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 97232-1274

Refer to NMFS No:
WCRO-2021-00263

July 12, 2022

Todd Tillinger
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
4735 East Marginal Way South, Bldg. 1202
Seattle, Washington 98134-2388

Re: Reinitiation of Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the State Route 9 Marsh Road to 2nd Street Vicinity Widening Project (USACE Number: NWS-2020-1158), (HUC 171100110203)

Dear Mr. Tillinger:

Thank you for your letter of February 11, 2021, requesting reinitiation with NOAA's National Marine Fisheries Service (NMFS) of consultation of number WCR-2012-01706 pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the State Route 9 Marsh Road to 2nd Street Vicinity Widening Project. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

For purposes of this consultation, we considered whether the substantive analysis and its conclusions regarding the effects of the proposed actions articulated in the biological opinion and its incidental take statement would be any different under the 50 CFR part 402 regulations as they existed prior to the 2019 Rule vacated by the order of the United States District Court for the Northern District of California on July 5, 2022. We have determined that our analysis and conclusions would not be any different.

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 (16 U.S.C. 1855(b)) for this action.

On September 20, 2012, NMFS issued a biological opinion (WCR-2012-01706) based on the original project design that concluded the project was likely to adversely affect Puget Sound (PS) Chinook salmon, PS steelhead, and PS Chinook salmon critical habitat. Project elements were also expected to adversely affect Essential Fish Habitat for Pacific salmon. The Federal Highway Administration was the federal nexus at the time; however, the funding source has since changed, and this project is only financed with state of Washington funds.

The original design was expected to require a permit from the U.S. Army Corps of Engineers (USACE) and the new proposed design will still require a Nationwide Permit 14 issued by the USACE, which is a nexus to the Endangered Species Act. Additionally, new science indicates possible deleterious effects of stormwater on prey species of Southern Resident Killer Whales that were not known when creating the 2012 biological opinion. Design changes, a new designation of critical habitat, and the emerging science on stormwater pollutants and their effects indicates effects not previously considered, are the bases for this re-initiated consultation.

As a reminder, the ESA requires that after initiation of formal consultation, the Federal action agency may not make any irreversible or irretrievable commitment of resources that limits future options. This practice ensures agency actions do not preclude the formulation or implementation of reasonable and prudent alternatives that avoid jeopardizing the continued existence of endangered or threatened species.

Please contact Elizabeth Babcock, in Seattle, Washington, at 206-526-4505, or Elizabeth.babcock@noaa.gov you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Kim W. Kratz, Ph.D.
Assistant Regional Administrator
Oregon Washington Coastal Office

cc: Nicole Evans, USACE
Pete Rinallo, WSDOT
Stephanie Jackson, WSDOT

Reinitiation of Endangered Species Act (ESA) Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the

State Route 9 Marsh Road to 2nd Street Vicinity Widening Project
(USACE Number: NWS-2020-1158), (HUC 171100110203)

NMFS Consultation Number: WCRO-2021-00263

Action Agency: U.S. Army Corps of Engineers

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 steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Puget Sound Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
Southern Resident Killer Whales (*Orchinus orca*)	Endangered	No	No	No	No

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

Consultation Conducted By: National Marine Fisheries Service,
West Coast Region

Issued By:

Kim W. Kratz, Ph.D
Assistant Regional Administrator
Oregon Washington Coastal Office

Date: July 12, 2022

TABLE OF CONTENTS

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, as amended.

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). The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the NMFS office in Lacey, Washington.

1.2. Consultation History

The following is a chronology of events that began on September 26, 2012, when NMFS issued an opinion (WCR-2012-01706) for this project to the Federal Highway Administration; however, the project was never constructed.

- On February 20, 2020, the U.S. Army USACE of Engineers (USACE), Washington Department of Transportation (WSDOT), and NMFS liaisons held a pre-Biological Opinion meeting to discuss design changes and a new listing under the Endangered Species Act (ESA) since the original consultation. The NMFS liaisons were notified that the Federal Highway Administration (FHWA) is no longer providing funding and is not connected to the proposed project. The USACE will issue a fill permit; thus, creating a nexus to the ESA.
- On February 11, 2021, NMFS received a biological assessment and request to reinitiate formal consultation, from the USACE for Puget Sound (PS) steelhead critical habitat that was designated after the original consultation. They also reiterated that the proposed project would have adverse effects on PS Chinook salmon, PS Chinook salmon critical habitat, and PS steelhead.
- On March 8, 2021, NMFS requested additional information, and partial responses from the USACE were received on March 29, 2021 with the remaining responses received on April 26, 2021.
- On June 24, 2021, NMFS sent an electronic mail reinitiation message to the USACE that the consultation package was complete.

- On July 9, 2021, NMFS determined that due to the changes in the federal lead agency, design, ESA listing, and advanced science a new opinion rather than a reinitiation addendum would be appropriate to complete this consultation.
- On July 12, 2021, the USACE requested to also conduct informal consultation on Southern Resident Killer Whales due to adverse effects on their primary prey species, Chinook salmon.

For purposes of this consultation, we considered whether the substantive analysis and its conclusions regarding the effects of the proposed actions articulated in the biological opinion and its incidental take statement would be any different under the 50 CFR part 402 regulations as they existed prior to the 2019 Rule vacated by the order of the United States District Court for the Northern District of California on July 5, 2022. We have determined that our analysis and conclusions would not be any different

1.3. Proposed Federal Action

Under the ESA, "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). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

"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 project is located in Sections 13 and 24, Township 28 North, Range 5 East and extends from Marsh Road to the 2nd Street Interchange in Snohomish, Washington (MP 8.41 to 9.68). The project is also located in water resource inventory area (WRIA) 7, and hydrologic unit code (HUC) 171100110203 (Snohomish River-Frontal Possession Sound).

The USACE and WSDOT propose to add onto a previously widened portion of SR 9, starting at the intersection with Marsh Road and progressing north approximately 1.30 miles to the intersection with 2nd Street in city of Snohomish. The proposed design is nearly identical to the original design described in 2012. The project includes a new lane in each direction, a new overflow bridge south of the Snohomish River and a southbound bridge over the Snohomish River. The existing overflow bridge and the Snohomish River bridge will be converted to carry two lanes of northbound traffic. Construction is anticipated to require three in-water work windows.

1.4. Revised Project Description

SR9 in the project vicinity currently consists of one lane in each direction. The proposed project will construct an additional bridge west (downstream) of the existing SR9 Snohomish River bridge, widen SR9 from Marsh Road to the 2nd Street interchange, and realign southbound on-ramp from the 2nd street interchange. The existing roadway and bridge will be converted to two northbound lanes; the new roadway will be two southbound lanes (Tables 1 and 2).

Project components include:

- A new river bridge over the Snohomish River west of the existing bridge with southbound two-lanes and two shoulders, one a 10- foot and one 4- foot.
- A new overflow bridge spanning a wetland in the Snohomish River floodplain, with two southbound lanes and two shoulders, one a 10- foot and one 4- foot.
- Two new southbound lanes between Marsh Road and 2nd Street Interchange. From south going north, there will be only guardrail with shoulders (no median). Close to the overflow bridge, the NB/SB will split to allow for a gap between new and existing bridges (overflow and Snohomish River), then merge back to the 2nd St. interchange. The existing two SR9 lanes will be reconfigured to two 12-foot lanes northbound with the right shoulder width varying from 4 to 10 feet.
- The southbound on-ramp will be realigned at the 2nd Street Interchange.
- Stormwater treatment

The existing bridge will be redirected to two northbound lanes. No work is planned for the existing bridge. Descriptions of project elements are provided below.

Clearing and Grading

A total of 30,738 cubic yards of cut and 17,841 cubic yards of fill will be required during road realignment and widening. Existing fill will be cut and used to fill the southbound on-ramp at the 2nd street interchange. Stockpiled material will be stored in designated areas at least 200 feet from sensitive areas. Unsuitable material will be hauled offsite and disposed of at a facility licensed to accept such material. No contaminated soils are expected at the construction site.

Approximately 9 acres of vegetation will be permanently cleared, of which 0.06 acres is riparian vegetation. Approximately 0.03 acre of wetland will be filled, and 0.017 acres of wetland buffer cleared. All temporarily impacted areas will be replanted with native vegetation after construction.

Table 1 summarizes the differences between the 2012 and 2021 project descriptions.

Table 1. Comparison of clearing and grading impacts.

Elements	2012 Project Description	2021 Project Description
Permanent vegetation impacts (acres)	approximately 9 acres (including 0.06 ac of wetland, and 1.44 ac of wetland buffer.	approximately 9 acres (including 0.03 ac of wetland, and 0.017 ac of wetland buffer
Riparian vegetation impacts (acres)	No impacts	0.06 acre (2,614 ft^2)
Cut (cubic yards)	30,738 cy	No change
Fill (cubic yards)	17,841 cy	No change

Construction of New Bridge Approaches

Once the embankment and bridge abutment footprint are cleared, the subgrade will be compacted in stages to allow settlement. Sediment and dust control measures will be implemented to prevent waterway contamination or the transport of debris outside of the construction site. No contaminated soils will be disturbed by construction. The northern and southern bridge approaches will be constructed concurrently.

Temporary Work Trestles at the Snohomish River

In the first in-water work window, two temporary work trestles will be constructed in the Snohomish River west (downriver) of the existing SR 9 Bridge. These will span from the shore to each of the two new piers located below the ordinary high-water mark (OHWM): one trestle will extend from the south shore to the southern pier, and another trestle from the north shore to the opposite pier. Steel piles will be vibrated into place to support the trestles and may require proofing with an impact hammer. A maximum of 50 steel piles 24-inches in diameter will be used to support each work trestle. The deck of each trestle will be sealed to prevent material passing through.

In the second in-water work window, piles supporting the temporary trestles will be removed using a vibratory hammer.

Table 2 summarizes the changes in proposed work trestle construction between the 2012 and 2021 project descriptions.

Table 2. Summary of work trestle construction element changes.

2012 Project Description	2021 Project Description
Two temporary work trestles.	No change
40 steel piles (18- to 24-in diameter) per trestle.	50 steel piles (24-in diameter) per trestle
Vibratory pile installation to extent possible.	Steel piles will be vibrated into place to support the trestles and may require proofing with an impact hammer
In place for two construction seasons.	Installed in first of three in-water work windows. Removed in third of three in-water work windows.
Proofing. Estimated 500 strikes per pile, 2 piles installed per day.	No change
Confined bubble curtain during impact driving (assumed 9 dB reduction)	No change

Construction of Cofferdams

The 2012 biological opinion did not describe the installation of cofferdams. The 2021 description includes the construction of a cofferdam containment system to contain elevated turbidity during shaft installation and drilling during pier construction (Table 3). A steel template consisting of approximately 10 steel H piles will be installed around each pier location. The template will consist of vertically driven H piles located around the perimeter of the proposed, and horizontal H piles tacked onto the vertical piles. This template provides a flat supportive surface to align the sheet piles. Using the template as a guide, 30 sheet piles will be driven with a vibratory hammer into the substrate immediately adjacent to each proposed pier to form a temporary interlocked sheet pile wall shoring/form system to provide a containment system during pier work.

Table 3. The number and type of cofferdam piles to be installed.

