and discountable as the project actions propose minimal adverse construction impacts to the shoreline of the Youngs and Wallooskee rivers.

BPA expects to submit the biological assessment to NMFS in the winter of 2015 with a request to enter into formal consultation. The potential effects on ESA-listed species are discussed in greater detail in Section 3.5, Fish and Wildlife, of this EA. Any decision to proceed with funding the Proposed Action would be conditioned on compliance with a biological opinion or other guidance from NMFS.

4.4.2 Fish and Wildlife Conservation Act & Fish and Wildlife Coordination Act

The Fish and Wildlife Conservation Act of 1980 (16 USC 2901 et seq.) encourages federal agencies to conserve and promote conservation of non-game fish and wildlife and their habitats. The Fish and Wildlife Coordination Act (16 USC 661 et seq.) requires federal agencies with projects affecting water resources to enter into consultation to protect fish and wildlife resources. Amendments enacted in 1946 require consultation with the Fish and Wildlife Service and the fish and wildlife agencies of States where the "waters of any stream or other body of water are proposed or authorized, permitted or licensed to be impounded, diverted . . . or otherwise controlled or modified" by any agency under a Federal permit or license. Consultation is to be undertaken for the purpose of "preventing loss of and damage to wildlife resources". The Proposed Action does not impound or direct waters of the United States. Instead, it restores habitat and allows tidal flows and flooding to occur naturally in a manner beneficial to fish and wildlife. Therefore, this act is not applicable to the Proposed Action.

4.4.3 Magnuson-Stevens Fishery Conservation and Management Act, 1976

This Act, Public Law 94-265 as amended, is designed to actively conserve and manage fishery resources found off the coasts of the United States, to support international fishery agreements for the conservation and management of highly migratory species. This Act established procedures designed to identify, conserve, and enhance Essential Fish Habitat for fisheries regulated under a Federal fisheries management plan. Federal agencies must consult with NMFS on all Proposed Actions authorized, funded, or carried out by the agency which may adversely affect fish habitat.

The following species and habitat may be affected by the Proposed Action: coho salmon, Chinook salmon and groundfish species. As of this writing, BPA is currently coordinating with NMFS to determine what groundfish species have the potential to be affected by the proposed project. . Because the Proposed Action is designed to increase and improve fish habitat under the FCRPS Biological Opinion, BPA does not expect the Proposed Action to adversely affect Essential Fish Habitat. Nevertheless, BPA has included the issue in its biological assessment submitted to NMFS for ESA compliance.

4.4.4 Migratory Bird Treaty Act and Federal Memorandum of Understanding

The Migratory Bird Treaty Act of 1918, as amended, implements various treaties and conventions between the United States and other countries, including Canada, Japan, Mexico, and Russia, for the protection of migratory birds (16 USC 703–712). Under the act, taking, killing, or possessing migratory birds, or their eggs or nests, is unlawful. The act classifies most species of birds as migratory, except for upland and nonnative birds such as pheasant, chukar, gray partridge, house sparrow, European starling, and rock dove.

BPA (through the U.S. Department of Energy [DOE]) and USFWS have a memorandum of understanding (MOU) to address migratory bird conservation in accordance with Executive Order 13186 (Responsibilities to Federal Agencies to Protect Migratory Birds), which directs each federal agency that is taking actions possibly negatively affecting migratory bird populations to work with the USFWS to develop an agreement to conserve those birds (DOE and USFWS, 2013). The MOU addresses how both agencies can work cooperatively to address migratory bird conservation and includes specific measures to consider implementing during project planning and implementation.

The analysis in Section 3.5, Fish and Wildlife, of this EA indicates that the project would have incidental, potentially moderate impacts on ground and low-lying nesting birds during construction within the floodplain, including migratory birds.

4.4.5 Bald Eagle Protection Act

The Bald Eagle and Golden Eagle Protection Act (16 USC. 668–668d) addresses taking or possessing of and commerce in bald and golden eagles, with limited exceptions. The Act only covers intentional acts or acts in "wanton disregard" of the safety of bald or golden eagles.

Although bald eagles are known to occur throughout the project area, no take of either bald or golden eagles is likely to occur as a result of the Proposed Action. No nests were found during avian surveys in the spring and summer 2014 of the area. Therefore, no adverse effects to eagles are anticipated.

4.4.6 Marine Mammal Protection Act, 1972

This Act established a Federal responsibility to conserve marine mammals within waters of the United States. With certain specified exceptions, the Act establishes a moratorium on the taking and importation of marine mammals. All marine mammals are covered under the MMPA. Three marine mammals would be expected to occur within the waters surrounding the project area, including harbor seals, the Steller sea lion and the California sea lion. But the project area is not a known haul-out location for any marine mammals. The Proposed Action is not likely to harass or injure any marine mammals. Therefore, an Incidental Harassment Authorization is not required.

