UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
Portland, OR 97232

Refer to NMFS No:
WCR-2017-7873

March 2, 2018

Daniel M. Mathis
Division Administrator
Federal Highway Administration
Evergreen Plaza Building
711 South Capitol Way, Suite 501
Olympia, Washington 98501-1284

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, Letter of Concurrence, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the U.S. 101 Elwha Bridge Replacement Project, Clallam County, Washington. (HUC 171100200514 Lake Adwell-Elwha River)

Dear Mr. Mathis:

Thank you for your letter of September 11, 2017, requesting consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 USC 1531 *et seq*.) for the US 101 Elwha River Bridge Replacement Project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 USC 1855(b)) for that project. In the enclosed biological opinion, NMFS concludes that the proposed actions are not likely to jeopardize the continued existence of Puget Sound Chinook salmon and Puget Sound steelhead, and is not likely to destroy or adversely modify Puget Sound steelhead critical habitat.

This document also contains the results of the MSA Essential Fish Habitat (EFH) consultation. The Federal Highway Administration (FHWA) determined that the project will adversely affect Pacific salmon EFH. NMFS concurs with that determination and is, therefore, providing conservation recommendations pursuant to the MSA (section 305(b)(4)(A)). The FHWA must respond to those recommendations within 30 days (MSA section 305(b)(4)(B)).

Please contact Jennifer Quan at 360-753-6054 or by e-mail at Jennifer.Quan@noaa.gov if you have any questions concerning this document, or if you require additional information.

Sincerely,

Barry A. Thom
Regional Administrator

cc: Leslie Durham, USFWS
Kevin Bartoy, WSF
Rick Huey, WSF
Michelle Meade, WSDOT
Jeff Dreier, WSDOT
George Ritchotte

Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Letter of Concurrence, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Consultation

for the

U.S. 101 Elwha Bridge Replacement Project
Clallam County, Washington. (HUC 171100200514 Lake Adwell-Elwha River)

NMFS Consultation Number: WCR-2017-7873

Action Agency: Federal Highway Administration

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Puget Sound ESU Chinook salmon (*Oncorhynchus tshawytscha*)	T	Yes	No	Yes	No
Puget Sound DPS steelhead (*O. mykiss*)	T	Yes	No	Yes	No
Southern DPS Pacific eulachon (*Thaleichthys pacificus*)	T	No	No	No	No

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	No	NA
Coastal Pelagic Species	No	NA

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:

Barry A. Thom
Regional Administrator

Date: March 2, 2018

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1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 U.S.C. 1531 et seq.) and implementing regulations at 50 CFR 402. We also completed an essential fish habitat (EFH) consultation on the proposed action in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). A complete record of this consultation is on file at the Oregon and Washington Coastal Office.

The Washington State Department of Transportation (WSDOT) will carry out the project. The U.S. Federal Highway Administration (FHWA) is the lead Federal agency and will fund the project, in part. The U.S. Army Corps of Engineers (COE) will issue a permit under Section 404 of the Clean Water Act.

1.2 Consultation History

Following removal of the Elwha Dam in 2012 and the Glines Canyon Dam in 2014, the Elwha River dramatically changed its course and flow, leading to severe erosion around the bridge pier foundations. Between 2012 and 2016, the riverbed at the bridge lowered 14 feet due to erosive forces of the restored river, undermined one bridge pier, and exposed another bridge pier. Geotechnical borings discovered that the bridge pier foundations were built on river bed gravel, not bedrock as was indicated in the 1926 engineering plans.

WSDOT issued emergency declarations in September 2016 and January 2017. The Washington Department of Fish and Wildlife (WDFW) issued an emergency Hydraulic Project Approval (HPA) for initial emergency scour repair on September 30, 2016. The COE authorized placement of fill in the river on October 4, 2016. Before starting the emergency scour repairs in October 2016, WSDOT coordinated with NMFS and the U.S. Fish and Wildlife Service (USFWS, collectively, the Services), and incorporated several conservation measures recommended by the Services. WSDOT was also issued an HPA for a second round of scour protection on July 5, 2017. WSDOT consulted with Pat Crain (Olympic National Park, Chief Fisheries Biologist) and Mike McHenry (Lower Elwha Klallam Tribe, Habitat Program Manager).

Initial emergency scour repair project in October 2016 consisted of 1,185 cubic yards of riprap placed around Pier 7 and 975 cubic yards of riprap around Pier 6 for scour protection. Minor excavation was used to fill the interstitial spaces between the rocks. Additional emergency repairs were made in August 2017, following unusually high flows and scour at the piers. Approximately 740 cubic yards of 6-man rock was placed around Piers 6 and 7. Approximately 100 cubic yards of material was excavated upstream and downstream of the bridge and used to fill interstitial spaces between the boulders. The emergency repairs will remain in place until the existing bridge is demolished.

The WSDOT and FHWA met with liaisons from NMFS to discuss the bridge replacement project at an early coordination meeting on April 11, 2017. WSDOT and FHWA also met with NMFS on May 24, 2017, for a pre-biological assessment (BA) meeting. WSDOT and FHWA met with representatives from the USFWS in Lacey, Washington, on July 10, 2017, and conducted a field visit with USFWS on July 12, 2017.

On September 13, 2017, WSDOT submitted a biological assessment to NMFS for the US 101 Elwha Bridge Replacement Project (project) and requested consultations under both the ESA and MSA. NMFS received additional project information via email exchanges between September 25 and October 12, 2017. Upon receiving the additional information, NMFS initiated consultation on October 12, 2017. The basis for NMFS's concurrence with a "not likely" determination for Southern DPS Pacific eulachon is presented in Section 2.12 of this document.

1.3 Proposed Federal Action

"Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02). "Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02).

The FHWA proposes to fund a WSDOT project to construct a new bridge and roadway, and remove the existing US 101 Elwha River Bridge. The existing three-span, 388-foot-long, concrete arch bridge over the Elwha River was built in 1926. Beginning in 2019, WSDOT will replace the US 101 Elwha River Bridge with a fixed-span, concrete girder bridge resting on four piers. The new bridge will be located approximately 250 feet north of the existing bridge and roadway. The existing bridge will be removed. A parking lot and trail access will be constructed along the right bank. Construction will take place between June 2019 and September 2020. In-water work will occur during two in-water work windows: July 15 through August 31, 2019, and June 15 to August 31, 2020. Each of the project elements is described in more detail below.

<u>Construction Access Pads</u>
To minimize impacts on aquatic habitat and species during the in-water work portions of bridge construction and demolition, contractors will construct temporary construction access pads within the channel to enable equipment to reach the necessary locations. The construction access pads will be composed of 11,700 cubic yards of 6-man riprap (54 to 60 inches in diameter) and will require up to 1,500 cubic yards of excavation. The construction access pads will encompass a total area of over 61,200 square feet, of which 29,500 square feet will be below the ordinary high water mark (OHWM). The construction access pads will extend from upland locations on

both sides of the river out to the proposed intermediate pier locations. On the right bank of the Elwha River, the construction access pad will originate from the former resort area boat launch (previously used for emergency bridge scour repairs) and will extend southward along the channel margin to the proposed Pier 3 location. On the left bank, the landward access will originate from US 101, approximately 300 feet west of the existing bridge abutment, and will extend down to near the confluence of the Elwha River and Indian Creek, where it will continue into the channel to the proposed Pier 2 location.

The construction access pads will be constructed to withstand the range of river flows for 1 year and the loads of heavy construction equipment. The construction access pad dimensions match the size of equipment used for constructing the bridge superstructure and will be at a height that allows for work in the dry, except in flow conditions that exceed the 2-year flow at elevation 195 feet (NAVD 88), which can be up to 10 feet above the existing grade. During such flow events, all equipment and materials will be moved off the access pads until waters subside.

The construction access pads will take approximately 3 weeks to construct and will remain in place from July 15, 2019, to August 31, 2020, to enable subsequent column and pier cap construction and girder placement outside of the in-water work window. To alleviate potential velocity and scour effects between the construction access pads outside of the approved in-water work window (between August 31, 2019, and June 14, 2020), WSDOT will remove a portion of each pad on the waterward side of the new piers.

Bridge Construction and Demolition

The proposed bridge will replace the existing three-span, concrete arch bridge with a fixed-span, concrete girder bridge, founded on concrete drilled shafts. It will be composed of three spans, for a total length of 494 feet—106 feet longer than the existing bridge. With a height ranging from 34 to 42 feet above the wetted channel, the proposed bridge will also be higher than the existing bridge. The area of overwater coverage of the proposed bridge will be approximately 15,710 square feet, which is 6,190 square feet more than that of the existing bridge.

The proposed east abutment (right bank of the Elwha River) will be built approximately 250 feet north of the existing abutment; the proposed west abutment (left bank of the Elwha River) will be built approximately 60 feet north of the existing west abutment (Figure 1).

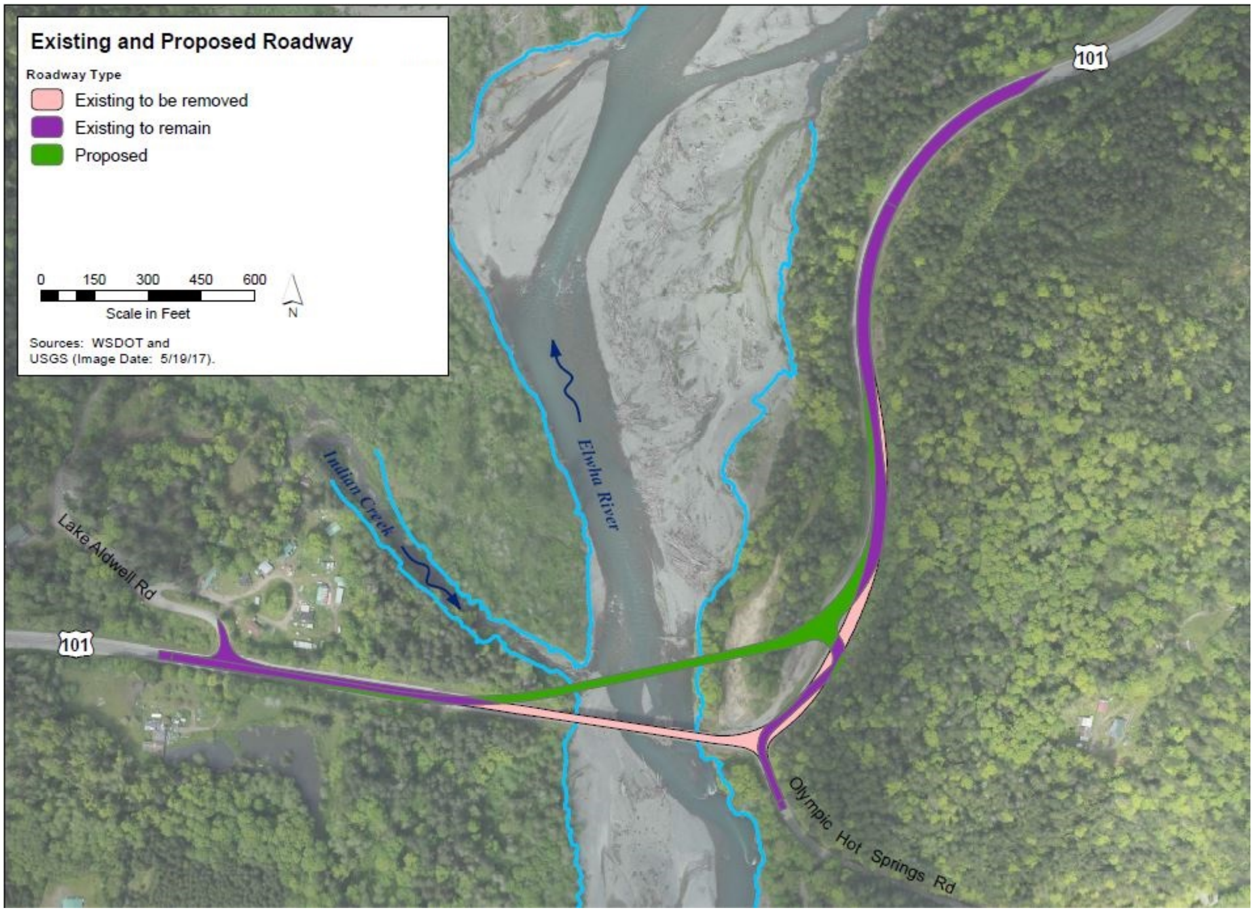

Figure 1. Existing and proposed bridge and roadway.

The proposed bridge will be supported by four piers, each composed of two 10-foot-diameter concrete drilled shafts with concrete support columns attached to the top of the drilled shafts. Piers 1 and 4 will be at the west and east abutments, respectively. Piers 2 and 3 will be within the Elwha River channel, and are designed at a 12-degree skew to the bridge alignment to correlate with river flow. Piers 1 and 4 will have cast-in-place concrete retaining walls constructed around the north, south, and waterward sides of the shafts to complete the bridge abutments, and will result in no in-water impacts. Piers 2 and 3 will have concrete columns connecting the bridge superstructure or pier caps (cross beams) to the drilled shaft, resulting in approximately 314 square feet of in-water impacts.

Each drilled pier casing will be steel and have an inner diameter of 10 feet. The pier casings will be installed in bedrock to a depth of approximately 50 feet. The bedrock is likely at a depth of approximately 10 to 12 feet below the river channel, and drilled shafts will extend above the 100-year flood elevation (approximately 202 feet; NAVD 88). A crane-mounted casing oscillator will be used to advance each steel casing through the substrate until it reaches bedrock, at which point an augur will be used to drill into the substrate until bedrock depth is achieved. After the shaft excavation is completed, a prefabricated, reinforcing steel shaft cage will be lowered into the excavation, concrete will be pumped into the casing, and the displaced water and slurry will be transferred to holding tanks or land-based facilities for treatment and reuse or disposal.