New Bridge Pier Element in Sequence	Pile Size and Type	Install or Remove	Estimated In-water Noise Level	Number of Piles	Estimated hammer operation per pile (minutes)[1]	Rate	Duration (minutes/ day)	Duration (days)
Construction of new bridge piers (coffer dam)	12-in H-pile	Install	153 dB_{RMS}	20	3	10/day	30	2
Construction of new bridge piers (coffer dam)	Sheet pile	Install	165 dB_{RMS}	60	6	5/day	30	12
Construction of new bridge piers (coffer dam)	Sheet pile	Remove	165 dB_{RMS}	60	3	10/day	30	6
Construction of new bridge piers (coffer dam)	12-in H-pile	Remove	153 dB_{RMS}	20	3	10/day	30	2

[1]Estimates for H piles and sheet piles based on data collected during the U.S. 101 Chehalis River Bridge Scour Repair Project in Grays Harbor.

When necessary, water will be pumped from the cofferdam system to draw down the water level approximately 1 to 2 feet to maintain negative pressure, thereby minimizing turbidity outside of the containment area. The turbid water will be treated to remove sediments before being discharged. The containment system will temporarily impact approximately 44 square feet of benthic habitat at each pier.

Temporary Work Trestles at the Snohomish River

In the first in-water work window, two temporary work trestles will be constructed in the Snohomish River west of the existing SR 9 Bridge from the shore to each of the new piers: one trestle will be extended from the south shore to the southern pier, and another trestle from the north shore to the opposite pier. Steel piles will be vibrated into place to support the trestles and may require proofing with an impact hammer. A maximum of 50 steel piles 24 inches in diameter will be used to support each work trestle. The deck of each trestle will be sealed to prevent material passing through. Using a vibratory hammer, piles supporting the temporary trestles will be removed in the second in-water work window.

Table 4 summarizes the changes in proposed work trestle construction between the 2011 and 2020 project descriptions.

Table 4. Summary of work trestle construction element changes.

2011 Project Description	2020 Project Description
Two temporary work trestles.	No change
40 steel piles (18- to 24-in diameter) per trestle.	50 steel piles (24-in diameter) per trestle
Vibratory pile installation to extent possible.	Steel piles will be vibrated into place to support the trestles and may require proofing with an impact hammer
In place for 2 construction seasons.	Installed in first of three in-water work windows. Removed in third of three in-water work windows.
Proofing. Estimated 500 strikes per pile, 2 piles installed per day.	No change
Confined bubble curtain during impact driving (assumed 9 dB reduction)	No change

Table 5 summarizes the pile installation and removal for the temporary work trestle.

Table 5. Pile noise and duration.

Project Element in Sequence	Pile Size and Type	Hammer Type	Estimated In-water Noise Level	Number of Piles	Estimated hammer operation per Pile (minutes)	Rate	Duration (minutes/ day)	Duration (days)
Installation of temporary work trestles	24-in dia. Steel	Vibratory	166 dB$_{RMS}$	100	15	2/day	30	50
		Impact	210 dB$_{Peak}$ 189 dB$_{RMS}$ 182 dB$_{SEL}$		30		60	
Removal of temporary work trestles	24-in dia. Steel	Vibratory	166 dB$_{RMS}$	100	15	5/day	75	20

Construction of New Bridge Piers

The new bridge will be constructed on two piers supported by three columns at each pier. The piers will be in hydraulic alignment with the piers supporting the existing bridge. The columns will be constructed within six, 12-foot diameter drilled shafts. A sheet pile containment system will be installed around each pier work area to contain turbidity (Table 4).

To create a drilled shaft, a 12-foot diameter steel casing will be vibrated into the substrate during the first in-water work window. Once the casings are in place, material inside the casing will be excavated using an auger. Augering is done within the casing such that no suspended sediments are released to the surface waters. Auger tailings are removed from the hole by mechanical means and disposed of in an approved upland location.

The casing will be dewatered as needed after augering. If required, a concrete seal at the base of the casing will be poured to prevent water from entering the casing from below, but depending on the till layer, the casing may not have any groundwater seeping into the drilled shaft. Any additional water will be pumped out of the casing. All water removed from the casing will be run through a filter before returning to the Snohomish River, or will be pumped into a Baker tank for proper disposal. Sediments will be disposed of in an approved upland location.

During excavation, a bentonite or synthetic polymer slurry is sometimes added to stabilize the walls of the shaft. When the shaft is of the desired depth, rebar reinforcement is placed in the shaft and concrete is poured with a flexible hose called a tremie. The concrete displaces any slurry that was previously added and a vacuum hose is used to remove the slurry from the top of the concrete.

The casings will be removed during the second in-water work window.

Table 6 summarizes the changes in proposed bridge pier construction between the 2012 and 2021 project descriptions.

Table 6. Summary of bridge pier construction element changes.

2012 Project Description	2021 Project Description
Two piers supported by two 72-inch diameter steel piles each (4 piles)	Two piers supported by three, 12-ft diameter drilled shafts each (6 drilled shafts)
72-inch piles installed with impact hammer	The columns will be constructed upon six, 12-ft diameter drilled shafts. The steel casings will be installed and removed with a vibratory hammer.
Impact pile driving. Estimated 2000 strikes per pile. One pile installed per day.	No impact driving associated with bridge pier construction
Confined bubble curtain (assumed 9 dB reduction).	Bubble curtain is not required for bridge pier construction
Temporary cofferdam associated with pier construction (in place for 2 construction seasons). Number, type, and installation of cofferdam piles not described	Cofferdams will consist of a total of 20 H piles and 60 sheet piles. All will be installed with a vibratory hammer.

Construction of New Bridge Superstructure

For the bridge over the Snohomish River, welded steel plate girder sections will be set on top of the pile bents. Pre-fabricated segments will then be assembled on top of the columns. The new structure will be painted on site. A containment system will be placed around the bridge during painting to prevent contamination and dust from entering the water.

The roadway deck and barrier will consist of cast-in-place concrete on top of the steel superstructure. Concrete forms will be sealed with foam to prevent leakage of any cement residue into the water.

Once the new bridge is complete, the temporary construction trestle will be removed. Removal will take place during the third and final season of in-water work. Piles will be vibrated out from below the mean higher high-water marks (MHHWMs), working backwards from the in-water end of the temporary construction trestles.

The overflow bridge spanning the wetland in the Snohomish River floodplain will be constructed of precast pre-stressed voided slabs set on top of the piles. Form work will be set on top of the voided slabs to construct the cast-in-place concrete bridge deck.
Construction of the new bridge will take approximately 18-24 months. No work will take place on the existing SR 9 Snohomish River Bridge.

Roadway Construction

The roadway subsurface will be prepared for asphalt and the edges will be sawcut. Existing surfaces will be milled, tack will be applied, and the surface prepared for overlay. Rollers will compact the asphalt to WSDOT standards prior to road striping.

Stormwater

The on-site stormwater runoff collection areas for this project are divided into five Threshold Discharge Areas (TDAs) based on existing drainage patterns. TDA 1, TDA 2, and portions of TDA 3 were in a previous project that overlapped and provided some runoff treatment to the existing impervious surface. The previous project was able to receive the Flow Control Exemption; therefore, no Flow Control Best Management Practices (BMP) were built.

Existing pollution generating impervious surface (PGIS) in the project area is 8.96 acres. The project will create approximately 5.54 acres of new PGIS from construction of the two new southbound lanes and bridge. All of the stormwater in the new and disturbed PGIS will be captured, treated, and disbursed to adjacent agriculture fields. The project will treat all new PGIS using enhanced treatment BMPs (media filter drains (MFDs), compost amended biofiltration swales (CABS), and/or a proprietary[1] BMP). There are no direct discharges to the Snohomish River from new components of the proposed project.

The existing bridge is a portion of TDA 4[2] and discharges directly to the Snohomish River, but this is not within the project design footprint. None of the other TDAs3 discharge to waters that support listed species. No new outfalls to the Snohomish River will be constructed as part of this project (Table 6).

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[1] Proprietary in design but functions equivalent to MFDs and CABS using bioinfiltration chambers. The design is termed "Modular Wetland System Linear" and passes stormwater through a series of soil treatment chambers.
[2] Approximately half of TDA 4 (=0.498 acres) includes the existing SR 9 Bridge that is not included in the project design. The remaining portion of TDA 4 is the new southbound bridge and all stormwater from the new bridge will receive enhanced treatment and outlet through the existing bridge drainage feature. WSDOT conducted a feasibility study to treat stormwater on the existing bridge but it was determined that further modification of the bridge could compromise the structural integrity.
[3] This includes TDAs 1, 2, 3, 5, and the new southbound bridge in TDA 4.

TDA 1

The Marsh Road intersection to the west delineates TDA 1 and encompasses 0.62 acre of existing impervious surface. TDA 1 is defined to be in the density fringe area of the Snohomish River Floodplain Zone AE (25-foot flood elevation). Existing stormwater conveyance includes sheet flow to ditches connecting to the Snohomish County surface drainage system that eventually joins Woods Creek and then outlets to the Snohomish River. The total distance from Marsh Road to Woods Creek is approximately 1.4 miles flowing west, and from that point another 4.3 miles before outletting to the Snohomish River; for a total distance from the source to fish bearing water in the Snohomish River of 5.7 miles.

The project will add 0.02 acre (871 square feet) of PGIS to this TDA. TDA 1 does not meet the triggers for either runoff treatment or flow control (WSDOT 2019). There will be no change to the existing stormwater conveyance system.

TDA 2

The Marsh Road intersection to the south and southeast delineates TDA 2 and includes a total of 0.667 acres of existing impervious surface. TDA 2 is in the density fringe area Zone AE (25-feet flood elevation) of the Snohomish River Floodplain. Existing stormwater conveyance is a sheet flow through the MFD BMP on the roadway embankment to the ditches flowing south to Woods Creek. The total distance from Marsh Road to Woods Creek is approximately one mile, flowing south. From this point to the intersection with TDA 1 in Woods Creek is approximately 1.6 miles flowing northwest through active agriculture fields, and then approximately another 4.3 miles to the Snohomish River.

The project will add 0.04 acre (1,742 square feet) of PGIS to this TDA. TDA 2 does not meet the triggers for runoff treatment or flow control because of the small area (WSDOT 2019). Stormwater BMPs associated with a previous project will continue to treat 0.67 acre of PGIS in this TDA.

TDA 3

The north and northeast section of the Marsh Road Intersection to the vertical profile peak of the Snohomish River Bridge (BR9/118) delineates a total of 5.030 acres of existing impervious surface for TDA 3. This is the largest of the five defined TDAs in the project and is located within the density fringe area Zone AE (25-feet to 31-feet flood elevation) of the Snohomish River Floodplain. Existing stormwater conveyance is a sheet flow through MFD in a portion of TDA 3. The stormwater moves to the ditches that flow north to an existing agricultural ditch and then to the Snohomish River. The total distance from Marsh Road to the existing agricultural ditch is approximately 0.45 mile, flowing north. The total distance from the vertical peak in the profile on the Snohomish River Bridge to the existing agricultural ditch is approximately 1,700 feet, flowing south. The distance from the existing agricultural ditch to the Marsh Road intersection with TDA 1 is approximately 1.3 miles, flowing southwest.