4.5 Land Use Consistency

As indicated in Section 3.6, Land Use and Recreation, implementation of the Proposed Action would be consistent with applicable local land use planning and zoning in Clatsop County. See Section 3.6, Land Use and Recreation, for further discussion.

4.5.1 Farmland Protection Policy Act

The Farmland Protection Policy Act (7 USC 4201 et seq.) directs federal agencies to identify and quantify adverse impacts of federal programs on farmlands. The purpose of this act is to minimize the number of federal programs that contribute to the unnecessary and irreversible conversion of agricultural land to non-agricultural uses. As discussed in Section 3.2, Geology and Soils, of this EA, the Proposed Action would result in conversion of agricultural land to non-agricultural uses. The majority of the project area (222 acres) is rated by NRCS as farmland of statewide importance (Figure 3-2). This represents about 0.3% of the 64,810 acres of farmland of statewide importance mapped within Clatsop County by the NRCS (NRCS 2014b).

4.6 Cultural and Historic Resources

Laws and regulations govern the management of cultural resources. A cultural resource is an object, structure, building, site, or district that provides irreplaceable evidence of natural or human history of national, state, or local significance, such as National Landmarks, archaeological sites, and properties listed (or eligible for listing) in the National Register of Historic Places. Cultural resource-related laws and regulations include the following:

- Antiquities Act of 1906 (16 USC 431–433)
- Historic Sites Act of 1935 (16 USC 461–467)
- National Historic Preservation Act (NHPA; 16 USC 470 et seq.), as amended, inclusive of Section 106
- Archaeological Data Preservation Act of 1974 (16 USC 469 a–c)
- Archaeological Resources Protection Act of 1979 (16 USC 470 aa–mm), as amended
- Native American Graves Protection and Repatriation Act (25 USC 3001 et seq.)
- Executive Order 13007 Indian Sacred Sites
- American Indian Religious Freedom Act of 1978 (42 USC 1996, 1996a)

Section 106 of the National Historic Preservation Act requires federal agencies to consider the effects of their actions on historic properties. The National Historic Preservation Act provides a process (known as the Section 106 process) that enables agencies to assess impacts on historic properties along with participation from interested and affected parties such as tribes, and then avoid, minimize, or mitigate for these impacts. Historic properties may be pre-contact or historic sites, including objects and structures that are included in or eligible for inclusion in the National Register of Historic Places. Historic properties also include artifacts or remains within historic sites and properties of traditional and cultural importance to tribes.

To this end, BPA, has provided information about the project and requested input on the level and type of identification and evaluation efforts for prehistoric resources to the Oregon State Historic Preservation Office and the following tribes: the Confederated Tribes and Bands of the Yakama Nation, the Confederated Tribes of Siletz, the Confederated Tribes of the Umatilla Indian Reservation, the Confederated Tribes of the Warm Springs Reservation of Oregon, the Nez Perce Tribe of Idaho, and the Confederated Tribes of Grand Ronde. BPA provided project information to and requested information from the consulting tribes, including information on potential cultural resources in the project area.

4.7 Air Quality

The federal Clean Air Act, as amended (42 USC 7401 et seq.), requires the EPA and delegated states to carry out a wide range of regulatory programs intended to assure attainment of the National Ambient Air Quality Standards. In Oregon, both the EPA and DEQ have responsibility for air quality. Because the project would occur in an area that is currently in attainment for meeting the National Ambient Air Quality Standards and because no stationary sources of air emissions would occur, construction activities associated with the project are exempted from state regulation. Air quality impacts from construction are expected to be low and mitigation measures are discussed in Table 2-2. When the project is complete, all construction-related emissions are expected to cease.

4.7.1 Climate Change

Gases that absorb infrared radiation and prevent heat loss to space are called greenhouse gases. Models predict that atmospheric concentrations of all greenhouse gases will increase over the next century, but the extent and rate of change is difficult to predict, especially on a global scale. As a response to concerns over the predicted increase of global greenhouse gas levels, various federal and state mandates address the need to reduce greenhouse gas emissions.

The Clean Air Act is a federal law that establishes regulations to control emissions from large generation sources such as power plants; limited regulation of greenhouse gas emissions occurs through the New Source Review permitting program.

The EPA has issued the Final Mandatory Reporting of Greenhouse Gases Rule (40 CFR 98) that requires reporting of greenhouse gas emissions from large sources. Under the rule, suppliers of fossil fuels or industrial greenhouse gases, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of greenhouse gases are required to submit annual reports to the EPA (74 FR 56260).

Executive Orders 13423 (Strengthening Federal Environmental, Energy, and Transportation Management) and 13514 (Federal Leadership in Environmental, Energy, and Economic Performance) require federal agencies to measure, manage, and reduce greenhouse gas emissions by agency-defined target amounts and dates.