The bridge superstructure will be constructed on top of the support columns, typically with pier caps spanning across the top of the two columns to distribute the weight of the bridge. The pier caps may require a soffit-forming system to support the weight of the reinforcing steel and wet concrete. The precast-concrete girders will be set on the pier caps using cranes operating from either landward approach sections or the in-channel construction access pads. Concrete forms, including the soffit support system, will be removed after the roadway deck concrete has cured and achieved adequate strength. Cast-in-place approach slabs will be constructed landward of each bridge abutment to tie into the roadway alignment. The bridge superstructure will then be completed with the installation of land barriers and rails.

After traffic has been shifted to the new alignment, the existing bridge and remaining roadway sections will be demolished. To ensure that all the work can be completed within a single in-water construction period, WSDOT contractors propose to demolish the bridge within an expanded work window of June 15 to August 31, 2019. Demolition will occur in two phases: the first phase involves the demolition of Arches 1 and 2, as well as Pier 6, from the left-bank side of the river; the second phase involves demolition of Arch 3 and Pier 7 from the right-bank side of the river. To complete the demolition, portions of the channel will be dewatered, corresponding to the phases.

A demolition laydown pad is proposed out into the channel for each demolition phase. The demolition laydown pads will provide equipment access and a surface to catch heavy pieces of concrete debris, so foreign debris does not enter the river. Once the area is dewatered, a woven wire fabric, overlain by geosynthetic fabric, will be installed under the drop zone to provide separation between the native riverbed and the foreign debris. The woven wire layer also helps ensure a complete removal of the geosynthetic fabric and all concrete particulate without suffering any loss of debris into the riverbed, or loss of riverbed material from over-excavating to remove concrete particulate. Approximately 900 cubic yards of ballast rock will be used to create a 1.5-foot layer over the demolition pad. This layer will be used to form a gradable, walkable, drivable surface for workers and equipment, and to absorb the impact of falling concrete without damaging the geosynthetic fabric. A construction stormwater interceptor swale will be integrated into the demolition laydown pad that will route runoff to a sump to be pumped to an upland storage tank.

When the demolition laydown pad is in place, WSDOT will begin phase 1 of the bridge demolition, starting with the bridge deck. WSDOT contractors will remove Arches 1 and 2 to collapse the structure. Thereafter, contractors will demolish the remaining arches, piers, and pier footings, the rubble from which will free fall onto the demolition laydown pad. The Pier 6 footing and the emergency protection rock will be fully broken down, as necessary, and removed from the channel bed. The concrete rubble will be transported for offsite disposal.

The temporary demolition laydown pad for phase 1 demolition work and Pier 2 construction access pad will be removed. The materials will either be re-used for phase 2 or hauled off for disposal. The remaining phase 2 demolition activities will be similar to those of phase 1. A demolition laydown pad will be constructed along the right bank from the Pier 3 construction access pad, beneath the existing bridge Arch 3, and out to Pier 7. The phase 2 demolition pad ballast material is expected to total 600 cubic yards. Once the demolition laydown pad is in place, demolition of the remaining bridge elements will be conducted in the same manner as described for phase 1.

The demolition laydown pad, cofferdam, and construction access pad will be removed from the river following the bridge demolition. Angular rock used for ballast or the construction access pad will be completely removed and hauled off site for recycling or disposal.

Dewatering and Fish Exclusion

Bridge demolition will require extensive work within the channel, and major portions of the channel will be dewatered to reduce the impact on aquatic habitat and species. Dewatering the channel will be conducted in two phases (Figure 2).

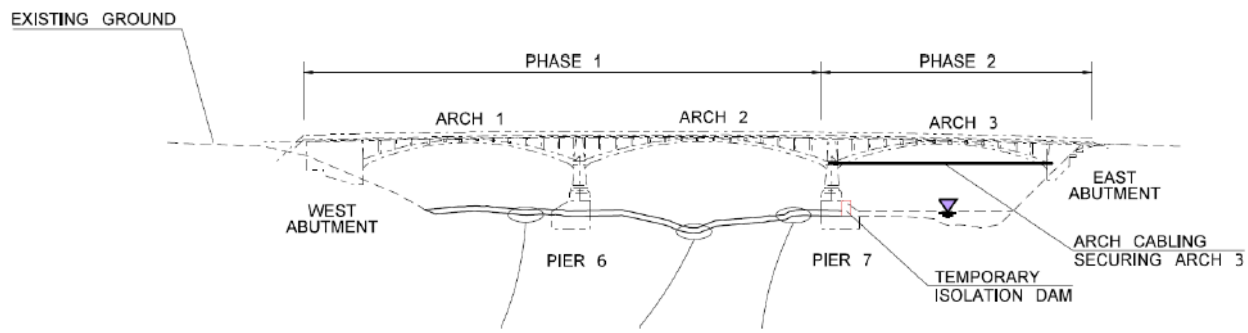

Figure 2. Dewatering and existing bridge demolition phases.

For phase 1, a 5,000-cubic-yard bulk bag (*e.g.*, "supersack") dam, or similar product filled with clean, 1- to 3-inch gravel and buttressed with riverbed material, will be used to dewater the western and central portions of the channel. The supersack cofferdam was selected over other alternatives, such as earthen dams, sheet pile dams, and inflatable water bladders, based on the supersack dam's superior ability to withstand high-energy river environments. The supersack cofferdam will be constructed approximately 295 feet upstream of the existing bridge, out into the Elwha River channel, around Pier 7, and back to the proposed Pier 2 construction access pad. The supersack dam will be designed to accommodate a 10 percent exceedance flow calculated based on flow gauge history upstream of the site. The supersack dam is expected to be approximately 9 feet wide and 9 feet tall, and 860 linear feet long, and to occupy 2,600 square feet of the channel bed. The cofferdam will dewater an area of approximately 110,000 square feet of channel. While the cofferdam is in place, the Elwha River will flow between Pier 7 and the east abutment (along the right bank).

After the cofferdam is in place and the river diversion has stabilized, the area behind the cofferdam will be completely dewatered. Pumps with screened intake hoses will be installed into the low points of any remaining isolated pool areas. Outlet hoses will be routed to a point downstream of the demolition work activities back into the Elwha River. The pools will then be dewatered at a maximum rate of 2 inches per hour, allowing aquatic life to migrate with the receding water level and, thereby, preventing stranding. Qualified personnel will capture and release any fish, or other remaining aquatic life, back into the flowing portion of the Elwha River pursuant to WSDOT's Fish Exclusion Protocols and Standards (WSDOT 2016a).

Following the completion of demolition activities, the cofferdam will be dismantled by opening the supersacks and releasing the gravel to the channel bed. The material will be released in a manner that will allow for natural redistribution of sediment under normal flows, or strategically placed to fill large voids in the channel bed, as needed.

Phase 2 will dewater the area along the right bank of the Elwha River. Similar to phase 1, a 400-cubic-yard supersack cofferdam will be constructed out from the right bank approximately 160 feet upstream of the bridge, around Pier 7, and will terminate at the construction access pad for the proposed bridge Pier 3. The phase 2 cofferdam will be 9 feet wide, 9 feet tall, and 480 feet long, and will occupy approximately 1,400 square feet of the channel bed. The area behind the cofferdam will be approximately 30,000 square feet. Construction, dewatering, and fish exclusion for the phase 2 cofferdam will be done in the same manner as described for phase 1.

To accommodate streamflow while the cofferdam is in place, the channel will be deepened in an area approximately 600 feet long and 80 feet wide. Doing so will reduce stream velocities, reduce scour, and provide a low-flow channel for the river during construction. Channel excavation is expected to result in removal of approximately 4,600 cubic yards of streambed materials, and will be used as fill at other project construction locations if material meets the required standards. Most of the excavation will occur while the work area is isolated during the initial demolition phase. During and after installation of the phase 2 cofferdam, some additional material may be excavated, as required.

Roadway Construction and Demolition

The WSDOT proposes to reconstruct approximately 0.6 mile of US 101, approximately 0.2 mile west of the new bridge, and 0.4 mile east of the new bridge (Figure 2). Proposed roadway improvements also include a new intersection and lower section of Olympic Hot Springs Road, beginning about 400 feet east of its current location. South of the new intersection, Olympic Hot Springs Road will closely follow the existing alignment of US 101 in a westerly direction to the point where it turns south near the existing intersection. The proposed new roadway will generally consist of a 12-foot travel lane in each direction with 8-foot shoulders on the outer edge of each travel lane, creating approximately 65,000 square feet (1.49 acres) of new impervious surface.

Roadway construction will involve excavation and fills; temporary shoring; retaining wall construction; reconstruction of existing driveway accesses; and drainage, stormwater, and stormwater culvert installations. Retaining walls will be used to protect roadway approaches while minimizing the roadway footprint. One retaining wall will be constructed adjacent to a tributary to Indian Creek to avoid impacts on the creek. The wall will use soldier piles, installed with a vibratory hammer above the OHWM.

Overall, roadway construction is anticipated to require approximately 8,000 cubic yards of excavation and 46,000 cubic yards of fill. Any material removed during excavation will be used as fill at other project construction locations if the materials meet the required standards. Once the embankments and retaining walls are complete, compacted layers of gravel will complete the subgrade before the road is paved with an asphalt surface and the channelization is painted. The roadway embankments beyond the shoulders will be vegetated by hydroseeding or other appropriate means.

The roadway approach sections on either side of the existing bridge will be demolished in conjunction with the bridge demolition (Figure 2). This work will likely consist of saw cutting and/or impact breaking the roadway surface, then removing the asphalt and subgrade with heavy earth-moving machinery. Approximately 28,200 square feet of the existing roadway will be removed, roughly within 150 feet on either side of the existing bridge. Demolished roadway material will be hauled off site for disposal at an approved facility.

Stormwater

Approximately 65,000 square feet of new pollutant-generating impervious surface (PGIS) will be constructed as part of the project, for an overall increase in PGIS of 16,550 square feet (0.38 acre) over the existing structures. To address the increase in PGIS surface, WSDOT will install water quality treatment facilities along new roadway segments and construction stormwater conveyance structures to carry stormwater to planned discharge points. Stormwater will sheetflow off the roadway into roadside swales, ditches, and filter strips, where runoff treatment methods will be installed. Cross culverts will be used where needed to convey water across the roadway. Although final design of the stormwater system is ongoing, the treatment options are expected to consist primarily of biofiltration best management practices (BMPs), such as vegetated filter strips, biofiltration swales, media filter drains, or bioswales. The project will increase the amount of stormwater quality treatment in the action area, thereby reducing loads and concentrations of total suspended solids, total and dissolved copper, and total and dissolved zinc.

Site Clearing and Restoration

To provide access to the river channel and new bridge and road alignment, construction areas will be cleared of vegetation. Within the limits of construction, approximately 6.7 acres of land outside the proposed roadway limits will be cleared and grubbed, of which approximately 2.9 acres will be within the 200-foot riparian buffer zone of the Elwha River and/or Indian Creek. WSDOT identified 461 trees within the clearing limits for the project: 199 conifers between 4 and 30 inches diameter at breast height (dbh), and 21 trees (conifer or hardwood) greater than 30 inches dbh. Temporary erosion and sediment control (TESC) measures, such as silt fences, berms, storm drain inlet protection, straw bale barriers, and detention or siltation ponds, will be implemented before engaging in any clearing and grubbing activities. Temporary driveways may need to be established from the staging areas to the roadway network. Some staging areas may also be equipped with wheel washes that clean truck tires to reduce the amount of dirt and dust tracked off site. TESC measures will be used to prevent the runoff of untreated stormwater and sediment from entering the staging areas.

Temporarily affected natural habitat and roadside vegetation will be revegetated with species similar to those removed, including 2.5 acres of habitat within the riparian buffer. Of the 2.5 acres to be restored within the buffer, approximately 1.8 acres will be replanted with native vegetation, and 0.7 acre will be replanted with roadside vegetation. The remaining 0.4 acre of vegetation that had been removed for construction will consist of new roadway for the US 101 alignment.

Restoration of temporarily disturbed areas will generally follow the standards contained in WSDOT’s Standard Specifications (WSDOT 2016b) for roadside restoration and WSDOT’s

Roadside Policy Manual (WSDOT 2017). Restoration will include placing topsoil, compost, and soil amendments; planting native species; and adhering the weed and pest control, and plant establishment plans. Tree replacement will likely entail the planting of approximately 2,700 1-gallon container coniferous trees based on ratios specified in the Roadside Policy Manual.

River Access

The eastern bridge abutment of the existing bridge, including the foundation will be removed. Approximately 8,000 square feet of the existing cleared area northeast of the existing bridge will be paved and will serve as a parking area for potential river access and a pedestrian trail that will extend northward approximately 200 feet from the parking area, along the top of the bluff above the right bank of the river (Figure 3). The paved trail will be approximately 14 feet wide and will have 13 feet of vertical clearance beneath the new bridge, to allow access by emergency response vehicles. Access to the trail will be from Olympic Hot Springs Road, approximately 350 feet southwest of the proposed intersection with US 101.