In TDA 3, 3.73 acres require treatment with current approved runoff treatment BMPs. The BMPs being applied in TDA 3 will be MFD on the roadway embankments, treating up to 2.979 acres. If the proposed first CABS can meet the minimum slope on the project, and the existing MFD on the east roadway embankment is included, the project would treat up to 5.326 acres. The project would be above the required treatment by 1.515 acres in TDA 3. The second CABS location in TDA 3 has been identified as a Closed Depressed Area (CDA).

TDA 4

TDA 4 is the existing bridge from the vertical peak to the north end over the Snohomish River and includes 0.49 acre of PGIS. Existing stormwater conveyance are bridge drains that discharge directly to Snohomish River.

TDA 4 is not included in the proposed project because it is fully functional and will continue to serve as the dedicated northbound two-lane bridge upon project completion.

TDA 5

The north end of the Snohomish River Bridge (BR9/118) to the ramp section near the 2nd Street interchange defines TDA 5 for a total of 2.146 acres of existing impervious surface. TDA 5 is defined to be in a Special Flood Hazard Area to the west of SR 9 and in Zone AE, with a 29-foot flood elevation. The flood elevation to the east of SR 9 for Zone AE is a 30-foot flood elevation. Existing stormwater conveyance is a sheet flow to defined ditches that drain into wetlands discharging to a City of Snohomish culvert. This culvert outlets to the Snohomish River. The total distance from the culvert discharging to Wetland 4 to the Snohomish River is approximately 0.7 mile flowing west.

TDA 5 requires 1.825 acres runoff treatment for SR 9 and off- and on-ramps to the 2nd Street interchange. This area is surrounded by Wetland 5 to the east, Wetland 4 to the west, and Wetland 6 in the interchange. To reduce the impacts of the widening to Wetland 4, it was proposed to build a retaining wall from the north end of the proposed bridge to the on-ramp. The same approach would be required for the off-ramp, either placing a wall or guard rail or not widening the ramp to avoid Wetland 5 impacts. With these design options, it would not allow the use of MFD on the embankment slopes and the only other approved BMP that could work would be a CABS or constructed wetland in the middle of the interchange.

The WSDOT project engineer will pre-approve proposed BMPs for spill prevention and erosion control. After construction is complete and the site is stabilized, all BMPs will be removed. Any remaining unvegetated and disturbed area will be planted with site appropriate woody plants.

Table 7. Comparison of PGIS and treatment quantities.

Stormwater Element	2020 Project Description	2011 Project Description	Change
Pre-project PGIS (ac)	8.96	8.69	0.27
Pre-project treatment (ac)	1.79	2.58	-0.79
New PGIS (ac)	5.36	4.87	0.49
Post-project PGIS (ac)	14.32	13.56	0.76
Post-project treatment (ac)	8.87	7.5	1.37

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

The ESA establishes 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 and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide 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 reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The USACE determined the proposed action is not likely to adversely affect Southern Resident Killer Whales. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12).

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably 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 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 designations of critical habitat for West Coast salmonid species use the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced this term 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 or destroy or adversely modify critical habitat:

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly 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, or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This biological 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 that the listed species face, 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 species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The 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 snowpack, increases winter flows, and advances the timing of spring melt (Mote et al. 2014; Mote et al 2016). Rain-dominated watersheds and those with significant contributions from groundwater may be less sensitive to predicted changes in climate (Tague et al. 2013; Mote et al. 2014).

During the last century, average regional air temperatures in the Pacific Northwest increased by 1-1.4°F as an annual average, and up to 2°F in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Recent temperatures in all but two years since 1998 ranked above the 20th century average (Mote et al. 2014). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 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). 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).

The combined effects of increasing air temperatures and decreasing spring through fall flows are expected to cause increasing stream temperatures; in 2015 this resulted in 3.5-5.3ºC increases in Columbia Basin streams and a peak temperature of 26ºC in the Willamette (NWFSC 2015). Overall, about one-third of the current cold-water salmonid habitat in the Pacific Northwest is likely to exceed key water temperature thresholds by the end of this century (Mantua et al. 2009).

Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Mantua et al. 2010; Isaak et al. 2012). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic foodwebs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Winder and Schindler 2004; Raymondi 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 & Weitkamp 2013; Raymondi et al. 2013).

As more 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 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).

In addition to changes in freshwater conditions, predicted changes for coastal waters in the Pacific Northwest as a result of 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 1.0-3.7°C 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).

Moreover, as atmospheric carbon emissions increase, increasing levels of carbon are absorbed by the oceans, changing the pH of the water. A 38 percent to 109 percent increase in acidity is projected by the end of this century in all but the most stringent CO_2 mitigation scenarios and is essentially irreversible over a time scale of centuries (IPCC 2014). Regional factors appear to be amplifying acidification in Northwest ocean waters, which is occurring earlier and more acutely than in other regions and is already impacting important local marine species (Barton et al. 2012; Feely et al. 2012). Acidification also affects sensitive estuary habitats, where organic matter and nutrient inputs further reduce pH and produce conditions more corrosive than those in offshore waters (Feely et al. 2012; Sunda and Cai 2012).

Global sea levels are expected to continue rising throughout this century, reaching likely predicted increases of 10-32 inches by 2081-2100 (IPCC 2014). These changes will likely result in increased erosion and more frequent and severe coastal flooding and shifts in the composition of nearshore habitats (Tillmann and Siemann 2011; Reeder et al. 2013). Estuarine-dependent salmonids such as chum and Chinook salmon are predicted to be impacted by significant reductions in rearing habitat in some Pacific Northwest coastal areas (Glick et al. 2007). Historically, warm periods in the coastal Pacific Ocean have coincided with relatively low abundances of salmon and steelhead, while cooler ocean periods have coincided with relatively high abundances, and therefore these species are predicted to fare poorly in warming ocean conditions (Scheuerell and Williams 2005; Zabel et al. 2006). This is supported by the recent observation that anomalously warm sea surface temperatures off the coast of Washington from 2013 to 2016 resulted in poor coho and Chinook salmon body condition for juveniles caught in those waters (NWFSC 2015). Changes to estuarine and coastal conditions, as well as the timing of seasonal shifts in these habitats, have the potential to impact a wide range of listed aquatic species (Tillmann and Siemann 2011; Reeder et al. 2013).

The adaptive ability of these threatened and endangered species is depressed due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. Without these 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 of these 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). These conditions will possibly intensify the climate change stressors inhibiting recovery of ESA-listed species in the future.

2.2.1 Status of ESA-Listed Fish Species

For Pacific salmon, steelhead, and certain other species, we commonly use the four "viable salmonid population" (VSP) criteria (McElhany et al. 2000) to assess the viability of the populations that, together, constitute the species. These four criteria (spatial structure, diversity, abundance, and productivity) encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these 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.

"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 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 in 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, we assess 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).

The summaries that follow describe the status of the 22 ESA-listed species, and their designated critical habitats, that occur within the geographic area of this proposed action and are considered in this opinion. More detailed information on the status and trends of these listed resources, and their biology and ecology, are in the listing regulations and critical habitat designations published in the Federal Register (Table 8).

Table 8. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register (FR) decision notices for ESA-listed species considered in this opinion. Listing status: 'T' means listed as threatened; 'E' means listed as endangered; 'P' means proposed for listing or designation.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon *(Oncorhynchus tshawytscha)*			
Puget Sound	T 6/28/05; 70 FR 37160	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160
Steelhead (*O. mykiss*)			
Puget Sound	T 5/11/07; 72 FR 26722	2/24/16; 81 FR 9252	P 2/7/07; 72 FR 5648

Status of PS Chinook Salmon

The Puget Sound Chinook salmon evolutionarily significant unit (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 plan consists of two documents: the Puget Sound salmon recovery plan (Shared Strategy for Puget Sound 2007) and a supplement by NMFS (2006). The recovery plan adopts ESU and population level viability criteria recommended by the Puget Sound Technical Recovery Team (PSTRT) (Ruckelshaus et al. 2002). The PSTRT's biological recovery criteria will be met when all of the following conditions are achieved:

- The viability status of all populations in the ESU is improved from current conditions, and when considered in the aggregate, persistence of the ESU is assured;
- Two to four Chinook salmon populations in each of the five biogeographical regions of the ESU (Table 8) achieve viability, depending on the historical biological characteristics and acceptable risk levels for populations within each region;
- At least one population from each major genetic and life history group historically present within each of the five biogeographical regions is viable;
- Tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations are functioning in a manner that is sufficient to support an ESU-wide recovery scenario; Production of Chinook salmon from tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations occurs in a manner consistent with ESU recovery; and
- Populations that do not meet the viability criteria for all VSP parameters are 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 Straits 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 PSTRT 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. The PSTRT distributed the 22 populations among five major biogeographical regions, or major population groups (MPG), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 9).

We can see a declining trend in the proportion of natural-origin spawners across the ESU starting approximately in 1990 and extending through the present (2018). Figure 93 shows the smoothed trends in the estimated fraction of the natural spawning populations that consist of natural-origin spawners. The populations with the highest fractions of natural-origin spawners across the entire 1980 to 2018 time period are the six Skagit River populations.

The Skykomish, Snoqualmie, and Cedar River populations had a lower proportion of natural-origin spawners in the late 1990s, but they have rebounded and stayed between 60–90% since the early 2000s. All other populations vary considerably across the whole time period. A number of populations (North and South Fork Nooksack, North and South Fork Stillaguamish, Skykomish, Snoqualmie, White, Puyallup, Nisqually, Skokomish, Dungeness, and Elwha Rivers) show recent declining trends in the fraction natural-origin estimates. Considering populations by MPG, Whidbey Basin is the only MPG with a consistently high fraction natural-origin spawner abundance, in six of 10 populations. All other MPGs have either variable or declining spawning populations that have high proportions of hatchery-origin spawners (Ford, 2022).

Table 9. Extant PS Chinook salmon populations in each biogeographic region (PSTRT 002, NWFSC 2015)

Biogeographic Region	Population (Watershed)
Strait of Georgia	North Fork Nooksack River
	South Fork Nooksack River
Strait of Juan de Fuca	Elwha River
	Dungeness River
Hood Canal	Skokomish River
	Mid Hood Canal River
Whidbey Basin	Skykomish River
	Snoqualmie River
	North Fork Stillaguamish River
	South Fork Stillaguamish River
	Upper Skagit River
	Lower Skagit River
	Upper Sauk River
	Lower Sauk River
	Suiattle River
	Upper Cascade River
Central/South Puget Sound Basin	Cedar River
	North Lake Washington/ Sammamish River
	Green/Duwamish River
	Puyallup River
	White River
	Nisqually River

Abundance and Productivity. Abundance across the Puget Sound Chinook salmon ESU has generally increased since the last status review, with only two of the 22 populations (Cascade River and North and South Fork Stillaguamish Rivers) showing a negative percentage change in the five-year geometric mean natural-origin spawner abundances since the prior status review. Fifteen of the remaining 20 populations with positive percentage changes since the prior status review have relatively low natural spawning abundances (<1,000 fish), so some of these increases represent small changes in total abundance. Given lack of high confidence in survey techniques, particularly with small populations, there remains substantial uncertainty in detecting trends in small populations (Ford 2022).