Greenhouse gas emissions were calculated for project construction activities including off-road construction equipment and on-road vehicles. Greenhouse gas emissions would be below EPA's mandatory reporting threshold, of 25,000 metric tons and the impact of the project on greenhouse gas concentrations would be low, as discussed in Section 3.9, Air Quality, Noise, Hazardous Waste, and Public Health and Safety, of this EA.

4.8 Noise

The Noise Control Act of 1972 (42 USC 4901 et seq.) sets forth a broad goal of protecting all people from noise that jeopardizes their health or welfare. The act further states that federal agencies are authorized and directed, to the fullest extent consistent with their authority under federal laws administered by them, to carry out the programs within their control in such a manner as to further this policy. No federal regulations apply to noise generated by the Proposed Action. Construction noise is exempt from State regulation in Oregon. Similarly, Clatsop County has not established a noise control ordinance that limits noise emissions except for qualitative limits on noise associated with public disturbances (e.g., firearms, explosives, other loud or boisterous noises) (Clatsop County Code 8.12).

The closest sensitive noise receptors to the project area are commercial farm equipment manufacturing company located south of Farm Lane, and the residential development on the south side of the Wallooskee River, which is located less than 0.10 mile (528 feet) away from the southern tip of the project area. The sensitive receptors on the east side of OR 202 are similarly located in close proximity (less than 500 feet) to the project area, although are likely less sensitive to noise given their proximity to OR 202. Additional sensitive noise receptors in the analysis area could include recreational users on the Youngs or Wallooskee rivers, such as boaters, kayakers, fisherman, or persons viewing wildlife. Existing noise sources consists primarily of traffic along OR 202. Background noise levels in rural areas such as those in the analysis area are roughly 45 dBA during the day and 35 dBA at night (EPA 1971 *in* BPA et al. 2014).

Individual equipment operating in the construction zone could be discernible above ambient noise up to 2,000 feet away from the construction zone. Therefore, temporary construction noise would be discernible to most sensitive receptors within the analysis area, and noise impacts would be moderate. To reduce construction-related noise impacts, construction would be limited to normal daytime, weekday working hours. Noise-generating activities that could occur at night would be limited to those necessary to keep the site dewatered during construction (i.e., operation of dewatering pumps) or if tidal schedules cannot be accommodated for the restoration activities. Table 2-2 summarizes these mitigation measures.

4.9 Hazardous Materials

Several federal laws related to hazardous materials and toxic substances potentially apply to the project, depending upon the exact quantities and types of hazardous materials created or stored in the project area.

4.9.1 Spill Prevention Control and Countermeasures Rule

The Spill Prevention Control and Countermeasures Rule (40 CFR Part 112) includes requirements to prevent discharges of oil and oil-related materials from reaching navigable waters and adjoining shorelines. It applies to facilities with total aboveground oil storage capacity (not actual gallons

onsite) of greater than 1,320 gallons and facilities with belowground storage capacity of 42,000 gallons. No onsite storage of oil or oil-related materials is proposed as part of the project.

4.9.2 Comprehensive Environmental Response Compensation Liability Act, as Amended

The Comprehensive Environmental Response Compensation Liability Act (42 USC 9601 et seq.), as amended, provides funding for hazardous materials training in emergency planning, preparedness, mitigation implementation, response, and recovery. Eligible individuals include public officials, emergency service responders, medical personnel, and other tribal response and planning personnel. No Superfund sites are located within the project area.

4.9.3 Resource Conservation and Recovery Act

The Resource Conservation and Recovery Act, as amended, is designed to provide a program for managing and controlling hazardous waste by imposing requirements on generators and transporters of hazardous waste, and on owners and operators of treatment, storage, and disposal facilities (42 USC 6901 et seq.). Each facility owner or operator is required to have a permit issued by EPA or the state. Typical construction and maintenance activities have generated small amounts of these hazardous wastes—solvents, pesticides, paint products, motor and lubricating oils, and cleaners. Small amounts of hazardous wastes, such as herbicide containers and fuel containers, may be generated by the project. These materials would be disposed of according to state law and the Resource Conservation and Recovery Act. Solid wastes would be disposed of at an approved landfill or recycled.

4.9.4 Federal Insecticide, Fungicide, and Rodenticide Act

The Federal Insecticide, Fungicide, and Rodenticide Act (7 USC 136 [a-y]) registers and regulates pesticides. No pesticides may be used as part of the project. Herbicides would be used for 2 days during construction, on less than 1-acre, outside of the levee in the tidal marsh. Long-term stewardship activities would also likely utilize herbicide to control invasive species within the project area. Herbicide use would be in accordance with label requirements and applicable ESA coverage.

All herbicide applications would be conducted in accordance with the biological assessment requirements and application methods would eliminate drift to neighboring properties. Herbicide treatment that may be used during the long-term stewardship would be described in the management plan that would the Cowlitz Indian Tribe would develop upon completion of the restoration as described in Section 2.1.2.3.