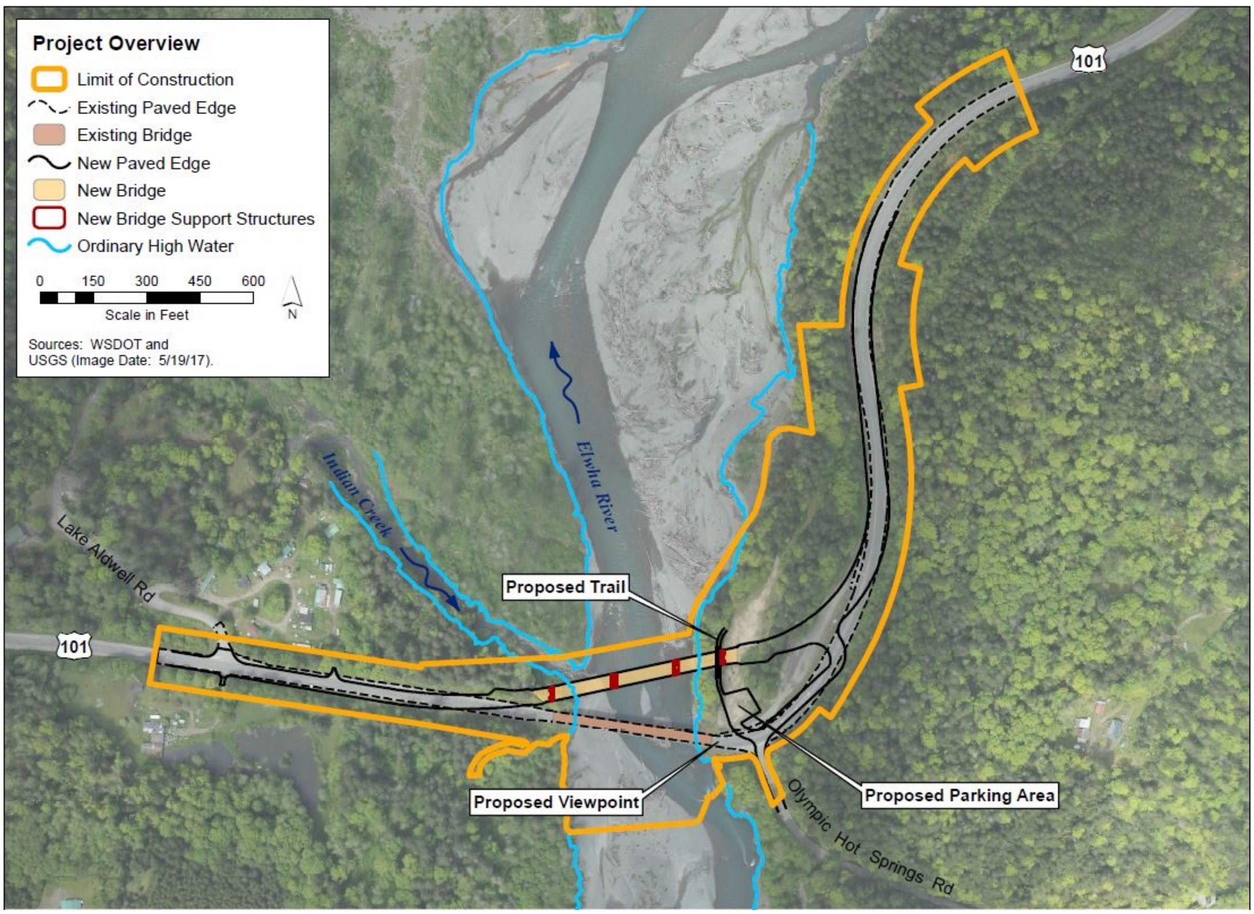

Figure 3. Project overview, showing proposed parking area, viewpoint, and trail.

<u>Best Management Practices</u>
The following list of best management practices (BMPs), are the measures and standards for the protection of aquatic species and habitats during bridge and roadway construction and demolition.

BMPs for general impact avoidance and minimization:

- All construction activities will comply with the National Pollutant Discharge Elimination System (NPDES) Construction Stormwater General Permit (Ecology 2015), the Stormwater Management Manual for Western Washington (Ecology 2014), the WSDOT Highway Runoff Manual (WSDOT 2014), and the Implementing Agreement between Ecology and WSDOT regarding the statewide application of the Highway Runoff manual. The project will also comply with the State of Washington Surface Water Quality Standards (Washington Administrative Code [WAC] 173-201A).
- All construction activities will comply with conditions of applicable COE permit, Ecology Water Quality Certification, and WDFW Hydraulic Project Approval.
- Contractors will identify existing vegetation to remain and delineate clearing limits with high visibility fencing, or other, before clearing activities commence.

BMPs to reduce the risk of delivering sediment to waterbodies:

- The contractor will develop and implement a TESC plan for all project elements that entail clearing, vegetation removal, grading, ditching, filling, embankment compaction, or excavation.
- The contractor will designate at least one employee as the erosion and spill control lead This person will be responsible for installing and monitoring erosion control measures and maintaining spill containment and control equipment. The erosion and spill control lead will also be responsible for ensuring compliance with all local, state, and federal erosion and sediment control requirements, including discharge monitoring reporting for Ecology.
- The contractor will install erosion control devices, as needed, to protect surface waters and other critical areas. Actual locations will be specified in the field based upon site conditions. The contractor will install erosion control blankets or an equally effective BMP on steep slopes that are susceptible to erosion and where ground-disturbing activities have occurred. This will prevent erosion and assist with the establishment of native vegetation.
- Project staging and material storage areas will be located a minimum of 150 feet from surface waters or in currently developed areas such as parking lots or previously developed sites.
- The contractor will cover erodible material that may be temporarily stored for use in project activities with plastic or other impervious material during rain events to prevent sediments from being washed from the storage area to surface waters.
- The contractor will inspect silt fences after each rainfall and at least daily during prolonged rainfall. Sediment will be removed as it collects behind the silt fences and prior to their final removal.
- Exposed soils will be stabilized during the first available opportunity during construction. No soils shall remain exposed for more than 2 days from October 1 to April 30, and for more than 7 days from May 1 to September 30. Any areas disturbed by construction

activities will be permanently stabilized and restored in a manner consistent with WSDOT's Roadside Policy Manual (WSDOT 2015). A minimum 1-year plant establishment plan will be implemented to ensure survival, or replacement, of vegetation by stem count at the end of 1 year.

BMPs to reduce the risk of introducing pollutants to waterbodies:

- The contractor will prepare an SPCC plan prior to beginning any construction activities. The SPCC plan will identify the appropriate spill containment materials that are available at the project site at all times, as well as specify what to do and whom to contact when spills occur. The approved SPCC plan will provide site- and project-specific details identifying potential sources of pollutants, exposure pathways, spill response protocols, protocols for routine inspection fueling and maintenance of equipment, preventative and protective equipment and materials, reporting protocols, and other information according to WSDOT Standard Specifications.
- All equipment to be used for construction activities will be cleaned and inspected prior to arriving at the project site to ensure no potentially hazardous materials are exposed, no leaks are present, and the equipment is functioning properly. If the contractor detects a leak on heavy equipment, the equipment will be immediately removed from areas within or immediately adjacent to the ordinary high water mark of waterbodies.
- The contractor will provide a stabilized construction entrance, temporary access road pads, and street cleaning for construction access. Absorbent materials will be placed under all vehicles and equipment on construction access or demolition laydown pads, or other overwater structures. Absorbent materials will be applied immediately on small spills and promptly removed and disposed of properly. The contractor will maintain an adequate supply of spill cleanup materials on site.
- The contractor will establish a concrete truck chute cleanout area or equally effective BMP to properly contain wet concrete. Uncured concrete and/or concrete byproducts will be prevented from coming in contact with streams or water conveyed directly to streams during construction in accordance with WAC 220-110-270(3).
- No paving, chip sealing, or stripe painting will occur during periods of rainfall or wet weather.
- As practicable, the contractor will fuel and maintain all equipment more than 200 feet from the nearest wetland, drainage ditch, or surface waterbody, or in currently developed areas such as parking lots or managed areas.
- All new PGIS will receive treatment in water quality treatment facilities. Where existing stormwater management features are modified by the project, the water quality treatment, detention, or conveyance capacity will either be maintained or increased compared to the existing capacity.

BMPs for in-channel construction:

- All work below the ordinary high water line will be completed during the approved in-water work window (July 15 to August 31, 2019, and June 15 to August 31, 2020), and will fully comply with the HPAs issued by WDFW for the project.
- A biologist will monitor fish use and timing during the 2019 in-water work window to validate the adequacy of proposed flexibility of the 2020 in-water work window. Fish from the isolation area will be captured and released using methods that minimize the risk

of fish injury, in accordance with the WSDOT protocols for such activities (WSDOT 2016).

- During equipment use within the wetted perimeter of a wetland or stream, the following provisions apply:
  - Equipment will be thoroughly cleaned of mud, petroleum products, or other deleterious material.
  - Operators will avoid turning and spinning within the streambed.
  - The streambed will be returned to pre-project condition at project completion.
  - The amount and duration of in-stream work with machinery will be limited to the minimum necessary to complete the work.
  - The contractor will use environmentally acceptable hydraulic fluids that meet requirements for biodegradability, aquatic toxicity, and bioaccumulation during in-water and overwater construction, where practicable.
  - There will be no visible sheen from petroleum products in the receiving water as a result of project activities.
- Throughout construction, the contractor will monitor Elwha River flows using the Northwest River Forecast Center station at McDonald Bridge, upstream of the project site. During flow events approaching the 2-year discharge, equipment and materials will be moved off the access pads until water subside. Portions of the cofferdam may be selectively removed to provide flow relief and prevent catastrophic failure.
- River diversion for phase 2 of the bridge demolition will occur prior to August 15 to minimize potential effects on early Chinook salmon spawning.
- The contractor will inspect the channel bed and gravel borrow areas for large depressions or voids. Any depressions or voids will be filled with bulk bag streambed material to smooth unnatural grades.

2. ENDANGERED SPECIES ACT: BIOLOGICAL OPINION AND INCIDENTAL TAKE STATEMENT

The ESA established a national program for conserving threatened and endangered species of fish, wildlife, plants, and the habitat upon which they depend. As required by section 7(a)(2) of the ESA, each Federal agency must ensure that its actions are not likely to jeopardize the continued existence of endangered or threatened species, or adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with NMFS. Section 7(b)(3) requires that, at the conclusion of consultation, NMFS provides an opinion stating how the agency’s actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

NMFS determined the proposed action is not likely to adversely affect the southern distinct population segment (DPS) Pacific eulachon. Our concurrence is documented in the “Not Likely to Adversely Affect” Determinations section (2.12). The proposed action will affect Puget Sound ESU Chinook salmon (*Oncorhynchus tshawytscha*), Puget Sound DPS steelhead (*O. mykiss*), and

Puget Sound steelhead critical habitat. Those species and habitat are addressed in Sections 2.1 through 2.11.

2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and/or an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the regulatory definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features (81 FR 7214).

The designation of critical habitat for species uses the term primary constituent element (PCE) or essential features. The new critical habitat regulations (81 FR 7414) replace these terms with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species:

- Identify the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Describe the environmental baseline in the action area.
- Analyze the effects of the proposed action on both species and their habitat using an "exposure-response-risk" approach.
- Describe any cumulative effects in the action area.
- Integrate and synthesize the above factors by reviewing the status of the species and critical habitat; and adding the effects of the action, the environmental baseline, and cumulative effects to assess the risk that the proposed action poses to species and critical habitat.
- Reach a conclusion about whether species are jeopardized or critical habitat is adversely modified.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk faced by the listed species, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The Status of the Species section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. This opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. The largest hydrologic responses are expected to occur in basins with significant snow accumulation, where warming decreases snow pack, increases winter flows, and advances the timing of spring melt (Mote *et al.* 2014; Mote *et al.* 2016).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1 degree Fahrenheit (°F) to 1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Kunkel *et al.* 2013; Abatzoglou *et al.* 2014). Warming is likely to continue during the next century as average temperatures are projected to increase another 3°F to 10°F, with the largest increases predicted to occur in the summer (Mote *et al.* 2014). Decreases in summer precipitation of as much as 30 percent by the end of the century are consistently predicted across climate models (Mote *et al.* 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote *et al.* 2013; Mote *et al.* 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote *et al.* 2014). Models consistently predict increases in the frequency of severe winter precipitation events (*i.e.*, 20-year and 50-year events), in the western United States (Dominguez *et al.* 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote *et al.* 2014), in as the Elwha River watershed.

The Elwha River is in a transient watershed, where increasing temperatures are likely to increase flood frequency, mainly during the winter and early spring peak streamflows, and decrease the summer low flows that may extend into early fall (Halofsky *et al*. 2011). As basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and will wash away incubating eggs (Goode *et al.* 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (McMahon and Hartman 1989; Lawson *et al.* 2004).

Further predicted changes for coastal waters in the Pacific Northwest due to climate change include increasing surface water temperature, increasing but highly variable acidity, and increasing storm frequency and magnitude (Mote *et al.* 2014). Elevated ocean temperatures already documented for the Pacific Northwest are highly likely to continue during the next century, with sea surface temperature projected to increase by 1.8°F to 4.7°F by the end of the century (IPCC 2014). Habitat loss, shifts in species' ranges and abundances, and altered marine food webs could have substantial consequences to anadromous, coastal, and marine species in the Pacific Northwest (Tillmann and Siemann 2011; Reeder *et al.* 2013). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier *et al.* 2008; Wainwright and Weitkamp 2013; Raymondi *et al.* 2013).