Across the Puget Sound Chinook salmon ESU, ten of 22 Puget Sound populations show natural productivity below replacement in nearly all years since the mid-1980s. These include the North and South Fork Nooksack Rivers (Strait of Georgia MPG), North and South Fork Stillaguamish and Skykomish Rivers (Whidbey Basin MPG), Sammamish, Green, and Puyallup Rivers (Central/South Sound MPG), Skokomish River (Hood Canal MPG), and Elwha River (Strait of Juan de Fuca MPG). Productivity in the Whidbey Basin MPG populations was above zero in the mid-to-late 1990s, with the exception of the Skykomish and North and South Fork Stillaguamish River populations. The White River population in the Central/South Sound MPG was above replacement from the early 1980s to 2001, but has dropped in productivity consistently since the late 1980s. In recent years, only five populations have had productivities above zero (Ford 2022).

Limiting Factors. Limiting factors for this species include:

- Degraded floodplain and in-river channel structure
- Degraded estuarine conditions and loss of estuarine habitat
- Riparian area degradation and loss of in-river large woody debris
- Excessive fine-grained sediment in spawning gravel
- Degraded water quality and temperature
- Degraded nearshore conditions
- Impaired passage for migrating fish
- Altered flow regime

Status of PS Steelhead

The PS Steelhead TRT produced viability criteria, including population viability analyses (PVAs), for 20 of 32 demographically independent populations (DIPs) and three major population groups (MPGs) in the DPS (Hard 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 concludes 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 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 (2015).

On December 27, 2019, we published a recovery plan for PS steelhead (84 FR 71379) (NMFS 2019). The proposed plan indicates that within each of the three MPGs, at least fifty percent of the populations must achieve viability, *and* specific DIPs must also be viable:

<u>Central and South Puget Sound MPG</u>: Green River Winter-Run; Nisqually River Winter-Run; Puyallup/Carbon Rivers Winter-Run, or the White River Winter-Run; and At least one additional DIP from this MPG: Cedar River, North Lake Washington/Sammamish Tributaries, South Puget Sound Tributaries, or East Kitsap Peninsula Tributaries.

<u>Hood Canal and Strait of Juan de Fuca MPG</u>: Elwha River Winter/Summer-Run; Skokomish River Winter-Run; One from the remaining Hood Canal populations: West Hood Canal Tributaries Winter-Run, East Hood Canal Tributaries Winter-Run, or South Hood Canal Tributaries Winter-Run; and One from the remaining Strait of Juan de Fuca populations: Dungeness Winter-Run, Strait of Juan de Fuca Tributaries Winter-Run, or Sequim/Discovery Bay Tributaries Winter-Run.

<u>North Cascades MPG:</u> Of the eleven DIPs with winter or winter/summer runs, five must be viable: One from the Nooksack River Winter-Run; One from the Stillaguamish River Winter-Run; One from the Skagit River (either the Skagit River Summer-Run and Winter-Run or the Sauk River Summer-Run and Winter-Run); One from the Snohomish River watershed (Pilchuck, Snoqualmie, or Snohomish/Skykomish River Winter-Run); and One other winter or summer/winter run from the MPG at large.

Of the five summer-run DIPs in this MPG, three must be viable representing in each of the three major watersheds containing summer-run populations (Nooksack, Stillaguamish, Snohomish Rivers); South Fork Nooksack River Summer-Run; One DIP from the Stillaguamish River (Deer Creek Summer-Run or Canyon Creek Summer-Run); and One DIP from the Snohomish River (Tolt River Summer-Run or North Fork Skykomish River Summer-Run)

<u>Spatial Structure and Diversity</u>**.** The PS steelhead DPS is the anadromous form of O. mykiss that occur in rivers, below natural barriers to migration, in northwestern Washington State 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 winter-run; White River winter-run; Dewatto River winter-run; Duckabush River winter-run; and Elwha River native winter-run (USDC 2014). Steelhead are the anadromous form of *Oncorhynchus mykiss* that occur in rivers, below natural barriers to migration, in northwestern Washington State (Ford 2011). Non-anadromous ''resident'' *O. mykiss* occur within the range of PS steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard et al. 2007).

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 2015). More information on PS steelhead spatial structure and diversity can be found in NMFS' technical report (Hard 2015).

Spatial Structure and Diversity. The recovery plan for Puget Sound steelhead (NMFS 2019b) recognizes that production of hatchery fish of both run types—winter- and summer-run—has posed a considerable risk to diversity in natural steelhead in the Puget Sound steelhead DPS. Because of the origin and aspects of the propagation history of these fish in Puget Sound, the TRT (Hard et al. 2015) considered continued hatchery production of steelhead to represent a major threat to the diversity VSP component for the DPS. In response to the risk of introgression between native steelhead populations and hatchery-origin, there has been a general decrease in the overall production from several hatcheries (Ford 2022).

Abundance and Productivity. The long-term abundance of adult steelhead returning to many Puget Sound rivers has fallen substantially since estimates began for many populations in the late 1970s and early 1980s; however, in the nearer term, there has been a relative improvement in abundance and productivity. Of the 20 datasets analyzed, abundance trends were available for seven of the eight winter-run DIPs in the Hood Canal & Strait of Juan de Fuca MPG; for five of the eight winter-run DIPs in the Central & South Puget Sound MPG; and for seven of the 11 winter-run DIPs, but only one of the five summer-run DIPs, in the Northern Cascades MPG.

Abundance information is unavailable for approximately one-third of the DIPs, disproportionately so for summer-run populations. In most cases where no information is available, it is assumed that abundances are very low. Some population abundance estimates are only representative of part of the population (index reaches, etc.). Where recent five-year abundance information is available, 30% (6/20) are at less than 10% of their high productivity recovery targets (lower abundance target); 65% (13/20) are between 10% and 50% of their targets; and 5% (1/20) are between 50% and 100% (Ford 2022).

Limiting Factors. In our 2013 proposed rule designating critical habitat for this species (USDC 2013b), we noted that the following factors for decline for PS steelhead persist as limiting factors:

- The continued destruction and modification of steelhead habitat
- Widespread declines in adult abundance (total run size), despite significant reductions in harvest in recent years
- Threats to diversity posed by use of two hatchery steelhead stocks (Chambers Creek and Skamania)
- Declining diversity in the DPS, including the uncertain but weak status of summer run fish
- A reduction in spatial structure
- Reduced habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and reduced movement of large woody debris

- In the lower reaches of many rivers and their tributaries in Puget Sound where urban development has occurred, increased flood frequency and peak flows during storms and reduced groundwater-driven summer flows, with resultant gravel scour, bank erosion, and sediment deposition
- Dikes, hardening of banks with riprap, and channelization, which have reduced river braiding and sinuosity, increasing the likelihood of gravel scour and dislocation of rearing juveniles

2.2.2 Status of Critical Habitats for Fishes

This section examines the status of designated critical habitat affected by the proposed action by examining the condition and trends of essential physical and biological features throughout the designated areas. These features are essential to the conservation of the 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).

Salmon and Steelhead. For salmon and steelhead, NMFS ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC_5) in terms of the conservation value they provide to each listed species they support.[4] The conservation rankings are high, medium, or low. To determine the conservation value of each watershed to species viability, NMFS's critical habitat analytical review teams (CHARTs) evaluated the quantity and quality of habitat features (for example, spawning gravels, wood and water condition, side channels), 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 (NOAA Fisheries 2005). Thus, even a location that has poor quality of habitat could be ranked with a high conservation value if it were essential due to factors such as limited availability (*e.g*., one of a very few spawning areas), a unique contribution of the population it served (*e.g*., a population at the extreme end of geographic distribution), or if it serves another important role (*e.g*., obligate area for migration to upstream spawning areas).

The physical or biological features of freshwater spawning and incubation sites, include water flow, quality and temperature conditions and suitable substrate for spawning and incubation, as well as migratory access for adults and juveniles (Table 10). These features are essential to conservation because without them the species cannot successfully spawn and produce offspring. The physical or biological features of freshwater migration corridors associated with spawning and incubation sites include water flow, quality and temperature conditions supporting larval and adult mobility, abundant prey items supporting larval feeding after yolk sac depletion, and free passage (no obstructions) for adults and juveniles. These features are essential to conservation because they allow adult fish to swim upstream to reach spawning areas and they allow larval fish to proceed downstream and reach the ocean.

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[4] The conservation value of a site depends upon "(1) the importance of the populations associated with a site to the ESU [or DPS] conservation, and (2) the contribution of that site to the conservation of the population through demonstrated or potential productivity of the area" (NOAA Fisheries 2005).

Table 10. Primary constituent elements (PCEs) of critical habitats designated fro ESA-listed salmon and steelhead species considered in the opinion and corresponding species life history events.

Primary Constituent Elements Site Type	Primary Constituent Elements Site Attribute	Species Life History Event
Freshwater spawning	Substrate Water quality Water quantity	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Floodplain connectivity Forage Natural cover Water quality Water quantity	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	Free of artificial obstruction Natural cover Water quality Water quantity	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine areas	Forage Free of artificial obstruction Natural cover Salinity Water quality Water quantity	Adult sexual maturation and "reverse smoltification" Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Nearshore marine areas	Forage Free of artificial obstruction Natural cover Water quantity Water quality	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing

CHART Salmon and Steelhead Critical Habitat Assessments

The CHART for each recovery domain assessed biological information pertaining to occupied by listed salmon and steelhead, determine whether those areas contained PCEs essential for the conservation of those species and whether unoccupied areas existed within the historical range of the listed salmon and steelhead that are also essential for conservation. The CHARTs assigned a 0 to 3 point score for the PCEs in each HUC_5 watershed for:

Factor 1. Quantity,
Factor 2. Quality – Current Condition,
Factor 3. Quality – Potential Condition,
Factor 4. Support of Rarity Importance,
Factor 5. Support of Abundant Populations, and
Factor 6. Support of Spawning/Rearing.

Thus, the quality of habitat in a given watershed was characterized by the scores for Factor 2 (quality – current condition), which considers the existing condition of the quality of PCEs in the HUC_5 watershed; and Factor 3 (quality – potential condition), which considers the likelihood of achieving PCE potential in the HUC_5 watershed, either naturally or through active conservation/restoration, given known limiting factors, likely biophysical responses, and feasibility.

Puget Sound Recovery Domain. Critical habitat has been designated in Puget Sound for PS Chinook salmon, PS steelhead, HC summer-run chum salmon, LO sockeye salmon, southern green sturgeon, and for eulachon. Major tributary river basins in the Puget Sound basin include the Nooksack, Samish, Skagit, Sauk, Stillaguamish, Snohomish, Lake Washington, Cedar, Sammamish, Green, Duwamish, Puyallup, White, Carbon, Nisqually, Deschutes, Skokomish, Duckabush, Dosewallips, Big Quilcene, Elwha, and Dungeness rivers and Soos Creek.

Landslides can occur naturally in steep, forested lands, but inappropriate land use practices likely have accelerated their frequency and the amount of sediment delivered to streams. Fine sediment from unpaved roads has also contributed to stream sedimentation. Unpaved roads are widespread on forested lands in the Puget Sound basin, and to a lesser extent, in rural residential areas. Historical logging removed most of the riparian trees near stream channels. Subsequent agricultural and urban conversion permanently altered riparian vegetation in the river valleys, leaving either no trees, or a thin band of trees. The riparian zones along many agricultural areas are now dominated by alder, invasive canary grass and blackberries, and provide substantially reduced stream shade and large wood recruitment (Shared Strategy for Puget Sound 2007).