Containers would be disposed of according to Resource Conservation and Recovery Act standards, and all mitigation actions described in Table 2-2, 3.3.2.1, and 3.10.2.2 would be followed to keep impacts low.

4.10 Executive Order 12898, Environmental Justice

In February 1994, Executive Order 12898 (Federal Actions to Address Environmental Justice in Minority and Low-income Populations) was released to federal agencies. This order states that federal agencies shall identify and address, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. The project would not cause impacts on minority and low-income populations. Section 3.12.1.3, Socioeconomics, of this EA contains a discussion on environmental justice.

4.11 Environmental Permit Requirements

Table 4-1. Environmental Permit Requirements

Permit	Agency	Authorization
Type II Conditional Use Permit	Clatsop County	Land and Water Development and Use Ordinance
Type 1 Development Permit	Clatsop County	Land and Water Development and Use Ordinance
Oregon Removal-Fill Permit	Department of State Lands	ORS 196.795-990
Scientific Collection Permit	Oregon Department of Fish and Wildlife	ORS 635-007-0900
Water Quality Certification	Department of Environmental Quality	Clean Water Act, Section 401
Dredge and Fill Permit	US Army Corps of Engineers	Clean Water Act, 404, Section 10
National Pollutant Discharge Elimination System Construction Stormwater Discharge Permit - 1200-C	U.S. Environmental Protection Agency /Department of Environmental Quality	Clean Water Act, Section 402
Incidental Take Permit	NOAA Fisheries and U.S. Department of the Interior Fish and Wildlife Service (USFWS)	Endangered Species Act

Chapter 5 Tribes, Individuals, Organizations, and Agencies Receiving the Environmental Assessment

Those consulted include local, state, and federal agencies; public officials; tribes; landowners and trustees in the project vicinity; media; and others who expressed an interest in the project. Specific individuals were contacted to gather information and data about the project area and applicable requirements, as part of consultation, or for permit applications.

5.1 Federal Agencies

- U.S. Environmental Protection Agency, Region 10
- NOAA Fisheries (NOAA)
- U.S. Department of the Interior Fish and Wildlife Service (USFWS)
- U.S. Army Corps of Engineers (Corps)

5.2 State Agencies

- Oregon Department of Environment Quality (DEQ)
- Oregon Department of Fish and Wildlife (ODFW)
- Oregon Department of State Lands
- Oregon Department of Transportation
- State of Oregon and Washington House and Senate members for Districts encompassing the Columbia River estuary
- Oregon State Historic Preservation Office

5.3 Tribes

- The Cowlitz Indian Tribe
- The Confederated Tribes and Bands of the Yakama Indian Nation
- The Confederated Tribes of the Siletz Reservation,
- The Confederated Tribes of the Umatilla Reservation
- The Confederated Tribes of the Warm Springs Reservation of Oregon
- The Nez Perce Tribe of Idaho
- Confederated Tribes of the Grand Ronde Community of Oregon
- Clatsop-Nehalem Confederated Tribes
- Chinook Indian Nation

5.4 Local Governments

- Clatsop County Board of Commissioners
- Clatsop County Community Development
- City of Astoria
- City of Warrenton

5.5 Newspapers

- The Daily Astorian (Astoria, OR)
- Columbia Press (Warrenton, OR)
- Longview Daily News (Longview, WA)
- Chinook Observer (Long Beach, WA)

5.6 Landowners and Trustees in Project Area

- Columbia River Inter-Tribal Fish Commission
- Lewis and Clark National Historical Park
- Lewis and Clark Trail Heritage Foundation
- Pacific Power
- Century Link
- Frontier Communication
- Northwest Natural
- Columbia River PUD
- Columbia River Keepers
- Private citizens (72 within ¼ mile of project area)

5.7 Technical Assistance

- Biohabitats
- ESA Vigil-Agrimis
- GeoEngineers
- PC Trask

Table 5-1. Project Team and Roles

Agency/Team Member ID	Role on Project
Bonneville Power Administration – Environment, Fish and Wildlife	• Lead Agency for NEPA • Project funder for restoration activities • Protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat
Bonneville Power Administration – Transmission	• Maintain and construct BPA's transmission system • Assure the Pacific Northwest of an adequate, efficient, economical, and reliable power supply
US Army Corps of Engineers – Regulatory	• 404 and Section 10 Permits
National Oceanic and Atmospheric Administration-National Marine Fisheries Service	• ESA Consultant for Restoration Activities
Department of State Lands	• Removal-Fill Permit (R/F)
Oregon Department of Fish & Wildlife	• Review of Joint Permit Applications (R/F)
Department of Environmental Quality	• 1200-C Permit
Clatsop County	• Review of Land Use Application • Act on behalf of defunct CCDD No. 13 to initiate Section 408
Cowlitz Indian Tribe	• Project Sponsor • Permit Applicant • Permanent Steward
Astoria Wetlands, LLC	• Current Landowner
Cascade Environmental Group	• Consultant to Cowlitz Indian Tribe & Astoria Wetlands, LLC • Prepare EA • Prepare Permit Applications (JPA, R/F, Clatsop County)

Chapter 6 List of Preparers

Kim Biafora/Cascade Environmental Group, LLC. **Responsible for:** GIS analysis and mapping, contributor to vegetation and wildlife sections. **Education:** B.S., Environmental Science; GIS Graduate Certificate courses. **Experience:** 5 years in wetland ecology, field survey, and GIS mapping and analysis work.