Changing environmental conditions depresses the adaptive ability of threatened and endangered species by reducing population size, habitat quantity and diversity, and resulting in a loss of behavioral and genetic variation. Without those natural sources of resilience, systematic changes in local and regional climatic conditions due to anthropogenic global climate change will likely reduce long-term viability and sustainability of populations in many ESUs (NWFSC 2015). New stressors generated by climate change, or existing stressors with effects that have been amplified by climate change, may also have synergistic impacts on species and ecosystems (Doney *et al.* 2012). Such conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future.

2.2.1 Status of the Species

For Pacific salmon, steelhead, and other relevant species, NMFS commonly uses four parameters to assess the viability of the populations that, together, constitute the species: spatial structure, diversity, abundance, and productivity (McElhany *et al.* 2000). The "viable salmonid population" (VSP) criteria for those four parameters, therefore, encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When the parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment. The parameters are influenced by survival, behavior, and experiences throughout a species' entire life cycle, and those characteristics, in turn, are influenced by habitat and other environmental conditions. "Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends fundamentally on habitat quality and spatial configuration and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation at single genes to complex life history traits (McElhany *et al.* 2000).

"Abundance" generally refers to the number of naturally-produced adults (*i.e.*, the progeny of naturally-spawning parents) in the natural environment (*e.g.*, on spawning grounds).

"Productivity," as applied to viability factors, refers to the entire life cycle; *i.e.*, the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is declining. McElhany *et al.* (2000) use the terms “population growth rate” and “productivity” interchangeably when referring to production over the entire life cycle. They also refer to “trend in abundance,” which is the manifestation of long-term population growth rate. For species with multiple populations, once the biological status of a species’ populations has been determined, NMFS assesses the status of the entire species using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany *et al.* 2000).

Puget Sound Chinook Salmon
The Puget Sound Chinook salmon ESU was listed as threatened on June 28, 2005 (70 FR 37160). We adopted the recovery plan for this ESU in January 2007. The recovery criteria include:

- Two to four Chinook salmon populations in each of the five biogeographical regions of the ESU need to achieve viability;
- At least one population from each major genetic and life history group historically present within each of the five biogeographical regions needs to be viable;
- Populations that do not meet the viability criteria for all VSP parameters need to be sustained to provide ecological functions and preserve options for ESU recovery.

Spatial Structure and Diversity. The Puget Sound Chinook salmon ESU includes all naturally spawning populations of Chinook salmon from rivers and streams flowing into Puget Sound, including the Strait of Juan De Fuca from the Elwha River eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound, and the Strait of Georgia in Washington. The ESU also includes the progeny of numerous artificial propagation programs (NWFSC 2015). The Puget Sound Technical Review Team (TRT) identified 22 extant populations, grouped into five major geographic regions, based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity.

Population diversity is often exhibited through alternative life-history strategies, such as varied timing of the outmigration of juvenile salmon, and of adult returns and spawning. After 94 years of restricted access to upstream habitat by the Elwha Dam and Glines Canyon Dam, the spring-run Elwha Chinook salmon on the Elwha River has become extinct (Ruckelshaus *et al*. 2006; Weinheimer *et al*. 2015). Currently, the winter-run Elwha Chinook salmon are largely supported by hatchery production below the removed Elwha Dam. Although fishery managers attempt to preserve the genetic integrity of the Elwha Chinook salmon stock by intentionally limiting the release of hatchery fish over the years, the proportion of natural origin spawners has continued to decline (NWFSC 2015; Weinheimer *et al.* 2015). Genetic analyses confirm that the Elwha Chinook salmon population is unique among the Puget Sound populations, and more closely related to Dungeness River Chinook salmon than other watersheds in the region (Ruckelshaus *et al.* 2006).

Abundance and Productivity. Available data on total abundance since 1980 indicate that, although abundance trends have fluctuated between positive and negative for individual populations, there are widespread negative trends in natural-origin Chinook salmon spawner abundance across the ESU (NWFSC 2015). Productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit River watershed. Available data show that most populations have declined in abundance over the past 7 to 10 years (NWFSC 2015). Further, escapement levels for all populations remain well below the TRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery (NWFSC 2015).

There has been a general decline in wild spawner abundance across all watersheds in the Puget Sound and Strait of Juan de Fuca, as shown by the Elwha River population negative trends during two recording periods, 1990 through 2005, and 1999 through 2014 (NWFSC 2015). Of the 22 populations, the Puyallup River population was the only other population with a negative abundance trend for the two periods (NWFSC 2015). Since the mid-1980s, the Elwha population has shown natural productivity below replacement (NWFSC 2015). Following the removal of the dams, there has been an increase in the proportion of Chinook salmon spawning in the mainstem, rather than tributary habitat, and the majority of the redds (73 percent) were observed above the former Elwha Dam (McHenry *et al.* 2015). Although Chinook salmon have been observed spawning in the larger tributaries (Indian Creek, Little River, and Hughes Creek), they are not known to spawn in the smaller tributaries (McHenry *et al.* 2015).

Limiting Factors. Limiting factors identified for Chinook salmon in the nearshore area of Puget Sound include shoreline modification, loss of estuarine habitat by diking, loss of riparian vegetation, overwater structures, contaminated sediments, and *Spartina* invasion (Smith 2005). Most of the impacts have been documented in Puget Sound, with some areas much more heavily impacted than others. Within the Elwha River, the Chinook salmon population was limited for 101 years by the presence of two dams that restricted access to 70 miles of historical spawning habitat. Following the removal of the dams, the population has continued to require hatchery supplementation and shows no sign of the return of early returning adult spawners (Weinheimer *et al.* 2015). Salmonids released from Puget Sound hatcheries operated for harvest augmentation purposes pose ecological, genetic, and demographic risks to natural-origin Chinook salmon populations (SSPS 2007; NMFS 2011). Total fishery exploitation rates have decreased 14 to 63 percent from rates in the 1980s, but weak natural-origin Chinook salmon populations in Puget Sound still require enhanced protective measures to reduce the risk of overharvest (SSPS 2007; NMFS 2011).

Puget Sound Steelhead

The Puget Sound Steelhead TRT produced viability criteria, including population viability analyses, for 20 of 32 demographically independent populations (DIPs) and three major population groups (MPGs) in the DPS (Hard *et al.* 2015). It also completed a report identifying historical populations of the DPS (Myers *et al.* 2015). The DIPs are based on genetic, environmental, and life history characteristics. Populations display winter, summer, or summer/winter run timing (Myers *et al.* 2015). The TRT concluded that the DPS is currently at "very low" viability, with most of the 32 DIPs and all three MPGs at "low" viability.

The designation of the DPS as "threatened" is based upon the extinction risk of the component populations. Hard *et al*. (2015) identify several criteria for the viability of the DPS, including that a minimum of 40 percent of summer-run and 40 percent of winter-run populations historically present within each of the MPGs must be considered viable using the VSP-based criteria. For a DIP to be considered viable, it must have at least an 85 percent probability of meeting the viability criteria, as calculated by Hard *et al*. (2015).

We are developing a recovery plan for the Puget Sound steelhead DPS.

Spatial Structure and Diversity. The Puget Sound steelhead DPS is the anadromous form of *O. mykiss* that occurs in rivers in northwestern Washington, below natural barriers to migration (Ford 2011), that drain to Puget Sound, Hood Canal, and the Strait of Juan de Fuca between the U.S./Canada border and the Elwha River, inclusive. The DPS also includes six hatchery stocks that are considered no more than moderately diverged from their associated natural-origin counterparts: Green River natural winter-run; Hamma Hamma River winter-run; White River winter-run; Dewatto River winter-run; Duckabush River winter-run; and Elwha River native winter-run (USDC 2014). Non-anadromous, ''resident'' *O. mykiss* occur within the range of Puget Sound steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard *et al.* 2007).

Steelhead DIPs can include summer steelhead only, winter steelhead only, or a combination of summer and winter run timing (*e.g.*, winter run, summer run or summer/winter run). Most DIPs have low viability criteria scores for diversity and spatial structure, largely because of extensive hatchery influence, low breeding population sizes, and freshwater habitat fragmentation or loss (Hard *et al.* 2007). In the Central and South Puget Sound and Hood Canal and Strait of Juan de Fuca MPGs, nearly all DIPs are not viable (Hard *et al*. 2015). More information on Puget Sound steelhead spatial structure and diversity can be found in NMFS' technical report (Hard *et al.* 2015).

The Olympic Peninsula is primarily composed of winter-run steelhead, but includes populations of summer-run steelhead in the larger rivers (Busby *et al*. 1996). The Elwha River currently supports only winter-run steelhead (NWFSC 2015). The Elwha River winter-run steelhead are among the populations with the highest estimated proportions of hatchery spawners; however, the estimates ceased by the late 1990s (NWFSC 2015). Approximately 95 percent of hatchery fish in Puget Sound are derived from two stocks: Chambers Creek winter-run steelhead and Skamania Hatchery summer-run steelhead (Hard *et al.* 2007). The production of these hatchery fish poses a considerable risk to steelhead diversity (NWFSC 2015).

Abundance and Productivity. Abundance of adult steelhead returning to nearly all Puget Sound rivers has fallen substantially since estimates began for many populations in the late 1970s and early 1980s. Smoothed trends in abundance indicate modest increases since 2009 for 13 of the 22 DIPs. Between the two most recent 5-year periods (2005 through 2009, and 2010 through 2014), the geometric mean of estimated abundance increased by an average of 5.4 percent. For seven populations in the Northern Cascades MPG, the increase was 3 percent; for five populations in the Central & South Puget Sound MPG, the increase was 10 percent; and for six populations in the Hood Canal & Strait of Juan de Fuca MPG, the increase was 4.5 percent.

However, several of these upward trends are not statistically different from neutral, and most populations remain small. Inspection of geometric means of total spawner abundance from 2010 to 2014 indicates that 9 of the 20 populations evaluated had geometric mean abundances fewer than 250 adults and 12 of 20 had fewer than 500 adults. Between the most recent two 5-year periods (2005 through 2009, and 2010 through 2014), several populations showed increases in abundance between 10 and 100 percent, but about half have remained in decline. Long-term (15-year) trends in natural spawners are predominantly negative (NWFSC 2015).

There are some signs of modest improvement in steelhead productivity since the 2011 review, especially in the Hood Canal & Strait of Juan de Fuca MPG (NWFSC 2015). However, the improvement in productivity must be sustained for a longer period (at least two generations) to lend sufficient confidence to any conclusion that productivity is improving over larger scales across the DPS. Moreover, several populations are still showing dismal productivity, especially those in the Central & South Puget Sound MPG (NWFSC 2015).

The Elwha River winter-run steelhead are among the smallest populations in the Puget Sound, and has fewer than 100 annual spawners (NWFSC 2015). A study of trends in abundance from 1999 to 2014 show an overall decrease in abundance among the Strait of Juan de Fuca and Hood Canal populations; however, an examination of the period between 2009 and 2014 indicate a modest increase in abundance for the Elwha River population (NWFSC 2015). While the recent increases in abundance are within the range of variability, and are not consistent with the low productivity observed in both the Dungeness and Elwha Rivers (NWFSC 2015), much of the positive trend has been observed in the period following the dam removal (after 2012). Similar to Chinook salmon, the steelhead have been observed spawning in the mainstem, including the action area, and larger tributaries (Indian Creek, Little River, Hughes Creek, Cat Creek, and lower reach of Griff Creek), but not the smaller tributaries (McMillan *et al.* 2015).

Limiting Factors. Similar to the limiting factors identified for Chinook salmon, steelhead are limited by impacts on nearshore, estuarine, and intertidal habitats (Smith 2005). Historical dredging of river mouths and armoring of the marine and estuarine shorelines have greatly altered the nearshore habitat (Smith 2005). Intertidal areas are affected by the loss of riparian vegetation and the removal of large woody debris to enhance navigation (Smith 2005). Elwha River steelhead have experienced widespread declines in adult abundance despite reductions in harvest (Ford 2011). The use of hatchery production to supplement declining stocks threatens steelhead genetic diversity (NWFSC 2015).

2.2.2 Status of Critical Habitat

This section describes the status of designated critical habitat relevant to the proposed action by examining the condition and trends of the essential physical and biological features of that habitat throughout the designated areas. These features are essential to the conservation of the ESA-listed species because they support one or more of the species' life stages (*e.g.,* sites with conditions that support spawning, rearing, migration, and foraging).

For salmon and steelhead, NMFS' critical habitat analytical teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NOAA Fisheries 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or serving another important role.

Puget Sound steelhead critical habitat has been designated within the action area. There is no designated critical habitat for Chinook salmon in the action area. NMFS designated critical habitat for the Puget Sound steelhead DPS on February 24, 2016 (81 FR 9252) (Table 1).

Table 1. Puget Sound steelhead critical habitat designation and status summary.

Species	Designation Date and Federal Register Citation	Features Designated	Critical Habitat Status Summary
Puget Sound steelhead DPS	2/24/16 81 FR 9285	Physical and biological features	Critical habitat encompasses 18 subbasins in Washington containing 66 occupied watersheds. Most HUC5 basins with PBFs for salmon are in fair-to-poor or fair-to-good condition (NOAA Fisheries 2005). However, most of these watersheds have some or high potential for improvement. We rated conservation value of HUC5 watersheds within the range of this DPS as high for 41 watersheds, medium for 16 watersheds, and low for 9 watersheds.