Diking, agriculture, revetments, railroads and roads in lower stream reaches have caused significant loss of secondary channels in major valley floodplains in this region. Confined main channels create high-energy peak flows that remove smaller substrate particles and large wood. The loss of side-channels, oxbow lakes, and backwater habitats has resulted in a significant loss of juvenile salmonid rearing and refuge habitat. When the water level of Lake Washington was lowered 9 feet in the 1910s, thousands of acres of wetlands along the shoreline of Lake Washington, Lake Sammamish and the Sammamish River corridor were drained and converted to agricultural and urban uses. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows. The interchange of surface and groundwater in complex stream and wetland systems helps to moderate stream temperatures. Forest wetlands are estimated to have diminished by one-third in Washington State (FEMAT 1993; Spence et al. 1996; Shared Strategy for Puget Sound 2007).

Loss of riparian habitat, elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus, and higher levels of turbidity, presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture or livestock impacts, have been documented in many Puget Sound tributaries (Shared Strategy for Puget Sound 2007).

Peak stream flows have increased over time due to paving (roads and parking areas), reduced percolation through surface soils on residential and agricultural lands, simplified and extended drainage networks, loss of wetlands, and rain-on-snow events in higher elevation clear cuts (Shared Strategy for Puget Sound 2007). In urbanized Puget Sound, there is a strong association between land use and land cover attributes and rates of coho spawner mortality likely due to runoff containing contaminants emitted from motor vehicles (Feist et al. 1996).

Dams constructed for hydropower generation, irrigation, or flood control have substantially affected PS Chinook salmon populations in a number of river systems. The construction and operation of dams have blocked access to spawning and rearing habitat (e.g., Elwha River dams block anadromous fish access to 70 miles of potential habitat) changed flow patterns, resulted in elevated temperatures and stranding of juvenile migrants, and degraded downstream spawning and rearing habitat by reducing recruitment of spawning gravel and large wood to downstream areas (Shared Strategy for Puget Sound 2007). These actions tend to promote downstream channel incision and simplification (Kondolf 1997), limiting fish habitat. Water withdrawals reduce available fish habitat and alter sediment transport. Hydropower projects often change flow rates, stranding and killing fish, and reducing aquatic invertebrate (food source) productivity (Hunter 1992).

Juvenile mortality occurs in unscreened or inadequately screened diversions. Water diversion ditches resemble side channels in which juvenile salmonids normally find refuge. When diversion headgates are shut, access back to the main channel is cut off and the channel goes dry. Mortality can also occur with inadequately screened diversions from impingement on the screen, or mutilation in pumps where gaps or oversized screen openings allow juveniles to get into the system (WDFW 2009). Blockages by dams, water diversions, and shifts in flow regime due to hydroelectric development and flood control projects are major habitat problems in many Puget Sound tributary basins (Shared Strategy for Puget Sound 2007).

The nearshore marine habitat has been extensively altered and armored by industrial and residential development near the mouths of many of Puget Sound's tributaries. A railroad runs along large portions of the eastern shoreline of Puget Sound, eliminating natural cover along the shore and natural recruitment of beach sand (Shared Strategy for Puget Sound 2007).

Degradation of the near-shore environment has occurred in the southeastern areas of Hood Canal in recent years, resulting in late summer marine oxygen depletion and significant fish kills. Circulation of marine waters is naturally limited, and partially driven by freshwater runoff, which is often low in the late summer. However, human development has increased nutrient loads from failing septic systems along the shoreline, and from use of nitrate and phosphate fertilizers on lawns and farms. Shoreline residential development is widespread and dense in many places. The combination of highways and dense residential development has degraded certain physical and chemical characteristics of the near-shore environment (Hood Canal Coordinating Council 2005; Shared Strategy for Puget Sound 2007).

The Ozette Lake tributary basin is 77 mi^2 and includes several large tributaries and numerous smaller tributaries. Currently, land ownership in the watershed is 73 percent private land, 15 percent Olympic National Park, 11 percent Washington State, and 1 percent Tribal. Natural disturbance in the watershed was dominated by wind and hydrogeomorphic events, while contemporary disturbance additionally includes logging, road construction and maintenance, residential and agricultural development, stream channelization and direct and indirect stream wood clearance. These activities alter stream flow patterns and elevate of sediment loads and sedimentation. Wood removal has resulted in less hydraulic roughness, reduced instream water depths, and reduced backwater effects on Lake Ozette, which has thus altered the entire hydraulic control on Lake Ozette levels and changed the in-river stage-discharge relationship. More recently, deposition of sediment originating from Coal Creek at the lake outlet has further altered lake and river levels (Haggerty et al. 2009).

Private timber companies own approximately 93 percent of the four largest tributary watersheds to Lake Ozette. Logging accelerated over the period of record, with 8.7 percent of the Ozette Lake basin clear-cut by 1953, increasing to 83.6 percent of the basin area clear-cut by 2003 (Haggerty et al. 2009). Effects associated with logging depended on stream size, gradient, and time elapsed. In high-energy coast streams, landslides and debris torrents often modify steep slope tributaries and the mainstem of creeks. Bank erosion also alters stream channels on alluvial floodplains. These effects are additive in the system and reduced the quality of spawning and rearing habitat for juvenile salmonids (Hartman et al. 1996). Lower gradient streams typically have an accumulation of sediment. Second-growth logged sections (12-35 years after logging), re-shaded by deciduous forest canopy, have lower biomass of trout and fewer predator taxa than old-growth sites (Murphy and Hall 1981). Based on the quantity and quality of the physical and biological features, the CHART assessed the conservation value of the Ozette Lake HUC_5 watershed (#1710010102) for sockeye salmon to be “high” (NOAA Fisheries 2005).

In summary, critical habitat throughout the Puget Sound basin has been degraded by numerous management activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of large wood, intense urbanization, agriculture, alteration of floodplain and stream morphology (*i.e*., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, dredging, armoring of shorelines, marina and port development, road and railroad construction and maintenance, logging, and mining. Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common limiting factors in areas of critical habitat.

The PS recovery domain CHART (NOAA Fisheries 2005) determined that only a few watersheds with PCEs for Chinook salmon in the Whidbey Basin (Skagit River/Gorge Lake, Cascade River, Upper Sauk River, and the Tye and Beckler rivers) are in good-to-excellent condition with no potential for improvement. Most HUC_5 watersheds are in fair-to-poor or fair-to-good condition. However, most of these watersheds have some or a high potential for improvement (Table 11).

Table 11. Puget Sound Recovery Domain: Current and potenial quality of HUC5 watersheds identified as supporting historically independent populations of ESA-listed Chinook salmon (CK) and chum salmon (CM) (NOAA Fisheries 2005).5

Current PCE Condition	Potential PCE Condition
3 = good to excellent	3 = highly functioning, at historical potential
2 = fair to good	2 = high potential for improvement
1 = fair to poor	1 = some potential for improvement
0 = poor	0 = little or no potential for improvement

Watershed Name(s) and HUC5 Code(s)	Listed Species	Current Quality	Restoration Potential
Strait of Georgia and Whidbey Basin #1711000xxx			
Skagit River/Gorge Lake (504), Cascade (506) & Upper Sauk (601) rivers, Tye & Beckler rivers (901)	CK	3	3
Skykomish River Forks (902)	CK	3	1
Skagit River/Diobsud (505), Illabot (507), & Middle Skagit/Finney Creek (701) creeks; & Sultan River (904)	CK	2	3
Skykomish River/Wallace River (903) & Skykomish River/Woods Creek (905)	CK	2	2
Upper (602) & Lower (603) Suiattle rivers, Lower Sauk (604), & South Fork Stillaguamish (802) rivers	CK	2	1
Samish River (202), Upper North (401), Middle (402), South (403), Lower North (404), Nooksack River; Nooksack River (405), Lower Skagit/Nookachamps Creek (702) & North Fork (801) & Lower (803) Stillaguamish River	CK	1	2
Bellingham (201) & Birch (204) bays & Baker River (508)	CK	1	1
Whidbey Basin and Central/South Basin #1711001xxx			
Lower Snoqualmie River (004), Snohomish (102), Upper White (401) & Carbon (403) rivers	CK	2	2
Middle Fork Snoqualmie (003) & Cedar rivers (201), Lake Sammamish (202), Middle Green River (302) & Lowland Nisqually (503)	CK	2	1
Pilchuck (101), Upper Green (301), Lower White (402), & Upper Puyallup River (404) rivers, & Mashel/Ohop(502)	CK	1	2
Lake Washington (203), Sammamish (204) & Lower Green (303) rivers	CK	1	1
Puyallup River (405)	CK	0	2
Hood Canal #1711001xxx			
Dosewallips River (805)	CK/CM	2	1/2
Kitsap – Kennedy/Goldsborough (900)	CK	2	1
Hamma Hamma River (803)	CK/CM	1/2	1/2
Lower West Hood Canal Frontal (802)	CK/CM	0/2	0/1
Skokomish River (701)	CK/CM	1/0	2/1
Duckabush River (804)	CK/CM	1	2
Upper West Hood Canal Frontal (807)	CM	1	2
Big Quilcene River (806)	CK/CM	1	1/2
Deschutes Prairie-1 (601) & Prairie-2 (602)	CK	1	1

[5] On January 14, 2013, NMFS published a proposed rule for the designation of critical habitat for LCR coho salmon and PS steelhead (USDC 2013b). A draft biological report, which includes a CHART assessment for PS salmon, was also completed (NMFS 2012). Habitat quality assessments for PS steelhead are out for review; therefore, they are not included on this table.

Current PCE Condition	Potential PCE Condition
3 = good to excellent	3 = highly functioning, at historical potential
2 = fair to good	2 = high potential for improvement
1 = fair to poor	1 = some potential for improvement
0 = poor	0 = little or no potential for improvement

Watershed Name(s) and HUC$_5$ Code(s)	Listed Species	Current Quality	Restoration Potential
West Kitsap (808)	CK/CM	1	1
Kitsap – Prairie-3 (902)	CK	1	1
Port Ludlow/Chimacum Creek (908)	CM	1	1
Kitsap – Puget (901)	CK	0	1
Kitsap – Puget Sound/East Passage (904)	CK	0	0
Strait of Juan de Fuca Olympic #1711002xxx			
Dungeness River (003)	CK/CM	2/1	1/2
Discovery Bay (001) & Sequim Bay (002)	CM	1	2
Elwha River (007)	CK	1	2
Port Angeles Harbor (004)	CK	1	1

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 for this project includes the portion of the Snohomish River impacted by the work trestles, the new bridge, stormwater, turbidity, and underwater noise from pile installation.

The action area is framed by noise disturbance within about 35 acres along 6,200 feet of the Snohomish River in 6th field Hydraulic Unit Code 171100110203 (Snohomish River-Frontal Possession Sound), in the city of Snohomish, Washington. The furthest extent of the action area in the Snohomish River is based on the extent of habitat temporarily affected by turbidity from pile installation and removal and underwater sound pressure waves created by impact pile driving. All other effects of the action will occur within a subset of this area.