Elizabeth Fausnight/Cascade Environmental Group, LLC. **Responsible** for: technical editing. **Education:** Certificate in Professional Editing, Courses toward Certificate in Technical Communication, M.Ed. Montessori Education, B.A. Anthropology **Experience:** 3 years in editing

Brent Haddaway/Cascade Environmental Group, LLC. **Responsible for:** Geology and Soils. **Education:** B.S., Environmental Science; Graduate Coursework in Soils. **Experience:** 19 years in wetland ecology and habitat restoration.

Sage Jensen/Cascade Environmental Group, LLC. Responsible for: Fish and Wildlife. **Education:** B.S., Environmental Science. **Experience**: 16 years in biological surveys, environmental analysis and permitting.

Rod Lundberg, P.E./Cascade Environmental Group, LLC. **Responsible for:** Erosion and Sediment Control; Water Resources. **Education:** M.S., Michigan Technological University. **Experience:** 18 years in civil engineering, utility design, stormwater management, grading, and erosion and sediment control design and permitting.

Alice McKee/Cascade Environmental Group, LLC. **Responsible** for: Aesthetics and Visual Resources. **Education:** BLA, University of Oregon 1994. **Experience:** 15 years in landscape architectural design, habitat restoration planning and design, and visual resources analysis.

John Runyon/Cascade Environmental Group, LLC. **Responsible for:** Water resources, air quality, and climate change. **Education:** M.S., Ecology; M.S., Environmental Policy; B.S., Biology. **Experience:** 23 years in project management, stream habitat evaluation, watershed analysis, and NEPA compliance.

Tammy Stout/Cascade Environmental Group, LLC. **Responsible for:** Vegetation, Draft EA Task Lead. **Education**: M.S., Environmental Horticulture and Urban Forestry/Forest Resources. B.S., Environmental Science. Experience: 18 years wetland science, ecology, botany, and habitat restoration.

April Zohn/Cascade Environmental Group, LLC. **Responsible for:** Land use, cultural resources, noise, public health and safety, hazardous waste, transportation, and socioeconomics. **Education:** MELP, Environmental Law (in progress), B.S., Marine Science. **Experience:** 15 years in project management and NEPA compliance.

Chapter 7 Acronyms and Abbreviations

BMP	Best Management Practices
BiOp	Biological Opinion
BPA	Bonneville Power Administration
cfs	Cubic Feet Per Second
CO_2e	carbon dioxide equivalent
Corps	U.S. Army Corps of Engineers
dBA	Decibel
Diking District	Diking District Number 13, Clatsop County, Oregon
DEQ	Oregon Department of Environmental Quality
DPS	distinct population segment
EA	Environmental Assessment
ESA	Endangered Species Act
ESA	Environmental Science Associates [in reference notes]
ESU	Evolutionarily Significant Unit
FCRPS	Federal Columbia River Power System
FCRPS Action Agencies	Bonneville Power Administration, the U.S. Army Corps of Engineers, and the Bureau of Reclamation[7]
FEMA	Federal Emergency Management Agency
NEPA	National Environmental Policy Act

[7] While all three federal agencies are FCRPS Action Agencies for the FCRPS BiOp, BPA and the Corps have agreed to develop the survival benefits in the Columbia River estuary.

NHP	Natural Heritage Plan
NMFS	National Marine Fisheries Service
NRCS	Natural Resources Conservation Service
Northwest Power Act	Pacific Northwest Electric Power Planning and Conservation Act of 1980
ODOT	Oregon Department of Transportation
OR 202	Oregon State Highway 202
ORBIC	Portland State University's Oregon Biodiversity Information Center
RPA	Reasonable and Prudent Alternatives
SV	Sensitive–Critical
USC	U.S. Code

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Appendices

Appendix A- Avian Survey Protocol and Results

Washington Department of FISH and WILDLIFE

PROPOSED METHODS FOR WILDLIFE DATA COLLECTION "FORM B"

(Consult instructions before completing this form)

This form should be attached to "Form A" when completed

Submitted by:___ _____ Date:__ _____

Mailing Address:

Brief description of proposed activity (copy from Form A):	Conduct surveys to detect presence and acquire indices of abundance of the Streaked Horned Lark (*Eremophila alpestris*) by visual and/or auditory detection during the breeding season on known occupied habitat.