The action area lies within the Dungeness/Elwha subbasin, which contains five watersheds, all of which are occupied by the Puget Sound steelhead DPS. Occupied watersheds encompass approximately 82 square miles. Fish distribution and habitat use data identify approximately 144 miles of occupied riverine habitat in the watersheds (78 FR 2726, January 14, 2013). Preliminary analyses by the Puget Sound TRT have identified one ecological zone (Olympic Peninsula) containing four winter-run populations (Dungeness River, Elwha River, Strait of Juan de Fuca Lowland Tributaries, and Strait of Juan de Fuca Independent Tributaries) in this subbasin (Ford 2011). The Puget Sound TRT concluded that all occupied areas contain spawning, rearing, or migration PBFs for this DPS and identified several management activities that may affect the PBFs, including agriculture, channel modifications/diking, dams, forestry, irrigation impoundments/withdrawals, road building/maintenance, and urbanization (NMFS 2012). Of the five watersheds reviewed, four were rated as having high conservation value and one was rated as having medium conservation value to the DPS.

For the 2005 critical habitat designations for salmon and steelhead (70 FR 52630, September 2, 2005), NMFS biologists developed a list of PBFs relevant to determining whether occupied stream reaches within a watershed meet the ESA section (3)(5)(A) definition of "critical habitat," consistent with the implementing regulation at 50 CFR 424.12(b). Relying on the biology and life history of each species, we determined the PBFs essential to their conservation. The PBFs include sites essential to support one or more life stages of the DPS (sites for spawning, rearing, migration and foraging). Those sites, in turn, contain physical or biological features essential to the conservation of the DPS (for example, spawning gravels, water quality and quantity, side channels, forage species). Specific types of sites and the features associated with the PBFs for salmonids in the action area include:

1. Freshwater spawning sites with water quantity and quality conditions and substrate that support spawning, incubation, and larval development;
2. Freshwater rearing sites with water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility, water quality and forage that support juvenile development, and natural cover such as shade, submerged and overhanging large wood, logjams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; and
3. Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks that support juvenile and adult mobility and survival.

In the Elwha River, Puget Sound steelhead critical habitat is designated from its outlet to the upper reach of the river, upstream of Delabarre Creek. Critical habitat is also designated in four tributaries of the Elwha River, including Indian Creek, Little River, one unnamed tributary to the upper reach of the Elwha River, and one unnamed tributary near the river's outlet.
Within the action area, the road adjacent to the river, as well as past effects of dams on Elwha River hydrology, have reduced river sinuosity and availability of off-channel habitats, important features for spawning and rearing PBFs. Since removal of the dams in 2012 and 2014, natural processes are being restored to the Elwha River, resulting in significant changes to hydrology and geomorphology. Those changes affect all PBFs within the action area: the increase in fine sediments following the removal of the dams has continued to raise the streambed elevation in the lower reaches and reduce the suitability of spawning habitat; and large wood now accumulates in gravel bars and can move through the entire system.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area is defined as the geographical extent (in both aquatic and terrestrial environments) of the physical, chemical, and biological effects resulting from the proposed action, including direct and indirect effects, as well as effects of interrelated and interdependent activities.

Project components with the potential to affect the environment include changes to stream characteristics upstream of the project due to backwater, modifications to the stream channel characteristics due to the project, turbidity due to construction or demolition activities, modifications to terrestrial habitats in the project footprint, and project disturbance including construction- and demolition-related noise and the presence of workers in the action area.

The aquatic portion of the action area is defined by the downstream extent of sediment and turbidity above background levels and the upstream extent of hydraulic effects from cofferdam installation. Water quality effects will be limited by the use of BMPs outlined in the contract specifications for the project. The project will maintain compliance with state water regulations in WAC 173-201A. Despite the use of BMPs, suspended sediment and turbidity from in-water construction is anticipated to extend approximately 2,400 feet downstream of the existing bridge (Hall *et al.* 2017).

Hydraulic effects of the project were evaluated using a 2-dimensional model for the existing, proposed, and construction phases of the project (NHC 2017). Based on the modeling results, the hydraulic effect of the action with the greatest upstream spatial extent is derived from backwater conditions formed by the river diversion and cofferdams. Under a worst-case flow scenario, the backwater conditions associated with the river diversion and cofferdams will extend approximately 1,300 feet upstream of the planned cofferdam and into the lower reaches of Little River.

Downstream effects due to changes in flow velocities, depths, and scour would extend less than 1,500 downstream of the existing bridge and are therefore captured within the area identified for potential suspended sediment and turbidity effects.

The project does not involve impact pile driving. Underwater sound from construction and demolition is not expected to be above baseline levels.

Noise from construction and demolition activities defines the extent of terrestrial impacts. Vibratory driving of soldier piles near the tributary to Indian Creek will create the loudest project-related sound levels, which will attenuate to background levels approximately 2.6 miles from the project footprint.

The action area for direct effects associated with this project therefore consists of aquatic habitats in an approximately 3,700-foot stretch of the Elwha River (2,400 feet downstream and 1,300 feet upstream of the existing bridge), plus all terrestrial habitats within 2.6 miles of the project footprint (Figure 4). The indirect effects will be contained within the action area that is defined for direct effects.

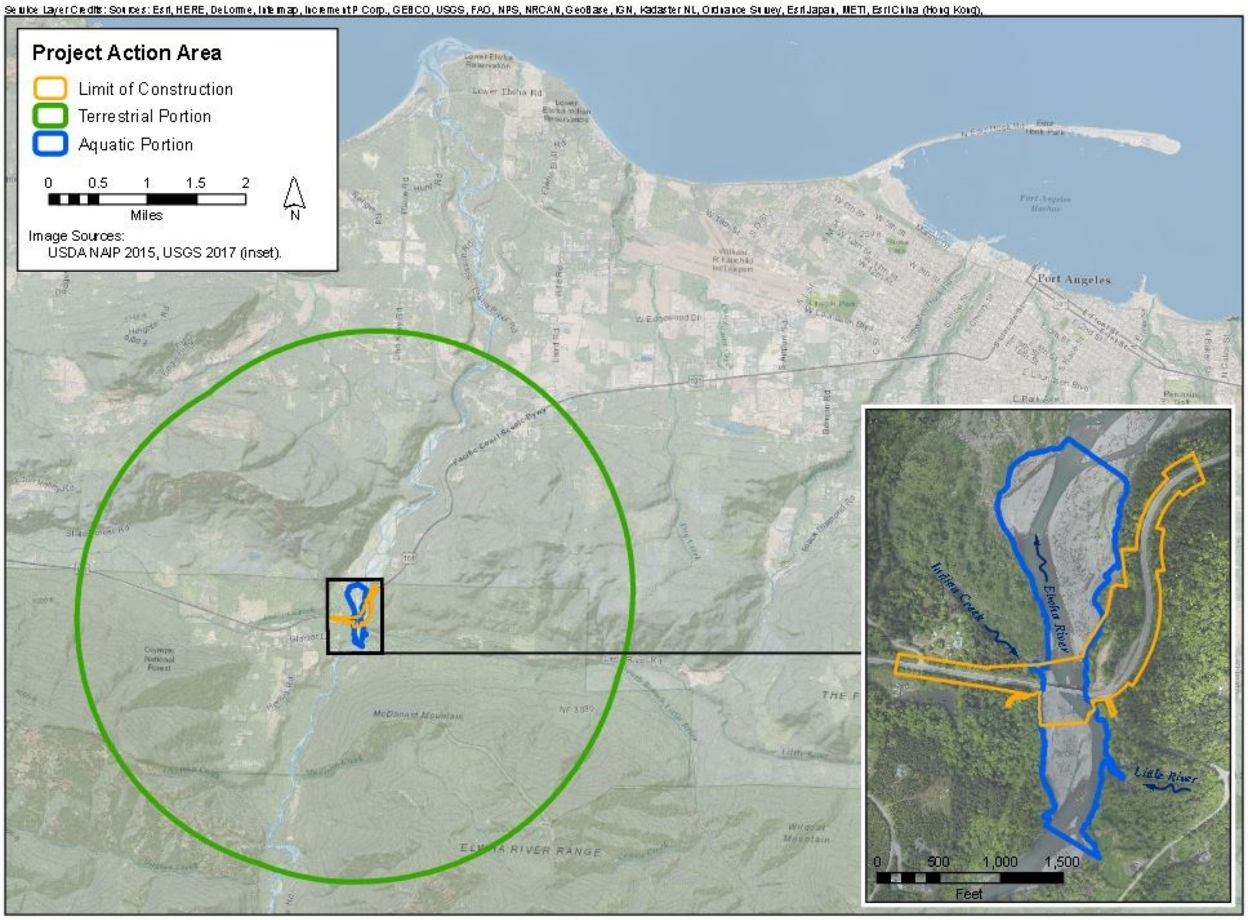

Figure 4. Project Action Area.

In this biological opinion, the term "project action area" or "action area" has a specific meaning, defined above. The project action area is different from the "project site," which encompasses the limits of construction, and is also referred to as the "project footprint," and from the "project area," which is a more general term for the vicinity of the project site.

Puget Sound Chinook salmon and Puget Sound steelhead are reasonably certain to be within the action area during the in-water work periods for the project.

2.4 Environmental Baseline

The "environmental baseline" reflects the environmental conditions due to the past and present impacts of all Federal, state, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultation, and the impact of state or private actions that are contemporaneous with the consultation in process (50 CFR 402.02).

In Washington, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average air temperatures in Washington are likely to increase 0.18°F to 10.8˚F per decade (Mote and Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow, especially in transient watersheds, such as the Elwha River watershed. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing and increasing peak river flows, which may limit salmon survival (Mantua *et al.* 2009).

The Elwha River is a 45-mile river that originates in the Olympic Mountains and drains approximately 321 square miles into the Strait of Juan de Fuca. The watershed is characterized by cool, wet winters and warm, dry summers, with a steep precipitation gradient. The Elwha River headwaters receive approximately 236 inches of precipitation annually, whereas the mouth of the river receives approximately 39 inches (Duda *et al.* 2011). Within the action area, the mean annual precipitation is approximately 83 inches (WSDOT 2016b). In the higher elevations, most precipitation falls as snow (Duda *et al.* 2008), contributing to river discharge in the spring when temperatures melt the accumulated snow pack. The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour streambeds and destroy salmon eggs (Battin *et al.* 2007).

The watershed is a dynamic system in a state of great change as a result of the removal of the Elwha Dam in 2012 and the Glines Canyon Dam in 2014, located approximately 2.3 miles downstream and 4.8 miles upstream of the project site, respectively. Following the removal of the two hydroelectric power dams, the Elwha River watershed is now going through large-scale ecosystem recovery, including significant hydrologic and geomorphic changes, increased flows, increased channel braiding, increased floodplain interaction, changing sediment deposition rates, and changing sediment grain size (East *et al.* 2015). These changes have important implications on habitat availability for fish and the fish community structure. Following the dam removal, anadromous fish can now access 70 miles of historical habitat that was previously blocked by the Elwha and Glines Canyon dams (Weinheimer *et al.* 2015); overtime, the change in sediment deposition rates and sediment grain size will provide suitable spawning substrate throughout all river reaches and tributaries (Pess *et al.* 2014), and the braided channels and increased floodplain interaction improve rearing habitat (East *et al.* 2015).

The US 101 Elwha River Bridge crosses the Elwha River at approximately river mile 7.7, at what was the upper limits of Lake Aldwell prior to the removal of the Elwha Dam. Lake Aldwell was formed by the impoundment of water above the Elwha Dam. The impoundment inundated former riverine and riparian habitats, and trapped sediment and wood debris from upland and upstream sources. Removal of the Elwha and Glines Canyon Dams released more than 10 million cubic yards of sediment (Foley *et al.* 2015), causing the riverbed to rise 3 feet in the lower Elwha River (East *et al.* 2015) and to lower 14 feet in the middle Elwha River at the existing bridge location (Hall *et al.* 2017). The sediment released from filled pools accumulated in floodplain channels and created riffle crests as it was transported downstream from the dam locations (Pess *et al.* 2014). The change in sediment composition increased the substrate and habitat diversity along the middle and lower reaches, and transformed the middle reach in the action area from a lake habitat to a braided channel. The transformation in topography, grain size, and channel morphology is not typical in natural river systems, but is a result of an artificially generated imbalance between sediment supply and transport capacity (East *et al.*

2015). The hydraulic, geomorphic, and wood-loading modifications resulting from the dam removal have not yet achieved the river's equilibrium condition.

The Washington Department of Ecology listed the portion of the Elwha River in the immediate vicinity of the US 101 bridge as a Category 5 polluted water for temperature exceedances (Ecology 2017). There is no TMDL for water quality parameters within the Elwha River. Monthly flows on the Elwha River upstream of the US 101 Elwha River Bridge (Site No. 12045500, Elwha River at McDonald Bridge near Port Angeles, Washington) exhibit strong seasonal fluctuations. Monthly flows vary from 587 cubic feet per second (cfs) in September to 2,200 cfs in June (monthly average from October 1897 to October 2016; USGS 2017). Lacking the same snowmelt-driven flows, Indian Creek has a more uni-modal hydrograph. The peak flows in Indian Creek coincide with the rainy winter months and flows decrease throughout the summer months (Hall *et al.* 2017).

High water temperatures and lower spawning flows, together with increased magnitude of winter peak flows, are likely to increase salmon mortality. Higher ambient air temperatures will likely cause water temperatures to rise (ISAB 2007). Salmon and steelhead required cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with higher than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold-water refugia (Mantua *et al.* 2009).