The noise from consecutive strikes per day to proof the piles could accumulate to injurious levels (183 dB) for all sizes of fish across the entire width of the 312-foot wide river. Therefore, the number of strikes will be restricted to reduce the zone of injurious noise that will not exceed 75 percent (236 feet) of the river width. However, the noise level of disturbance from pile driving may exceed ambient levels 3,600 feet upstream to the first bend and 2,600 feet downstream to the next bend in line-of-sight from the source. Underwater noise cannot propagate beyond the bends.

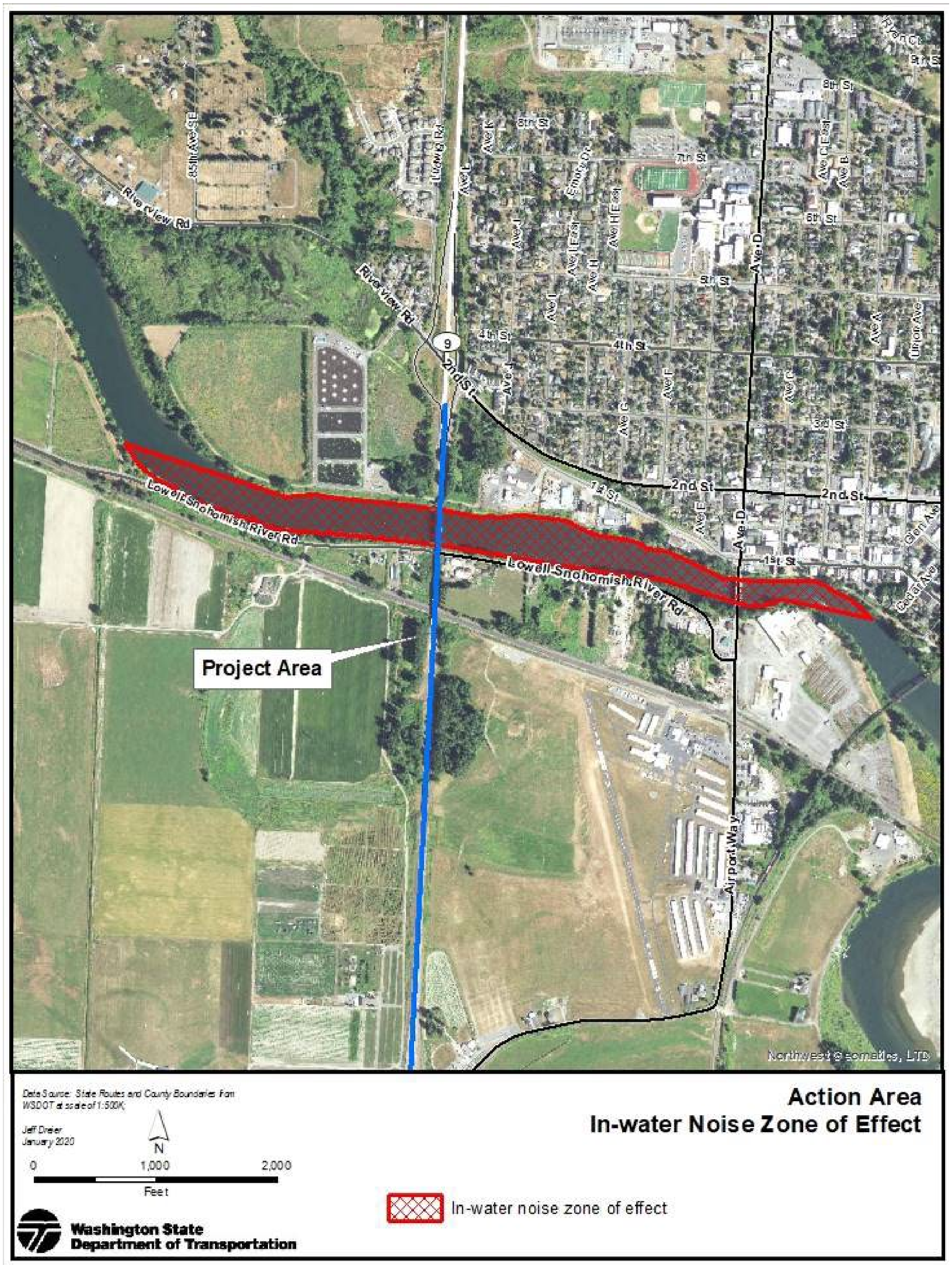

Figure 1. Action Area

2.4. Environmental Baseline

The “environmental baseline” includes 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 which are contemporaneous with the consultation in process (50 CFR 402.02).

The Snohomish River basin is the second largest in Puget Sound, draining 1,856 square miles. The basin includes two main tributaries, the Skykomish and Snoqualmie Rivers (Williams et al. 1975). The Snoqualmie and the Skykomish Rivers converge to form the Snohomish River about 20 miles upstream of its Puget Sound delta near Everett (WDF 1975).

The Snohomish River basin is significantly degraded. The Snohomish River flows through agricultural land for the majority of its length. Logging and road construction in the upper watersheds of the Skykomish and Snoqualmie Rivers have altered deliver flow regimes resulting in higher and more frequent flow events (Williams et al. 1975). Significant portions of the banks of the main stem Snohomish River are diked and armored with riprap. Riparian areas below the town of Snohomish have few mature trees or vegetation. Most of the estuary and floodplain has levees, dikes, tide gates, and pump houses resulting in the loss of off-channel habitat.

The Washington State Department of Ecology (DOE) lists the Snohomish, Skykomish, and Snoqualmie Rivers on the 303(d) list of impaired and threatened water bodies for temperature, copper, and mercury (DOE 1998). Additional water quality problems in the Snohomish River Basin include polychlorinated bi-phenyls (PCBs), phenols, fecal coliform, and dissolved oxygen levels (DOE 1995). Currently, stormwater runoff from the existing bridge is untreated and flows through scuppers in the bridge falling directly into the river. The existing bridge is not being structurally modified in the proposed project; however, vehicular use will be modified to single direction flow of traffic in the opposite direction of the new bridge. The baseline includes the discharge of untreated stormwater from the existing bridge. This discharge includes metals (copper, zinc, mercury, silver, chromium), high and low molecular weight PAHs, and 6PPD, each of which is known to impair water quality or sediment quality, and to have detrimental effects on listed fish and their prey base (Ecology 2018).

Increased water temperatures in the main stem reduce spawning and rearing habitat quality and increase habitat suitability for salmonid predator (TAG 2002). Armored banks, dikes, and levees, and the elimination of riparian vegetation have drastically reduced main stem and off-channel spawning and rearing habitat. Higher velocity flows, the result of the river’s inability to access its floodplain in most flow events, have further reduced floodplain connectivity and functions.

Fish can freely move through the action area as there are no dams or anthropogenic features on the Snohomish River, and none are expected to be built. There is no spawning habitat in the action area. The nearest spawning takes place over a mile upstream from the project area near the confluence of the Snohomish and Pilchuck rivers. The substrate in the action area is embedded with fine sediment. The riverbanks are rip-rap levees on both sides supporting a narrow ribbon of trees and shrubs on the edges and tops. The levees protect adjacent industrial buildings, airport, houses, crop fields, and farms except during extreme flood events that may overtop the levees. Public and private ditching entities control streams and impounded water levels in the flood plain by pumping excess water over the levees and into the river. This water passes through crop fields that are fertilized with domestic animal manure.

The city of Snohomish sewage treatment ponds are adjacent to the proposed project with discharges immediately downstream of the project footprint. The discharges may have high levels of nitrogen that have resulted in numerous violations of the state of Washington water quality standards.

The action area supports the rearing and migration of Snohomish/Skykomish River population of PS steelhead. DIPs in the Snohomish Basin were stable or negative. The Snohomish/Skykomish River winter run DIP exhibited 29% decrease in recent five-year geomean abundances. Long term, the 15-year (2005-2019), were also significantly negative with 8% declines for the Snohomish/Skykomish River DIP (Ford 2022).

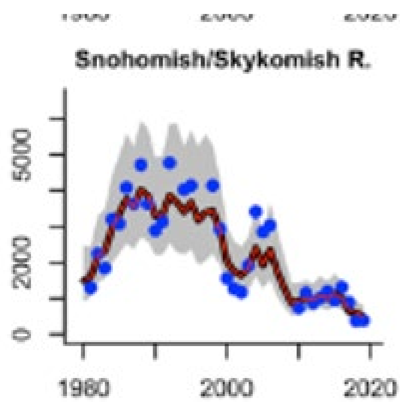

Figure 2. Abundance Trend Snohomish/Skykomish River Steelhead

The action area also supports rearing and migration of Skykomish summer run Chinook salmon. The Skykomish population includes all chinook that spawn in the Skykomish River and its tributaries and in the Snohomish River and its tributaries, including the Pilchuck River (Snohomish Basin Salmonid Recovery Technical Committee in cooperation with NOAA Fisheries May 2004). The Skykomish population has remained below replacement for productivity since the 1980s. Skykomish also shows recent declining trends in the fraction natural-origin estimates (Ford 2022).

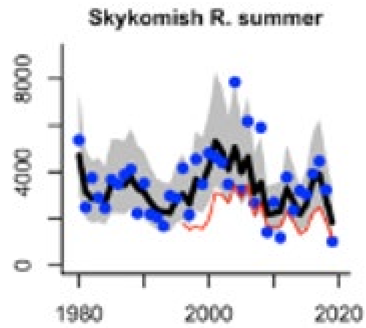

Figure 3. Abundance Trend Skykomish Summer Chinook Salmon.

The baseline condition of both populations is trending away from recovery.

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 still are reasonably certain to occur.

Construction effects will occur during the in-water work window is August 1 to October 31 for three seasons. Effects of the infrastructure will be contemporaneous with those structures (estimated for the purpose of this analysis to be 75 years).

2.5.1 Underwater Noise

In-water background sound data are not available for the Snohomish River at the SR 9 Bridge. The Ebey Slough (approximately 15 miles downstream from the SR 9 Bridge in the Snohomish River estuary) in-water background sound level was measured at 131 dB_{RMS} (Laughlin 2011; J. Laughlin, pers. comm. 2016). This BA will use the measurement collected downstream of this project.

The project includes impact driving of up to 24-inch diameter steel piles. Based on in-water measurements at the Friday Harbor Terminal, impact pile driving of 24-inch diameter steel piles generated 189 dBRMS measured at 10 meters (WSDOT 2020). There are no available in-water noise data associated with vibratory driving of 144-inch diameter shafts. Based on in-water measurements at the Richmond Harbor in California, vibratory driving of 72-inch diameter steel piles generated 180 dBRMS measured at 10 meters (CalTrans 2015). The loudest in-water noise associated with vibratory pile driving was measured at the Kingston Ferry Terminal where 36-inch diameter steel piles generated 184 dBRMS (WSDOT 2020). Therefore, it is assumed that the loudest in-water noise generated by the project will be 189 dBRMS. All piles will be vibrated to the extent practicable and then impact proofed to the desired depth. It is anticipated a production of 2 piles per day with up to 500 impact strikes per pile. There will be up to 100 piles; however, the total duration of actual impact strikes is anticipated to not exceed one hour per day followed by a 12-hour break from impact strikes.

Using the practical spreading loss model, the distance at which underwater noise associated with impact driving of steel piles (189 dBRMS at 10 m) will attenuate to background levels (131 dBRMS) is approximately 40 kilometers (25 miles) or the nearest landform within that distance. Bends in the Snohomish River contain underwater noise from approximately 3,600 feet upstream to approximately 2,600 feet downstream of the project site.