1. Species: **Streaked Horned Lark (*Eremophila alpestris*)**

2. Objectives:

- Confirm the presence of Streaked horned larks by conducting line transect surveys throughout occupied habitat at Joint Base McChord-Ft Lewis -- airfields, artillery impact area, 13th Division Prairie, Ranges 74/76/51; Olympia Airport; Shelton Airport, outer WA coast; Columbia R islands.
- Acquire estimates of abundance
- Provide a non-invasive method of inventory
- Provide an efficient and repeatable survey design
- Provide consistency among surveyors
- Provide standardized protocol for survey and management

3. Describe in detail the methods that will be used to complete the above activity
(Or attach description to this form)**:**

Surveys to detect presence: Streaked horned larks are migrant, ground-dwelling passerines that have adapted to nesting on open grasslands, sparsely vegetated beaches and dredge spoil islands (Stinson 2005). They prefer bare ground and vegetation no more than several inches tall (Beason 1995, Altman 1999, Rogers 2000, Pearson and Hopey 2005). Streaked horned larks are loosely colonial nesters, with both males and females detectable during the breeding season, which occurs roughly from March through August. Survey timing is designed to coincide with clutch initiation curves – first clutches are initiated at the end of April at all sites and taper off dramatically in the Puget Sound area in early July; later on the coast and Columbia River (Pearson et at. 2005). Mates are socially monogamous for the breeding season. Males are easier to detect because they sing on the ground and also perform aerial courtship displays.

Methods: Surveys should begin within ½ hour of sunrise and end by 12:00 noon on days when wind is less than 20 mph with little to no precipitation (light drizzle and brief showers are fine). Surveys should end by 11:00 a.m. or earlier on days when the predicted maximum temperature is 80 F or higher. Four surveys per location should be conducted between 19 April and the first week of July in the Puget lowlands and between 19 April and mid-July for the outer coast and Columbia River as follows:

Survey 1: last two weeks of April **Survey 2:** mid two weeks of May **Survey 3:** mid two weeks of June **Survey 4:** first week of July (Puget lowlands) through second week of July (outer coast and Columbia River). At sites where access is limited, priority should be given to May – July surveys.

Line transects – observers should be positioned 75 m from the survey boundary and 150 m apart (to avoid

double-counting and to maximize detection ability) on predetermined transects/routes and should maintain a slow-moderate pace. Observers should stop every 150 m for approximately 1 minute to listen and scan for larks. Pausing to confirm a detection is allowed, however all observers should remain parallel. Transects should cover as much suitable habitat as possible in the allowed time window. Surveyors should familiarize themselves with vocalizations of male streaked horned larks, flight display behavior, and differentiating larks by sex and age. Young of the year birds look markedly different from adult birds. Every effort should be made to cover all areas with suitable habitat, preferably each time an area is surveyed. However, varying the area surveyed during each of the four surveys is acceptable for large expanses to ensure complete coverage. Observers should rotate between sites/transects and walk the survey route in the opposite direction on subsequent surveys.

Observers will independently record the approximate detection location of each bird on an area orthographic map, as well as the corresponding bird number from the field form. Environmental conditions, age, sex and behavior (see below). Observers may communicate with each other by radio or mobile if necessary. Waypoints should be verified at the beginning, end, and intermediate locations for each transect to verify observers remain on transect. Observers may briefly leave a line to avoid flushing birds or disturbing nests.

Data Recording: (field form attached)

- To avoid confusion between American (month/day/year) vs European (day/month/year) methods of writing dates with Arabic numbers, date should be written with a two-digit numeric for day first, the month using a three-letter abbreviation (e.g., Feb, Mar) second, and the year as a four-digit number last (ex. 26FEB2008).
- The lead observer should record surveyors' full names (not just initials), cloud cover, wind, precipitation, and air temperature at the beginning and end of the survey.
- Record the survey start/stop times. Time should be recorded on a 24-hour clock to avoid confusion with differentiating AM versus PM (e.g., 5:00 PM is 17:00).
- Each observer will receive an ortho map of the survey area, containing transect lines or routes and reference waypoints.
- Each observer will receive a data sheet for recording detections.
- Data to record for each detection include:
  AGE – AD (adult), YOY (young of the year), U (unknown)

  SEX – M (male), F (female), U (unknown and young of the year)

  BEHAVIOR (when first observed; can use more than one code) **–** S = Song, C = call, F = Foraging, FD = flight display, FL = flight, A = agonistic behavior, AI = alert posture (**standing erect with neck extended and appearing vigilant but not singing or calling)**, FC = food carry, CO = copulation, NM = carrying nest material.

- Record any incidental nests found (mark location on ortho, coordinates and contents on data form in Notes section).