Turbidity data for the Elwha River were only available for water years 2014 through 2016 (Site No. 12046260, Elwha River at Diversion near Port Angeles, Washington) (Table 2). Due to the extreme sediment conditions in the Elwha River, reported values above 1,000 formazin nephelometric units (FNUs) may be less accurate. The mobilization of stream sediment resulted in periods of high turbidity within the channel, at times exceeding 4,000 nephelometric turbidity units (NTUs) (Pess *et al.* 2014). The timing of the peak turbidity event (April 6 through 8, 2013) coincided the with WDFW's annual hatchery release of Chinook salmon, resulting in numerous smolt mortalities due to stranding, disorientation, and clogged gills (Pess *et al.* 2014).

Table 2. Turbidity data at Site No. 12046260, Elwha River at Diversion near Port Angeles, Washington (2014–2016; USGS 2017).

Month	2014		2015		2016	
	Minimum	Maximum	Minimum	Maximum	Minimum	Maximum
October	40.0	1,430	10.0	>1,500	0.0	>1,500
November	36.0	>1,500	54.0	>1,500	55.0	>1,500
December	23.0	>1,500	80.0	>1,500	50.0	>1,500
January	21.0	>1,500	47.0	1,450	15.0	>1,500
February	301	>1,500	26.0	<1,500	17.0	672
March	208	>1,500	11.0	366	6.4	197
April	42.0	212	5.8	233	3.7	38.0
May	72.0	820	4.5	20.0	3.9	32.0
June	11.0	118	1.7	11.0	3.6	229
July	12.0	85.0	0.2	11.0	0.3	24.0
August	6.2	20.0	0.2	1240	1.4	3.6
September	2.1	20.0	0.3	136	0.2	84.0

Elevated turbidity and suspended sediment deposition are also associated with reductions in benthic invertebrates (Pess *et al.* 2014). Because the peak turbidity events are isolated and related to the removal of the dams, and will naturally reach equilibrium below the level that triggers listing, the middle Elwha River is not listed by the Washington State Department of Ecology (Ecology) for turbidity.

Since removal of the Elwha and Glines Canyon dams, the changes to the project vicinity are consistent with the large-scale changes in the rest of the river. Following the draining of the Lake Aldwell impoundment, several gravel bars and braided channels emerged both upstream and downstream of the US 101 Elwha River Bridge. A large section of riparian forest on the left bank, upstream of the bridge, was washed away to expose a large gravel bar (Hall *et al.* 2017). As the left bank eroded, the confluence with Indian Creek moved further downstream from the existing bridge (Hall *et al.* 2017). In September 2016, Lower Elwha Klallam Tribe staff observed that the piers supporting the bridge were becoming exposed due to the erosive forces of the changing channel.

The project reach has been transformed from the former Lake Aldwell reservoir to a braided pool-riffle type channel with an unconfined floodplain (Hall *et al.* 2017). The channel bed is composed of well-sorted sediments ranging from boulder-size substrate to finer sands and silts, and large woody debris accumulations are prevalent on the gravel bars (Hall *et al.* 2017). Upland vegetation in the action area is primarily second- and third-growth forest, having been logged at least once between the late-19th and mid-20th century, and includes Douglas-fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*), western red cedar (*Thuja plicata*), bigleaf maple (*Acer macrophyllum*), red alder (*Alnus rubra*), black cottonwood (*Populus trichocarpa*), salmonberry (*Rubus spectabilis*), evergreen blackberry (*R. laciniatus*), salal (*Gaultheria shallon*), oceanspray (*Holodiscus discolor*), and sword fern (*Polystichum munitum*).

2.5 Effects of the Action

Under the ESA, “effects of the action” means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but are still reasonably certain to occur. During consultation, neither NMFS nor the action agency identified any interrelated or interdependent actions.

Effects of the action that reduce the ability of a listed species to meet its biological requirements may increase the likelihood that the proposed action will result in the jeopardy to that listed species or in the destruction or adverse modification of a designated critical habitat.

Based on the information provided and developed during the consultation, the proposed project is likely to result in permanent and temporary effects, including: 1) injury or death from fish exclusion, 2) loss of forage area during construction and for a few weeks after construction, 3) loss of riparian vegetation, 4) water quality diminishment from turbidity caused by in-channel work (placement and removal of temporary cofferdams), and 5) increase in overwater structure water and associated water quality impairment (stormwater runoff from the road/bridge structure).

2.5.1 Effects on Critical Habitat

Designated critical habitat within the action area consists of freshwater spawning, rearing, and migration PBFs. The essential elements of freshwater spawning and rearing sites and migration corridors are substrate, water quality and quantity for spawning, floodplain connectivity, water quality and quantity including temperature conditions supporting juvenile and adult salmonid mobility, abundant prey items supporting juvenile feeding, cover generally associated with complex habitat, and free passage (no obstructions) for adults and juveniles. These features are essential to conservation because they allow adult fish to reach upstream spawning areas and they allow juvenile fish to rear in and near natal streams for at least 1 to 2 years before proceeding downstream and to the ocean.The PBFs likely to be affected by the proposed action on the Elwha River are water quality, substrate, forage, and natural cover, all of which are necessary to support juvenile survival, and growth, and mobility of both juveniles and adults.

Water Quality – Construction/Turbidity

Water quality is an essential PBF of the freshwater spawning, rearing, and migration site types. Construction activity likely to increase turbidity includes the construction and removal of the temporary access pads, the construction of the proposed bridge, the removal of the existing bridge, and installation and removal of the cofferdams. The duration and magnitude of suspended sediment increases vary with stream size, flow volume, construction activity, sediment characteristics, and BMPs. Low flow conditions during instream disturbance can result in minimal dilution and high suspended sediment concentrations, although the distance of downstream transport may be minimized (Newcombe and Macdonald 1991). The proposed action has the potential to temporarily decrease water quality within the work area and up to 2,400 feet downstream of the existing bridge site.

The water quality in the action area will likely remain at baseline levels, except during the time (up to a few hours) when the existing piling is pulled out of the channel and the cofferdam is removed. Because the water quality impairment associated with each of these activities is a brief, and dissipated quickly by river currents, NMFS does not expect the effects from the proposed action to reduce the suitability of the action area for supporting spawning, rearing, or migrating salmonids. Ppassage will be maintained throughout the project and will continue unchanged when construction is completed, so that the migration corridor is not impaired, andturbid conditions are not expected to affect access to spawning or rearing habitat.

Substrate
The proposed action will have short-term negative effects on the quantity and quality of substrate within the project area and vicinity. To construct the temporary construction access pads, approximately 1,500 cubic yards will be excavated from gravel bars in the channel to use as choking material (to prevent fish entrainment in the interstitial spaces of riprap). To prevent fish entrainment in depressions formed by excavations, the channel bed and gravel borrow areas will be inspected and large depressions or voids will be filled with bulk bag streambed material to smooth unnatural grades.

The cofferdams used to dewater portions of the channel during bridge demolition will be dismantled by opening the bulk bags and releasing the gravel to the channel bed. This method of release will allow for natural redistribution of sediment under normal flows and will increase the suitable substrate for spawning, rearing, and migrating habitats within the mainstem of the Elwha River.

Natural Cover
Approximately 2.9 acres of riparian vegetation will be removed to provide access for constructing the new bridge and removing the existing structures. The area will experience approximately 6 years (1 for construction, 5 for vegetation to mature) of decreased shade and detrital input from the cleared area. The riparian area within the action area is forest vegetation. Approximately 2.5 acres will be replanted, and the maturation of these plantings is expected to return the area to function similar to the baseline within several growing seasons. The temporary loss of 2.5 acres, and the permanent loss of 0.4 acre of forest vegetation, is unlikely to have any measurable effects on water temperatures, shade, or woody debris within the river, though detrital input of insects which serve as forage may be slightly diminished, and cover from avian predators will be reduced.

Benthic Forage
The project will directly affect the Elwha riverbed through the installation and removal of construction access pads and the excavation of material from gravel bars. The temporary construction access pads will cover approximately 29,500 square feet of streambed, elevating the area so equipment can operate above the water surface (up to a 2-year flow event at elevation 195 feet). The temporary construction access pads will be composed of 6-man riprap (54- to 60-inch-diameter angular rock) and “choked” with streambed gravel that is used to fill the interstitial spaces in the riprap foundation to solidify the structure. The choking material will be excavated from nearby gravel bars, impacting an additional 8,000 square feet of river substrate.

The placement and excavation of rock, and the presence of in-water structures will reduce the production of benthic and epibenthic macroinvertebrates on which juvenile Chinook salmon and steelhead feed. The placement and excavation of rock for the temporary construction access pads and permanent installation of two piers to support the bridge are expected to cause mortality of or reduce the abundance of benthic aquatic macroinvertebrates. Effects to aquatic macroinvertebrates from smothering will be temporary, and the river will return to natural contours following the completion of construction. Macroinvertebrates are expected to rapidly recolonize disturbed areas (within approximately 2 weeks to 2 months) (Merz and Chan 2005). The presence of two piers will permanently impact approximately 314 square feet of habitat. However, the project will also remove two existing piers that affect approximately 1,408 square feet of habitat, for a net reduction in effect on benthic habitat of 1,094 square feet. The benthic macroinvertebrate production within the project area is expected to increase when the project is complete. The amount of forage material available for juvenile salmonids is, therefore, expected to return to at least pre-project conditions.

Overwater Coverage– Stormwater
The area of overwater coverage of the new bridge will be approximately 15,710 square feet, an increase of 6,190 square feet over the existing condition.

Rainwater falling on paved surfaces can accumulate heat and warmed runoff can increase water temperature in receiving water. However, water quality treatment associated with the proposed project is expected to provide infiltration for low precipitation events reducing or eliminating this effect. Water quality monitoring at the US 101 Elwha River Bridge through 2015 suggests that water temperatures in the Elwha River vary between approximately 4°C and 8ºC (Ecology 2017). Because total stormwater runoff discharges to the river are expected to be similar to existing discharges, stormwater is not expected to adversely affect river temperatures. Highways collect a variety of pollutants from traffic and are disproportionate contributors to overall pollutant loads in waterbodies (Wheeler *et al.* 2005). Pollutants are mobilized by runoff water and are transported to nearby waterbodies. Traffic residue contains several metals including iron, zinc, lead, cadmium, nickel, copper, and chromium (Wheeler *et al.* 2005). The metals come off disintegrating tires, brake pads, and other vehicle parts and accumulate in roadside dust and soil (Wheeler *et al.* 2005).

2.5.2 Effects of the Action on Listed Species

Fish Handling and Exclusion
The proposed construction actions below the OHWM will take place for 1 week for each bridge demolition phase (2 weeks total) during the June 15 to August 31, 2020, in-water work window, when low numbers of juvenile and no adult Chinook salmon or steelhead are likely to be in the Elwha River in the action area (NWFSC 2015). Prior to dewatering areas behind the cofferdams, fish will be captured and removed from the area to be dewatered.

Fish handling to remove fish from the worksite is intended to reduce fish exposure to harmful habitat conditions associated with the work. The in-water work area from which fish will be salvaged and which will be temporarily isolated is 110,000 square feet during phase 1, and

30,000 square feet during phase 2. The total area to be isolated is approximately 140,000 square feet.
However, fish handling itself is reasonably certain to harm some juvenile salmonids, disrupt their normal behavior, and cause short-term stress, fatigue, and some injury and mortality. Studies indicate stress is revealed by increased plasma levels of cortisol and glucose (Hemre and Krogdahl 1996; Sharpe *et al.* 1998). Even short-term, low intensity handling may cause reduced predatory avoidance for up to 24 hours (Wedemeyer 1972; Olla *et al.* 1995). While injury and death due to handling stress from nets and seines is expected to be lower than that for electrofishing, poor, improper, or careless handling after capture can result in as much mortality, stress, and injury as electrofishing (Barrett and Grossman 1988).

Electrofishing involves passing an electrical current through water containing fish to stun them, making them easier to locate and remove from the worksite. The process can cause a suite of effects on fish, ranging from disturbance or fright behavior and temporary immobility, to physical injury or death resulting from accidental contact with the electrodes. The amount of unintentional mortality attributable to electrofishing can vary widely depending on the equipment used, the settings on the equipment, and the expertise of the technician. The long-term effects electrofishing has on both juveniles and adult salmonids is not well understood, but a few studies have examined the long-term effects of electrofishing on salmonid survival and growth (Dalbey *et al.* 1996; Thompson *et al.* 1997; Ainslie *et al.* 1998). Those studies indicate that, although some fish suffer spinal injury, few die as a result. Injured fish may suffer short-term, long-term, or lifetime handicaps that affect their behavior, health, growth, or reproduction, which could impact community structure and population size (Snyder 2003). Electrofishing stresses are cumulative when added to existing environmental stresses, increasing mortality due to stress and fatigue directly or indirectly through greater susceptibility to predators, disease, and parasites (Snyder 2003).

While the project is timed to reduce the number of fish present, the fish capture/relocation is is likely to cause stress, injury, or death among a small number of juvenile fish – most likely steelhead, even though it will be conducted by a qualified fish biologist.

Reduced Habitat Access - Project Site Dewatering
The project will dewater an area of approximately 140,000 square feet in two phases. NMFS anticipates temporary changes to instream flow upstream, within, and downstream of the project site during the two-phased demolition of the existing bridge.