Effect on critical habitat: For steelhead and Chinook salmon, the habitat supports rearing and migration life stages. The timing of the in-water work will avoid returning adult steelhead, and Chinook salmon and outmigrating juvenile Chinook salmon, so critical habitat values that are diminished by pile driving sound are only conditions that support juvenile steelhead rearing and migration values. The diminishment will persist only during pile driving, as elevated noise ceases when the activity stops and conditions return to their baseline level.

Exposure and response of species: Given their longer freshwater life history, juvenile steelhead will range in size from sub yearling to 3-year old fish (Hard et al. 2007). Chinook salmon will outmigrate as sub yearlings typically by the end of June and potentially into early July (Tulalip Tribe 2013). Juvenile Chinook are not expected to be exposed to this effect.

2.5.2 Riparian vegetation

Terrestrial Vegetation

Approximately 9.0 acres of terrestrial vegetation will be permanently impacted. Approximately 0.06 acre (2,614 ft2) of riparian vegetation along the Snohomish River will be impacted by the proposed project. With replanting, the small reduction of riparian vegetation will be fully recovered within a period of several years.

Effect on critical habitat: For steelhead and Chinook salmon, the riparian habitat supports juvenile rearing and juvenile and adult migration life stages by providing shade to cool the water and organic input for prey base insects in the Snohomish River. Riparian habitat will be removed at the beginning of the project and will not replanted until after construction is complete. Most of the existing vegetation is non-native invasive species. Location-appropriate native species with woody stems will be selected to revegetate temporarily disturbed soils. The new bridge height will allow enough light under the bridge deck for plant growth. Short growth plants will be located under the bridge to avoid interference with the maintenance and operations of the bridge. Taller growing plants may be selected outside of the bridge deck. Within a few years, early successional species are expected to have noticeable growth while it may take a decade or more for late successional species to achieve influential height to contribute to shading and organic detritus.

Exposure and response of species: All life history stages of steelhead and Chinook salmon will experience the incremental loss and subsequent regrowth of riparian vegetation. Given their longer freshwater life history, juvenile steelhead will range in size from sub yearling to 3-year old fish in the action area (Hard et al. 2007). Chinook salmon will outmigrate as sub yearlings typically by the end of June and potentially into early July (Tulalip Tribe 2013). Adults of both species are expected to migrate quickly through the action area because this reach of the river is confined by levees with little or no holding habitat.

2.5.3 Wetlands

Approximately 0.02 acre (871 ft2) of wetland, and 0.03 acre (1,307 ft2) of wetland buffer will be permanently impacted.

Effect on critical habitat: For steelhead and Chinook salmon, the habitat supports rearing and migration of all life stages. The impacted wetlands and buffers indirectly support designated steelhead and Chinook salmon critical habitats by improving water quality through bioabsorption and tempering release of flows into the Snohomish River. The loss of wetlands in the project area will be offset by purchasing wetland credits at an established wetland bank in the Snohomish River watershed.

Exposure and response of species: Given their longer freshwater life history, juvenile steelhead will range in size from sub yearling to 3-year old fish (Hard et al. 2007). Chinook salmon will outmigrate as sub yearlings typically by the end of June and potentially into early July (Tulalip Tribe 2013). Adult steelhead and Chinook salmon will be incrementally impacted by reduced water quality in the project vicinity, but all life histories will experience improved water quality at the upstream established wetland credit bank.

2.5.4 Water Quality

The downstream zone of the action area is also established by the maximum extent sediment may travel or resuspend into the water column as a result of in-water work. Potential turbidity impacts from sediment disturbance can vary widely depending on the type of in-water work, sediment sources, particle size and stream or river discharge. WAC 173-201A provides a 300-foot mixing zone since the river exceeds 100 cfs at this location. Construction method BMPs to treat or settle construction stormwater will be used for the project to remain in compliance with water quality standards. Selection of BMPs will be up to the contractor; however, all BMPs will be in accordance with the permits granted for the project. Turbidity from in-water work will be monitored and is unlikely to extend more than 300 feet downstream of the project (Figure 4).

As described above, stormwater runoff from the new impervious surfaces will not discharge to the Snohomish River, but will be captured, treated, and discharged to adjacent land for infiltration. We expect no exposure of listed fishes or critical habitat to stormwater from new or modified PGIS. Baseline water quality conditions/discharge of untreated stormwater from the existing bridge will remain unchanged.

Effect on critical habitat: For steelhead and Chinook salmon, the habitat supports rearing and migration of all life stages. Water quality critical habitat values are diminished by stormwater runoff from the existing bridge into the Snohomish River.

Exposure and response of species: Given their longer freshwater life history, juvenile steelhead will range in size from sub yearling to 3-year old fish (Hard et al. 2007). Chinook salmon will outmigrate as sub yearlings typically by the end of June and potentially into early July (Tulalip Tribe 2013). Adult steelhead and Chinook salmon will be exposed to diminished baseline water quality downstream of the existing SR 9 bridge.

2.5.5 Streambed

The installation of the work trestles and coffer dams will result in approximately 451 square feet of temporary benthic impacts. The new bridge piers will permanently replace 680 square feet of benthic habitat (Table 12).

Table 12. Summary of benthic impacts.

Project Element	Pile Size and Type	Number of Piles	Impact (sq ft)	Type of Effect
Temporary work trestles	24-in steel	100	315	Temporary
Construction of new bridge piers (coffer dam)	12-in H-pile	20	16	Temporary
Construction of new bridge piers (coffer dam)	Sheet pile	60	120	Temporary
Construction of new bridge piers	144-in steel	6	680	Permanent

Effect on critical habitat: For steelhead and Chinook salmon, the benthic habitat supports rearing and migration life stages. The timing of the in-water work will avoid returning adult steelhead, and Chinook salmon and outmigrating juvenile Chinook salmon, so critical habitat values that are diminished by temporary pile placement are only conditions that support juvenile steelhead rearing and migration values. The diminishment will persist while temporary work trestle piles are in place and the permanent loss of benthic habitat from the new bridge support piers.

Exposure and response of species: Given their longer freshwater life history, juvenile steelhead will range in size from sub yearling to 3-year old fish (Hard et al. 2007). Chinook salmon will outmigrate as sub yearlings typically by the end of June and potentially into early July (Tulalip Tribe 2013). Juvenile Chinook are not expected to be exposed to the temporary benthic habitat loss but will be exposed to the permanent new bridge support piers.

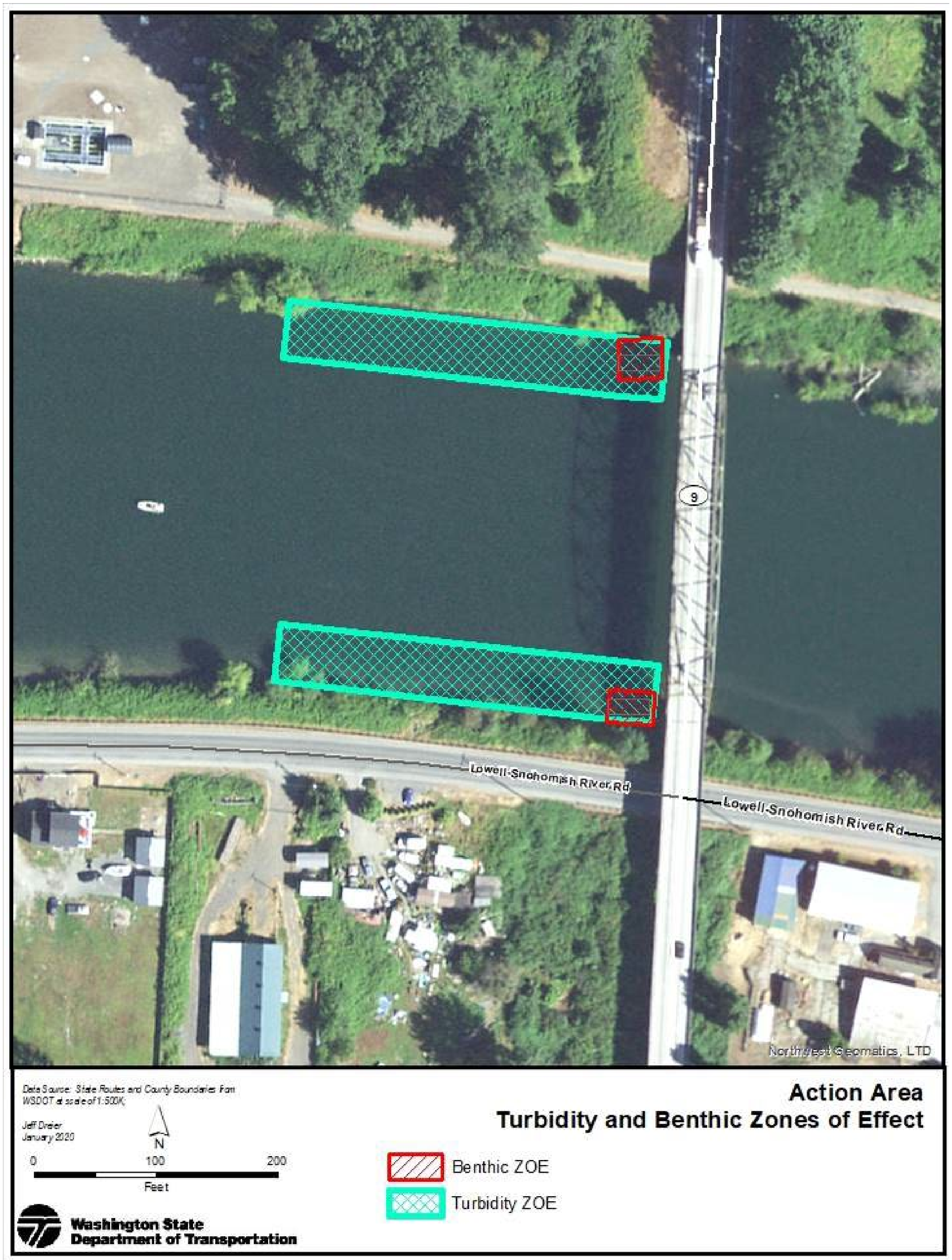

Figure 4. Turbidity and benthic zone of effect

2.5.6 Shading

The existing SR9 Bridge runs north and south and is approximately 40 feet above the river surface. The bridge height, as well as its orientation, allows sunlight to penetrate under the bridge for much of the day. WSDOT studies indicated that bridges higher than 24 feet do not affect vegetation growth (WSDOT 2009). Vegetation is present underneath the SR9 Bridge on both banks, indicating that adequate light penetrates underneath the existing bridge. Therefore, bridge shading is not likely to prevent riparian or aquatic vegetation from growing underneath the new bridge as well.

The temporary work trestle will span the nearshore portions of the river from both banks to the new piers and will result in approximately 10,000 square feet of temporary overwater coverage. As with the proposed bridge, the trestle will be approximately 40 feet above the water in a north-south alignment, reducing potential impacts from shading.