Streaked Horned Lark Field Survey Form

SITE:_____ Month: _____ Day: _____ Year: _____

	Full Name	Affiliation/Ph#
Observer 1		
Observer 2		
Observer 3		
Observer 4		

	start	stop	
Cloud cover (%)			Cloud Cover: 0=0%, 1=33%, 2=66%, 3=100%
Wind (ave mph)			
Temp (F)			Precip: N=None, R=Rain, F=Fog, D=Drizzle
Precip.			

W. meadowlarks		Killdeer	
Crows			
Ravens		Record est. abundance of negatively impacting bird species	
Unknown corvid			
N. Harrier			

Start time		24 hr
End time		24 hr
Total		hrs. min.

Bird number	Age	Sex	Perp. Distance (m)	Behavior	Notes		Bird number	Age	Sex	Perp. Distance (m)	Behavior	Notes
1							23					
2							24					
3							25					
4							26					
5							27					
6							28					
7							29					
8							30					
9							31					
10							32					
11							33					
12							34					
13							35					
14							36					
15							37					
16							38					
17							39					
18							40					
19							41					
20							42					
21							43					
22							44					

Age: A = Adult, YOY = young of the year, U = unknown **Sex**: M = Male, F = Female, U = unknown and YOY

Behavior (only when first observed; can use more than one code): A= agonistic behavior (chase or aggressive contact), Al = alert posture (standing erect w/ neck extended and appearing viligent but not singing or calling), C = call, CO = copulation, F = Foraging, FC = food carry, FD = flight display, FL = flight, FS = flushed, NM = carrying nest material, R = resting, S = Song

Youngs-Wallooskee Avian Survey Summary Results – 2014

Three bird surveys were required by USFWS to determine presence of the streaked horned lark (USFWS threatened) using the WDFW streaked horned lark survey protocol. No streaked horned larks were observed during the survey efforts. The following species were observed within the Project Limits during one or more survey efforts occurring on the following dates: April 22, 2014, June 30, 2014 and July 18, 2014.

Species
American crow
American goldfinch
American robin
Bald eagle
Barn swallow
Black-headed grosbeak
Brown-headed cowbird
California quail
Canada geese
Caspian tern
Cedar waxwings
Chestnut-backed chickadee
Cliff swallow
Common raven
Common yellowthroat
Cormorant
European starling
Golden crowned sparrow
Great blue heron
Green heron
Green-winged teal
House finch
Killdeer
Mallard
Marsh wren
Mourning dove
Northern flicker
Northern harrier
Orange-crowned warbler
Osprey
Pacific-slope flycatcher
Red-tailed hawk
Red-winged blackbird
Ruby-crowned kinglet
Savanah sparrow
Song sparrow
Song sparrow
Swainson's thrush
Tree swallow
Violet-green swallow
White crowned sparrow
Willow flycatcher
Yellow warbler

Appendix B- Construction Sequencing Details

Wallooskee-Youngs Construction Sequencing Details

No fish salvage would be needed during the construction of the channel segments and other features in Phase 1A because the excavation areas would not be hydrologically connected to Youngs River or otherwise accessible by fish; this work would potentially require localized pumping of groundwater to be discharged on the levee-protected floodplain, away from surface waters. During Phase 1A passive evacuation of fish would occur through the tide gate manipulation described below and the ditch network accessible to fish would be monitoring to assure there is no fish stranding.

Phases 1B, 2A, and 2B would require diversion or dewatering, and fish salvage as described.

Typical sequencing of Phase 1B fish salvage and dewatering work:

1. Manually open tide gates at low tide and allow water and fish to evacuate the in-water work areas. Manage tide gates throughout all Phases 1B and 2A to minimize the need for pump driven dewatering.

2. Install block nets will at both sides of the primary tidal channel where it intersects with the borrow ditch to isolate the tidal channel from the borrow ditch. On an outgoing tide, and beginning from the uppermost reaches of a given tidal channel network, use seine nets to herd fish toward an open tide gate. Work would occur from small boats and/or from the bank. Repeat sequence for a total of two seine passes to clear the work area.

3. Once a channel network has been seined twice, construct an earthen plug interior to the block nets to isolate the channel network.

4. Begin dewatering in the isolated area behind the temporary earthen plug as necessary. All pump intakes would have NMFS-approved fish screens. Clean (i.e., low turbidity) water would be pumped over the levee in the Youngs or Wallooskee rivers. Turbid waters would be pumped to the nearby levee-protected floodplain. Fish observed in the work area during dewatering would be dip netted and released per NMFS fish handling protocols. Dewatering will continue as needed while work is performed in tidal channel area.

5. Remove all earthen plugs once the channel network is complete and suspended solids have settled.

6. Fill interior drainage ditches from upstream to downstream to herd fish toward the borrow ditch, restored tidal channels, and tide gates to allow for an exit from the site. Ditches will be filled to the surrounding floodplain elevations as the work systematically proceeds downstream to allow fish the opportunity to leave the work area.