Stream flow diversion and dewatering could harm individual rearing salmonids by concentrating or stranding them in residual wetted areas, or entrapping them within the interstices of channel substrate where they may not be seen by fish relocation personnel. Juvenile salmonids that avoid capture in the project work area will likely die due to desiccation, thermal stress, or crushing. However, fish relocation efforts are expected to be effective at removing fish from the area. Therefore, NMFS expects that the number of juvenile Chinook salmon and steelhead that may be missed and have the potential to be left within the dewatered area will be very low.

Dewatering operations may also affect aquatic food sources that Chinook salmon and steelhead use for forage. Benthic aquatic macroinvertebrates, an important food source for salmonids, may be killed or their abundance reduced when the river is dewatered (Cushman 1985). However, effects to aquatic macroinvertebrates resulting from river flow diversions and dewatering will be temporary because construction activities will be short-term (fewer than 3 months). Rapid recolonization (2 weeks to 2 months) of disturbed areas by macroinvertebrates is expected following the removal of all cofferdams (Merz and Chan 2005). Because the channel will not be completely dewatered, the activities are short-term, and macroinvertebrate populations from areas adjacent to the project footprint would contribute to recovery, macroinvertebrate recolonization should occur more quickly than 2 months. In addition, the effect of macroinvertebrate loss on juvenile salmonids is likely to be negligible because food from upstream sources (via drift) would be available downstream of the dewatered areas because river flow will be bypassed around the project work site. Therefore, Chinook salmon and steelhead are not anticipated to be exposed to a meaningful reduction in food sources from the temporary reduction in aquatic macroinvertebrates as a result of dewatering activities.

Riparian Vegetation Reduction

Indirect effects associated with the removal of riparian vegetation can include increased water temperatures (Mitchell 1999; Opperman and Merenlender 2004) and decreased water quality (Lowrance *et al.* 1985; Welsch 1991), attributable to a loss of shade and cover adjacent to the active channel. Vegetation will be removed from 6.7 acres, of which 2.9 acres is within the riparian buffer and may affect aquatic habitat and species. However, the loss of vegetation as a result of the proposed action is expected to be temporary because 1.8 acres of native riparian vegetation and 0.7 acre of roadside vegetation will be replanted throughout the disturbed riparian area to minimize impacts from project construction. Vegetation will be planted on 3-foot centers and monitored to ensure survival of 80 percent of planted material over 3 years.

Functional riparian vegetation will be absent from approximately 600 feet along the shoreline on both banks (1,200 feet total) for a period of approximately 6 years (1 year for construction and 5 years for the vegetation to mature). The riparian habitat on both banks outside the immediate project vicinity is forested with native vegetation, and NMFS believes that the absence of mature vegetation for a small portion of the reach will only slightly impair rearing and migrating salmonids because they will water temperature will not be discernibly increased, detrital prey reduction for the first several years is not expected to significantly increase competition for food because prey is not limited in the action area, Reduction in the amount of cover that allows fish to avoid avian predators could result in a slight increase in juvenile morality while the replanted vegetation matures.

Water Quality – Construction Activities

In-water construction activities will temporarily disturb soil and streambed sediments, resulting in the potential for temporary increases in turbidity and suspended sediments in the action area. Turbidity plumes are expected to affect a portion of the channel and extend 2,400 feet downstream of the site. Construction-related increases in sedimentation and turbidity above background levels could potentially affect fish species and their habitat by reducing egg and juvenile survival, interfering with feeding activities, causing breakdown of social organization, and reducing primary and secondary productivity. The magnitude of the potential effects on fish depends on the timing and extent of sediment loading and flow in the river before, during, and immediately following construction.

High concentrations of suspended sediment can have both direct and indirect effects on salmonids. The severity of effects depends on the sediment concentration, duration of exposure, and sensitivity of the affected life stage. Based on the types and duration of proposed in-water construction methods, short-term increases in turbidity and suspended sediment may disrupt feeding activities or result in avoidance or displacement of fish from preferred habitat. Juvenile salmonids have been observed to avoid streams that are chronically turbid (Lloyd 1987) or move laterally or downstream to avoid turbidity plumes (Sigler *et al.* 1984). Prolonged exposures to turbidities between 25 and 50 NTUs may result in reduced growth and increased emigration rates of juvenile coho salmon and steelhead compared to controls (Sigler *et al.* 1984). These findings are generally attributed to reductions in the ability of salmon to capture prey in turbid water (Waters 1995). Chronic exposure to high turbidity and suspended sediment may also affect growth and survival by impairing respiratory function, reducing tolerance to disease and contaminants, and causing physiological stress (Waters 1995). Berg and Northcote (1985) observed changes in social and foraging behavior, and increased gill flaring (an indicator of stress) in juvenile coho salmon at moderate turbidity (30 to 60 NTUs). In that study, behavior returned to normal quickly after turbidity was reduced to lower levels (0 to 20 NTUs).

The Elwha River basin has not yet reached a natural equilibrium following the dam removal, and the turbidity varies between approximately 0.5 to 138 NTUs (Hall *et al.* 2017), with highs of up to 4,000 NTUs (Pess *et al.* 2014). Any increase in turbidity associated with in-water work is likely to be brief and to occur only in the vicinity of the action, attenuating downstream as suspended sediment settles out of the water column. Temporary spikes in suspended sediment may result in avoidance of the site by fish; several studies have documented active avoidance of turbid areas by juvenile and adult salmonids (Sigler *et al.* 1984; Lloyd 1987; Servizi and Martens 1992). Individual fish that encounter increased turbidity or suspended sediment concentrations will likely move away from affected areas into more suitable surrounding habitat. In-water work will only occur from July 15 to August 31, 2019, and June 15 to August 31, 2020, which will limit the duration of turbidity effects and exposure of salmonids to them. Juvenile Chinook salmon and steelhead may be present during instream construction activities. Individual fish present during instream construction will likely be exposed to the above effects. However, due to the short duration of turbidity-generating activities, the effects of increased turbidity will be minor and are unlikely to result in increased predation, decreased feeding, injury, or death.

Sedimentation can kill or injure incubating salmonid eggs by decreasing space between spawning gravel in which dissolved oxygen can be transported. Sediment also blocks micropores on the surface of incubating eggs, inhibiting oxygen transport, and creates an additional oxygen demand through the chemical and biological oxidation of organic material (Suttle *et al.* 2004; Greig *et al.* 2007; Kemp *et al.* 2011). Due to the location and timing of construction, Chinook salmon and steelhead eggs will not be present, and impacts on incubating eggs are not expected to occur.

Finally, although the proposed action involves construction activities and equipment staging over or near the Elwha River and Indian Creek that will increase the potential for accidental releases of fuel, oil, uncured concrete, and other contaminants, such contamination is discountable due to BMPs that will be implemented. For instance, the BMPs require that all equipment be free of leaks and that refueling, maintenance, and staging occur at least 100 feet from a stream. Additionally, the BMPs require all hazardous material spills be cleaned up immediately.

Water Quality – Stormwater
Increased copper and zinc loading presents two pathways for possible adverse effects: 1) direct exposure to water column pollutant concentrations in excess of biological effects thresholds, and 2) indirect adverse effects resulting from the accumulation of pollutants in the environment over time, altered food web productivity, and possible dietary exposure. Dissolved copper and dissolved zinc are the constituents of greatest concern because they are prevalent in stormwater, they are biologically active at low concentrations, and they have adverse effects on salmonids (Sprague 1968; Sandahl *et al.* 2007).

Sub-lethal concentrations of dissolved copper have been shown to impair olfactory function in salmon in freshwater (Tierney *et al.* 2010). Baldwin *et al*. (2003) found that 30- to 60-minute exposures to a dissolved copper concentration of 2.3 micrograms per liter (µg/L) over background level caused olfactory inhibition in coho salmon juveniles. Sandahl *et al.* (2007) found that a 3-hour exposure to a dissolved copper concentration of 2.0 µg/L caused olfactory inhibition in coho salmon juveniles. That copper-induced loss of smell leads to a reduction in predator avoidance (McIntyre *et al.* 2008). Further, fish have shown avoidance of sub-lethal levels of dissolved copper in freshwater (Giattina *et al.* 1982).

The toxicity of zinc is widely variable, dependent upon concurrent levels of calcium, magnesium, and sodium in the water column (De Schamphelaere and Janssen 2004). A review of zinc toxicity studies reveals effects including reduced growth, avoidance, reproduction impairment, increased respiration, decreased swimming ability, increased jaw and bronchial abnormalities, hyperactivity, hyperglycemia, and reduced survival in freshwater fish (Eisler 1993). Juveniles are more sensitive to elevated zinc concentrations than adults (EPA 1987). Sprague (1968) documented avoidance in juvenile rainbow trout exposed to dissolved zinc concentrations of 5.6 µg/L over background levels.

There are five threshold discharge areas in the action area that discharge to three waterbodies: the Elwha River, Indian Creek, and an unnamed tributary to Indian Creek. The existing stormwater system collects runoff in ditches and culverts, and discharges it untreated to receiving water bodies. The project will increase PGIS by 0.38 acre and will provide enhanced water quality treatment for approximately 1.5 acres of new and replaced PGIS, substantially increasing the amount of water quality treatment in the action area. While water quality will still be episodically diminished by stormwater carrying contaminants to the Elwha, the loads and concentrations of total suspended solids (TSS), copper, dissolved copper, zinc, and dissolved zinc in stormwater runoff will all be reduced by 18 to 34 percent (Table 3), which is an overall benefit in the action area because the intensity of exposure to these contaminants is expected to decrease.

Table 3. Summary of stormwater pollutant loads and concentrations.

	PGIS (acre)	Acres with Stormwater Treatment	Median Predicted Values from WSDOT HI-Run				
			TSS Load (lb/yr)	Total Copper (lb/yr)	Dissolved Copper (lb/yr)	Total Zinc (lb/yr)	Dissolved Zinc (lb/yr)
Pre-project	2.89	0	2,879	0.739	0.172	4.5	1.28
Post-project	3.27	1.49	1,907	0.51	0.14	3	0.98
Change	+0.38	+1.49	-972	-0.229	-0.032	-1.5	-0.3

2.6 Cumulative Effects

Cumulative effects are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

There are no reasonably foreseeable non-Federal activities within the action area that would affect listed species. Federal actions dominate current and future impacts in the action area because the vast majority of activities that may affect listed species in the action area will require an approval under the Clean Water Act. Future Federal actions will be subject to the section 7(a)(2) consultation under the ESA. As described in Section 2.4, Environmental Baseline, most of the watershed is composed of forestland. Timber harvest operations on state trust lands in the action area are covered under the habitat conservation plan that was developed to support issuance of section 10(a)(1)(B) permit for incidental take of Chinook salmon and steelhead, among other species (WDNR 1997). Because section 7 consultation for that permit has been completed, timber harvest activities on state trust lands is considered to be part of the environmental baseline for those species, and are not addressed as cumulative effects (USFWS and NMFS 1998).

Lands in the action area are zoned for timber production and very-low-density residential development. As such, it is extremely unlikely that any development projects with significant impacts on the environmental will be proposed in the action area. Moreover, the potential for future development projects to adversely affect ESA-listed species and critical habitat will be minimized through compliance with the critical areas rules of Clallam County.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult to distinguish between the action area’s future environmental conditions caused by global climate change and those caused by cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4).

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate NMFS' biological opinion as to whether the proposed action is likely to: 1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or 2) appreciably diminish the value of designated or proposed critical habitat for the conservation of the species.

The current status of the Puget Sound Chinook salmon ESU and Puget Sound steelhead DPS is poor, which is the reason for their continued listing. The Puget Sound Chinook salmon ESU is at moderate risk of extinction. All Puget Sound Chinook salmon populations are well below recovery escapement levels (NWFSC 2015). Most populations are also consistently below recovery spawner-recruit levels identified. Across the ESU, most populations have declined in abundance since the last status review in 2005, and trends since 1995 are mostly flat (NWFSC 2015). Abundance across the Puget Sound Chinook salmon ESU has generally decreased between 2010 and 2014, within only six small populations of 22 total populations showing a positive change in natural-origin spawner abundances.

Similarly, the Puget Sound steelhead remain at moderate risk of extinction. From 2010 to 2014, geometric means of natural spawners indicate relatively low abundance (12 of 20 populations with fewer than 500 spawners annually), and declining trends continue in approximately half of the populations throughout Puget Sound, particularly in southern Puget Sound and on the Olympic Peninsula (NWFSC 2015). Abundance of adult steelhead returning to nearly all Puget Sound rivers has fallen substantially since estimates began for many populations in the late 1970s and early 1980s.

The threatened status of the affected species is related to systemic loss and degradation of habitat, poor baseline conditions, and overharvesting. In general, baseline habitat conditions within Puget Sound rivers have been degraded chiefly by human development. Relevant habitat modifications include the channelization and diking of rivers, increase of impervious surfaces in most watersheds, simplification of river deltas, reduction in sediment supply due to beach armoring, and loss of tidal wetlands (Fresh *et al*. 2011). The extent of habitat changes significantly impairs several aspects of critical habitat and puts its function for listed salmonids at risk. Within the Elwha River, the removal of the dams has increased access to historical reaches. However, conditions are still degraded by high water temperatures and low flows during summer and fall, high magnitude of winter peak flows, and poor water quality due to high turbidity and suspended sediment.

For both Chinook and steelhead, factors limiting habitat include habitat quantity, riparian conditions, channel structure and form, side channel and wetland conditions, floodplain conditions, sediment conditions, and water quality and water quantity. The environmental baseline of the action area is degraded by and recovering from previous dam removals and is subject to excessive amounts of sediment and elevated water temperatures. The channel substrate has a high background level of sand and fine sediment following the removal of the Glines Canyon Dam, which released millions of cubic yards of stored sediment (Pess *et al*. 2014). The high levels of sand and fine sediment limit the probability that eggs in redds constructed in the action area by Chinook or steelhead will survive.