7. In order to complete the project as quickly as possible two interior channel network basins may be simultaneously cleared of fish and dewatered. The same protocols described above would be initiated and maintained simultaneously or slightly offset for fish salvage crew efficiency. At no time will work sequencing trap fish between work areas.

8. Dewatering pumps may be used to lower water levels in drainage ditches, depending on water depths. Pumps will not completely dewater drainage ditches, allowing for fish egress to non work areas.

Phase 2A and 2B will begin after tidal channel networks grading and drainage ditch filling is complete. Some spoils from tidal channel grading will be stockpiled along the interior of the borrow ditch and staged for Phase 2A. Typical sequencing of Phase 2A and 2B fish salvage and dewatering work:

1. Remove exterior (bay side) riprap and invasive species from the top of the levee, place in the bottom of the borrow channel, below elevations 0 NAVD 88 where tidal channels would establish.

2. Fill the borrow ditch with staged Phase I material with a second operator located along the landward side of the borrow ditch. The borrow ditch will be filled systematically where soil is placed on top of the vegetation and riprap, from upstream to downstream, to allow fish to exit the site on an outgoing tide, or seek refuge in a completed tidal channel network. All borrow ditch fill would be placed to surrounding floodplain elevations prior to any levee breaching activities, thereby eliminating areas where fish could become stranded following the first tide entering the site.

3. Begin levee breaching and lowering activities from the outermost points along the levee, working back toward the staging areas located at each end of the levees. Excavation would require careful monitoring of the tides. In general, excavation would begin immediately as tides begin to fall and would follow the tide down while staying above the water line, using the levee for access and construction. Once a portion of the levee has been breached or lowered, it would not be used again. Levee breaching and lowering material would be placed on top of the borrow channel fill and graded into the marsh to direct tidal flows into the tidal channel network and avoid reclaiming the borrow ditch as a conveyance.

4. As necessary, fish will be excluded from the levee breach work area by applying netting along the interior levee slope, and extended outward to allow for adequate work space. Netting will be moved along the levee slope and ground surface to exclude fish from the work area. Fish will not be excluded from the levee exterior slope as fish will have access to the Youngs and Walloskee rivers and are expected to avoid the work area.

5. The two tide gates will be removed using excavators and removed from the site and recycled.

6. The pilot channel excavation will occur before the levee breaching and be timed to perform work outside of water, above the tide line. No fish salvage will be necessary.

Dewatering Details

Water management would be required under one of three general circumstances during construction: tidal channel construction, tide gate removal, and levee breaching.

Tidal channel construction is expected to have a direct dewatering component, and excavation area–specific pumping would be necessary to lower the local water table in areas in which excavation is occurring. Local excavation-related dewatering activities would follow the work as necessary from downstream to upstream within each channel network.

Tide gate removals and levee breaches would occur as the tide is falling such that work areas would remain above the water line and work would occur downward with the falling tide as the water levels

drop to the greatest extent possible. As the incoming tide raises water levels, equipment would continue to work above the water surface, moving away and upward from the advancing tide.

Pumps would be used to keep the work areas dewatered to the extent practical. If the pumped discharge is clean water, it would likely be discharged to an adjacent ditch or channel that is not under construction. This water would be allowed to release with the next outgoing tide. If the pumped discharge is not clean, it would be run through a bag filter prior to discharge to the ground surface, where it would either infiltrate into the ground or flow to the nearest ditch or channel.

Throughout dewatering activities, the contractor would implement BMP's to mitigate for project impacts to water and air quality. A complete list of mitigation measures is provided in Table 2-2.

Erosion and Sediment Control

Oregon Department of Environmental Quality (DEQ) administers construction-related erosion permits under their 1200-C National Poliution Discharge Elimination System General Permit for sites that propose to disturb more than 1 acre of land area; therefore, a 1200-C permit would be required for the project. Erosion control measures for the project would be designed and implemented to meet or exceed DEQ's permit requirements and prevent sediment-laden water from leaving the project area to the maximum extent practicable and maintain any discharge within allowable limits.

The Youngs and Wallooskee rivers are not listed for sediment or turbidity on DEQ's Clean Water Act 303(d) list for water quality limited waters. This means that DEQ would not require additional, more stringent erosion control measures required for sites that discharg to a water bodies that are listed for these parameters.

The interior of the project area is relatively flat with undulating topography, and drainage ditches convey water from the interior of the site to tide gates at two locations through the perimeter levee. Other than relic tidal channels on site, there are no natural stream channels, and there is nominal run-on into the site from upland areas. Other than the ditches, connecting culverts, and tide gates, there is no on-site stormwater collection or conveyance infrastructure that needs to be considered in the design of an erosion control plan.

On-site water management would be a significant erosion and sediment control BMP. Section 2.1.3 describes the construction phasing and sequencing intended to prevent turbid water from leaving the site. Table 2-2 lists all BMPs that will be used for construction of the project.

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