The baseline conditions of habitat are changing as a result of dam removals, and have not reached a natural equilibrium. The cumulative effects will be related to timber harvest and very low-density residential development above the OHWM, which currently is not regulated by the COE and, thus, does not have a federal nexus. Such habitat alterations may influence critical habitat for listed species.

Climate change will increase pressure on the survival and recovery of salmonids in the Elwha River. Increased water temperatures can cause mortality from heat stress, changes in growth and development rates, and disease resistance. Behavioral responses to higher temperatures include shifts in seasonal timing of important life history events, such as the adult migration, spawn timing, fry emergence timing, and the juvenile migration. Indirect effects on salmon mortality, growth rates and movement behavior are also expected to follow from changes in the freshwater habitat structure and the invertebrate and vertebrate community, which governs food supply and predation risk. Both direct and indirect effects of climate change will vary among Pacific salmon ESUs and among populations in the same ESU. Adaptive change in any salmonid population will depend on the local consequences of climate change as well as ESU-specific characteristics and existing local habitat characteristics (NWFSC 2015).

While several elements of the proposed action will not likely result in any measurable effect to listed salmon or steelhead (i.e., installation and removal of construction pads, excavation of material from gravel bars, increase in overwater cover, dewatering the project site, riparian habitat removal, and stormwater discharge), two aspectslikely to have measureable negative effects on salmonids - fish exclusion and increased turbidity and sedimentation. Because of the variability of cohort size, and variation in presence over time, we cannot quantify the number of individual salmonids that will be injured or killed from fish exclusion and handling, nor from increased sediment generated during in-water construction. Nonetheless, based on general patterns of rearing and migration we expect that any stress, avoidance behaviors, injury, or mortality that occur among juvenile Chinook or steelhead will occur to only a small number of individuals, and any reduction in abundance will be so low as to be indiscernible among the cohort's adult return, so that productivity will not be affected. When considered in the context of 1) the species' threatened status, 2) the baseline, and 3) likely cumulative effects, the project will not influence the populations' viability characteristic for productivity, and in turn are insufficient to create any discernible change in trends for spatial structure or diversity among the affected species.

Effects of the proposed action on features of critical habitat will be minor, and mostly temporary. Increased sediment generated during construction will briefly degrade water quality, slightly reducing the quality of PBFs in the action area, but once construction is complete, water quality will return to its baseline level, and critical habitat will continue to function at current levels. Conservation values of the action area will not be diminished.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Puget Sound Chinook salmon or steelhead.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "Incidental take" is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1 Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows: Puget Sound Chinook salmon and steelhead will be present in the action area and may be 1) injured or killed during worksite isolation, fish exclusion and removal, and 2) exposure to elevated turbidity is likely to injure or kill some fish.

Although available information indicates that fish from the listed species may be present and exposed to project construction activities, the density of each species in the action area is unknown, and there is no way to observe or count the number of fish affected without potentially increasing the number of injured or killed fish. When NFMS cannot quantify take in numbers of fish, NMFS quantifies take in terms of the extent of habitat modified, since exposure to changes in habitat, and responses to those changes, are the mechanisms for harm among individuals of the species, and the extent of modified habitat can be easily monitored and measured. Because NMFS cannot quantify the number of fish that will be exposed to in-water work related to the proposed action, NMFS quantifies the extent of take for this proposed action on, based on the physical area of 1) habitat that will have elevated sediment generated from in-water work and 2) the worksite areas to be isolated. The extent of take is based on "harm." Harm, in the definition of "take," includes significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102).
For this opinion, the extent of take is defined in Table 4.

Table 4. Take summary.

Species	Life Stage	Type of Take	Description of Take Mechanism	Maximum Numbers Affected or Area Affected
Puget Sound ESU Chinook salmon and Puget Sound DPS steelhead	Juvenile	Harm	Fish capture and handling	Fish will be excluded from a diverted and dewatered area of 140,000 square feet (3.21 acres). Any fish that did not leave during the dewatering phase will be captured and released by qualified personnel.
			Short-term impacts related to construction activities	Increased turbidity (affecting 2,400 feet downstream of the existing bridge), dewatering areas (140,000 square feet), altered hydraulics (affecting 1,300 feet upstream of the existing bridge), and the temporary construction access pads (29,500 square feet), for a total area of 2,077,800 square feet (47.7 acres).

Additionally, NMFS cannot estimate the number of individuals from the multiple cohorts over the several years that will experience adverse effects from, the permanent placement of structure in the river channel, nor the 0.4 acre of permanent riparian vegetation loss, or the short-term impacts of 2.5 acres of removed riparian vegetation, dewatering, and construction activity. The project will decrease the overall amount of bridge structure (piers) that is in the river channel, but the new bridge structure will remain within the aquatic habitat for an estimated 75 years. Therefore, NMFS will use the overall area of in-water structures as a surrogate for the number of Puget Sound Chinook salmon and steelhead affected. Take from the continued presence of in-water structure is reasonably certain to occur within the 314 square feet (0.007 acre) of channel impacts from in-water structures, and 2.5 acres of impaired riparian area.

2.9.2 Effect of the Take

In the biological opinion, NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" (RPMs) are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The RPMs must be carried out for the exemption in section 7(o)(2) to apply.

FHWA shall minimize take of Puget Sound Chinook salmon, Puget Sound steelhead, and eulachon. The following reasonable and prudent measures are necessary and appropriate to minimize the take of those species. FHWA shall:

1. Minimize incidental take from worksite isolation and fish handling during construction activities;
2. Minimize incidental take from elevated levels of turbidity resulting from construction activities; and
3. Ensure completion of a monitoring and reporting program to confirm that this opinion is meeting its objective of limiting the extent of take and minimizing take from permitted activities per 50 CFR 402.14(i)(1)(iv) and 50 CFR 402.14(i)(3).

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and WSDOT or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). WSDOT or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to which a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement RPM 1 (worksite isolation), WSDOT shall ensure that:
    a. Intakes for all pumps used for the project have fish screens installed, operated, and maintained according to NMFS' fish screen criteria (NMFS 2011) or equivalent.
    b. Any fish trapped in the in-water work area before dewatering will be herded out or removed and released to suitable habitat as near to the capture site as possible in compliance with the WSDOT Fish Exclusion Protocols and Standards (2016a) or equivalent.
    c. ESA-listed fish are handled with extreme care; fish will be kept in water to the maximum extent possible during dewatering, capture, and transfer.
    d. If electrofishing equipment is used to capture fish, it shall comply with WSDOT Fish Exclusion Protocols and Standards (2016a) or equivalent.
        i. Electrofishing will not be used if water temperatures exceed 64˚F (18˚C) or are expected to rise above 64˚F (18˚C), unless no other method of capture is available.
        ii. Water quality conditions are adequate in buckets or tanks used to transport fish by providing circulation of clean, cold water, using aerators to provide dissolved oxygen, and minimizing holding times.
        iii. NMFS, or its designated representative, is allowed to accompany the capture team during the capture and release activity, and to inspect the team's capture and release records and facilities.

2. To implement RPM 2 (minimizing turbidity), WSDOT shall ensure that:
    a. Erosion control activities, including minimization measures and BMPs, are monitored and corrective actions are taken, if necessary, to ensure protection of riparian areas and eliminate the potential for BMPs failing along the river.
    b. An onsite representative will monitor water quality conditions during in-water work to monitor for construction-related exceedances. Should exceedances occur, in-water work activities shall be stopped until the plume dissipates within the work area.

3. To implement RPM 3 (monitoring), WSDOT shall ensure that all monitoring items will include, at a minimum, the following:
    a. Project identification
        i. Project name: US 101 Elwha Bridge Replacement Project
        ii. NMFS Tracking Number: WCR-2017-7873
        iii. WSDOT contact person.
    b. Construction details
        i. Starting and ending dates of completed in-water construction.
        ii. Post-erosion control BMP photos.
        iii. A description of any elements of the project that were constructed differently than proposed.
        iv. Water quality monitoring reports. Submit monitoring report to NOAA Fisheries, Attention: Jennifer Quan, 7600 Sand Point Way NE, Seattle, WA 98115.

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02).

NMFS has identified the following measure to further minimize or avoid adverse effects on listed species:

1. To retain all trees within the river system, all large trees removed from upland and riparian areas associated with the project shall be stockpiled and shall be placed on gravel bars or within the river following the completion of construction.

2.11 Reinitiation of Consultation

This concludes the formal consultation for the relocation of the US 101 Elwha River Bridge Replacement Project.

As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: 1) the amount or extent of incidental taking specified in the ITS is exceeded, 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, 3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or 4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects on the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur.

Based on this analysis, NMFS concurs with the FHWA that the proposed action is not likely to adversely affect the subject listed species.

Pacific Eulachon
The Southern DPS of eulachon was listed by NMFS as threatened on March 18, 2010 (75 FR 13012). The listing encompasses all subpopulations of eulachon within Washington, Oregon, and California, extending from the Skeena River in British Columbia to the Mad River in northern California. The main threats to eulachon include climate change impacts on ocean

and freshwater conditions, bycatch in trawl fisheries, dams and water diversions, and predation (NMFS 2016).

Eulachon are endemic to the northeastern Pacific Ocean. They range from northern California to southwest and southcentral Alaska and into the southeastern Bering Sea. Puget Sound lies between two of the larger eulachon spawning rivers (the Columbia and Fraser rivers). Although Puget Sound lacks a major eulachon run of its own (Gustafson *et al.* 2010), there has been a gradual increase in returns to the Elwha River, which reflects changes in biological status and improved monitoring (Gustafson *et al.* 2016). The Elwha is the only river in the United States portion of Puget Sound and the Strait of Juan de Fuca that supports a consistent eulachon run (NMFS 2016).

Shaffer *et al.* (2007) was the first to formally document the presence of eulachon in the Elwha River in 2005 and provided anecdotal observations that eulachon were regularly found in the Elwha until the mid-1970s. Small numbers of adult eulachon continued to be observed during the smolt outmigration studies in the mid- to late-2000s, over 100 eulachon were captured during 2012, and hundreds of eulachon were documented in the lower Elwha River during the January 2015 sampling efforts of the lower estuary (Gustafson *et al.* 2016). Although eulachon now have access to the entire river system and tributaries, use has only been documented in the lower mainstem of the river by spawning adults (Gustafson *et al.* 2016). As spawning gravels become more common in the river system, eulachon use may extend upstream. Because eulachon are not yet documented upstream of the removed Elwha Dam, NMFS believes it is very unlikely that eulachon will occur in the action area. Therefore, NMFS concludes that project effects on the southern DPS eulachon will be discountable.

3. MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT ESSENTIAL FISH HABITAT RESPONSE

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. The MSA (section 3) defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity.” Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based, in part, on the EFH assessment provided by the WSDOT and descriptions of EFH for Pacific Coast salmon (PFMC 2016) contained in the fishery management plan developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The proposed action and action area for this consultation are described in the Introduction to this document. The action area includes areas designated as EFH for Pacific Coast salmon but does not occur within a Habitat Area of Particular Concern.

3.2 Adverse Effects on Essential Fish Habitat

NMFS determined that the proposed action will have adverse effects on EFH designated for Pacific Coast salmon, based on information provided in the 2017 biological assessment (Hall *et al.* 2017) and the analysis of effects presented in the ESA portion of this document. NMFS determined that the proposed action will adversely affect EFH by permanently reducing forage, rearing, and migration habitat and temporarily decreasing habitat value through the permanent removal of 0.4 acre and short-term removal of 2.5 acres of riparian vegetation and construction-related turbidity and altered hydrology.

The EFH of forage, rearing, and migrating habitat (314 square feet [0.007 acre]) will be affected by in-water structure (piers for bridge).

The EFH of riparian vegetation in the action area will be affected by removal of riparian vegetation (2.9 acres total: 0.4 acre permanent and 2.5 acre short-term).

The EFH within 1,300 feet upstream and 2,400 feet downstream of the construction area (47.7 acres) will be affected by increased turbidity and altered hydraulics during construction.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS expects that full implementation of the following EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in Section 3.2, approximately 47.7 acres of designated EFH for Pacific Coast salmon. This calculation is based on the amount of habitat presumed to be disturbed by elevated turbidity and altered hydrology. The conservation recommendations include a subset of the ESA terms and conditions. NMFS recommends that WSDOT:

- Retain the removed riparian trees and place them on gravel bars within the reach to mimic natural recruitment of large wood;
- Monitor riparian planting for minimum 80 percent survival over 3 years;
- Submit the following to NMFS: 1) a turbidity monitoring report by April 1 following each construction season, 2) a report that describes the disposition of creosote-treated wood; and
- Report any violations of WDFW’s Hydraulic Project Approval or Ecology’s requirements to NMFS.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, FHWA must provide a detailed response in writing to NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the proposed action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and FHWA have agreed to use alternative timeframes for FHWA response. The response must include a description of measures proposed by FHWA for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, FHWA must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

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

3.5 Supplemental Consultation

FHWA must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document: utility, integrity, and objectivity. This section addresses those DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

"Utility" principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are NMFS, the FHWA, and COE. Other interested users could include WSDOT, Clallam County, the State of Washington, and the general public. Individual copies of this opinion were provided to the above-listed entities. The format and naming adheres to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 *et seq*., and the MSA implementing regulations regarding EFH, 50 CFR 600.

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

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

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

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