<u>Effect on critical habitat</u>: Given the height and orientation of the temporary and permanent structures, shade is expected to have very little effect on vegetation, or prey communities in the Snohomish River. Rearing conservation values maintain with little change. Migration values for juveniles originating from upstream of the bridge may be slightly diminished over the life of the project due to salmonid response to stark light/dark transition which may occur on clear sunny days (described more fully below).

<u>Exposure and response of species</u>: All juvenile salmonids from the Skykomish population of PS Chinook salmon and the /Snohomish/Skykomish population of PS steelhead spawned upstream of the bridge are likely to encounter shade cast by the bridge in their migration corridor. When exposed to a sudden light level change, fish eye cells cannot adjust quickly enough, and fish experience momentary “blindness.” Juvenile salmon generally need more than 30 minutes to completely recover from such light changes (Ali and Hoar 1959). This recovery period is usually longer when the organism suddenly encounters distinct darkness (Ono et al. 2010). Also, Sabal et al. (2021) found that shade significantly modified the reaction of migrating Chinook to predators, and it did so in two ways. First, the magnitude of antipredator behavior was larger in shade compared to direct sun, which suggests salmon perceived shade to be a riskier environment than sun. Second, the escape tactic also varied; salmon slowed down to be cautious in shade and sped up in sun. Similarly, salmon avoid passing under anthropogenic structures because low light decreases prey vision and acquired information (Sabal et al. 2021, internal citations omitted).

2.5.7 Lighting

The temporary lighting zone of effect during construction will largely be confined to the immediate area of the work trestles, which will extend approximately 30 feet from each side of the channel. Most of the channel will not be impacted by additional lighting until the new bridge spans the river. At this point, permanent lighting installed on the bridge will create a zone of effect that is difficult to delineate; however, lamp shades will be installed to direct the artificial light onto the deck surface and avoid directly lighting the water. For the purpose of this analysis, the permanent lighting is assumed to be directed towards the roadway surface. Any temporary lighting effects are expected to be intermittent and limited to the channel immediately adjacent to the bridge.

Effect on critical habitat: Given the height of the temporary and permanent structures, artificial lighting is expected to have little effect on prey communities in the Snohomish River. Rearing conservation values maintain with little change. Migration values for juveniles originating from upstream of the bridge may be slightly diminished over the life of the project due to salmonid response to stark light/dark transition which may occur at night.

Exposure and response of species: The available information suggests that artificial illumination levels from the bridge would be above the illumination levels where the onset of daylight activities and phototaxis are expected to occur. Therefore, juvenile salmonids that are under or alongside of the bridge are likely experience some level of nocturnal phototaxis, and may experience other altered behaviors, such as delayed resumption of migration in the morning. Over the life of the bridge, it is likely that small subset of the exposed individuals would experience reduced fitness and/or altered behaviors that could reduce their overall likelihood of survival.

The annual numbers of juvenile PS Chinook salmon and PS steelhead that would experience measurably reduced likelihood of survival due to bridge lighting is unquantifiable with any degree of certainty. However, the proportion of any year's cohort that would be exposed to the bridge's lighting would be extremely small because the majority would pass through the action area during the day, when artificial light would cause no effect. Further, only a small portion of the exposed individuals would experience reduced likelihood of survival. Therefore, the numbers of either species that would experience reduced likelihood of survival due to artificial lighting would be too low to cause any detectable population-level effects.

Stormwater runoff was analyzed for potential exposed to species and critical habitats but all of the stormwater in the new and disturbed PGIS is captured, treated, and outlets to adjacent agriculture fields. There are no direct discharges to the Snohomish River from the proposed project.

Effect on critical habitat: Conditions of stormwater runoff from the existing bridge will be maintained with direct discharges from the bridge deck into the Snohomish River; thus, continuing the water quality degradation, particularly in the vicinity of the bridge.

Exposure and Response of Species: The proposed project is not expected to increase or decrease baseline stormwater conditions and the potential harmful impact on adult and juvenile steelhead and Chinook salmon.

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 and 402.17(a)). 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.

We evaluate the cumulative effects as those expected to affect the action area contemporaneously with the proposed action, which we estimate here at 75 years. Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. While site specific climate effects are difficult to precisely predict, certain trends are likely, such as greater variability in stream flow associated with drier summers and more intense rain fall, modified food webs, and warmer stream temperatures. For example, Crozier et al.

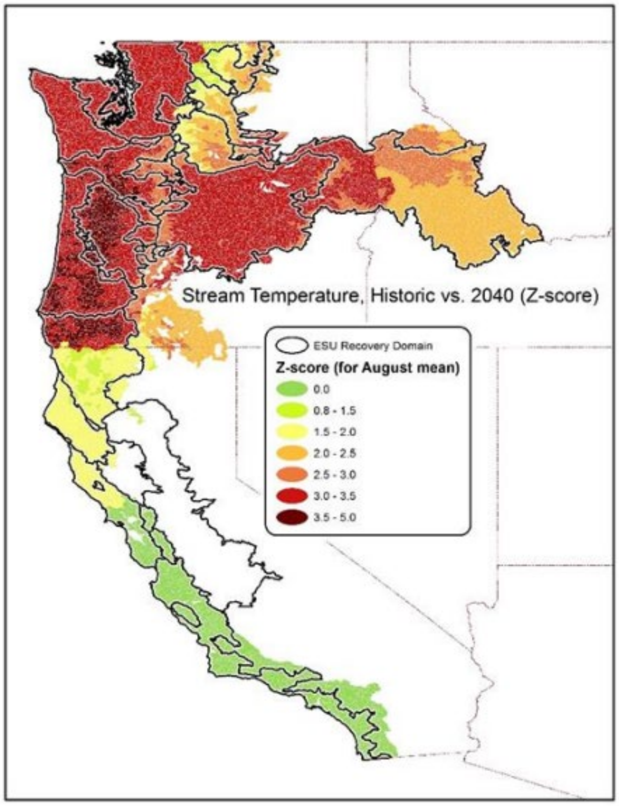

Figure S2-1. Change in stream temperature from 1993-2011 historic mean to 2040s, based on results from Isaak (2016).

Figure 5. Projected stream temperature changes regionally, by 2040 (from Crozier et al. 2019).

(2019) forecasted stream temperatures regionally into the 2040s, based on trends over approximately 20 years, shown in figure 5, above. Survival through the incubation period is not well documented, but there are potential temperature effects for summer-run Puget Sound steelhead. In the Skagit, Snohomish, and Elwha Rivers, 15-27% of summer steelhead are age 3 at outmigration. Puget Sound summer steelhead ranked moderate in exposure to summer water deficit and high in exposure to stream temperature and flooding (Wade et al. 2013). Winter-run adults are not sensitive to summer stream temperature or low flows during migration. For PS Chinook salmon, compared to other species they are likely to have lower exposure to adverse temperature impacts during upstream migration, holding, and spawning, although stream temperature effects are more likely for summer/fall-run adult migrants (Crozier et al. 2019), which includes Skykomish River Chinook salmon.

No activities have been identified in the portion of the action area under the jurisdiction of Snohomish County (Skorney, pers. comm. 2020). Several projects are planned or in progress with the City of Snohomish. All of these projects will take place on previously developed parcels within the City's Urban Growth Area (UGA). WSDOT has several projects planned in the vicinity, all of which have a federal nexus and will be consulted on separately.

Harvey Field is an airport located in the eastern portion of the action area. In December 2018, the Federal Aviation Administration (FAA) approved Harvey Field's proposed new layout, and construction is anticipated to begin in 2021. The renovation will shift the airstrip to the south on a new 2,600-foot-long, 75-foot wide paved runway. That runway would replace the airport's 2,550 feet long, 100-foot wide turf runway and its 2,750-foot long, 36-foot wide blacktop runway (Jviation 2018). The project also includes the realignment of Airport Road. This project and its associated delayed consequences has a federal nexus (FAA) and will be consulted on separately.

Between 1990 and 2010 the average annual population growth rate in Snohomish County was 2.1 percent, accounting for a population increase of over 245,000, or 52% (OFM 2010 http://www.ofm.wa.gov/pop/key2pop.asp). Future public and private actions are likely to continue, increasing with the population, and population growth will increase the demand for agricultural, commercial, and residential development. The 2022 population of the city of Snohomish is 10,000 inhabitants. The population is anticipated to increase to 12,000 by 2035.

The effects of new development caused by that demand have the potential to reduce the function and value of habitat within the action area. Environmental regulations at state and local levels such as the city of Snohomish and Snohomish County Comprehensive Plans, Shoreline Management Programs, and Critical Area Ordinances will function to reduce some effects of future human population growth and upland development. However, intensifying land use in upland areas is likely to contribute both to greater recreational use of the Snohomish River, and contribute increasing amount of nonpoint source pollution, over the life of the structure.

When considered together, future non-federal activities are likely to increase pressure on the habitat in the action area, making recovery objectives more difficult to achieve.

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 the agency's 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 as a whole for the conservation of the species.

The effects of the action include harm, injury, and death of individual juvenile steelhead during construction, but juvenile Chinook salmon are expected to have migrated out of the action area before the in-water construction window. We cannot estimate the number of fish that will be harmed, injured or killed during either season of construction. Long lasting effects will include some increased potential for harm from shade, which will affect an uncertain number of both Chinook salmon and steelhead each year, but only on days when weather is particularly clear and the light bright enough to cast a distinct shadow from the bridge. The number of fish annually affected by this habitat change is also impossible to predict but more juvenile steelhead are likely to be affected due to their long freshwater residency, compared to Chinook salmon.

We add this effect to the baseline, which is degraded for multiple habitat conditions, and which has poor performance for abundance, productivity, and diversity of the specific populations affected, and persistently declining trends. Neither population's viability metrics are meeting recovery objectives. The target abundance for Snohomish/Skykomish population for Major Population Group (MPG) viability and DPS viability is 20,566 (NMFS 2019) and the target abundance for Skykomish population of PS Chinook is 39,000. While the Skykomish population is not identified as specifically necessary to achieve this number for MPG viability, it is one of 3 late populations and one of the late populations must be viable for the MPG and the species to be viable. Currently, none of the late populations are meeting abundance objectives. When we consider the cumulative effects, we expect future negative effects on the habitat quality, and greater difficulty in achieving increased productivity and abundance of both populations. This trend, however, is expected irrespective of the proposed action.

When taken together, the effects of the proposed action are unlikely to impact enough Chinook salmon and steelhead, either during construction or over the long term, to modify the abundance to the degree that overall productivity, diversity, or spatial structure will be diminished. We consider the addition of the project effects to the baseline together with the cumulative effects in the context of the threatened status of both species, which remains at a moderate risk of extinction, as other populations outside the affected MPGs are performing more positively.

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 PS Chinook salmon and PS steelhead, or destroy or adversely modify its designated critical habitat.

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

Effects of the action will coincide with the presence of PS Chinook salmon and PS steelhead such that the incidental take is reasonably certain to occur. Take caused by elevated suspended sediment, impact pile driving, and benthic displacement from the temporary work trestles, coffer dams, and permanent pier cannot be accurately quantified as a number of fish because NMFS cannot predict, using the best available science, the number of PS Chinook salmon and PS steelhead that will be exposed to these stressors. Furthermore, even if NMFS could estimate that number, the manner in which each exposed individual responds to that exposure cannot be predicted.

In circumstances where the NMFS cannot estimate the amount of individual fish that would be injured or killed by the effects of the proposed action, the NMFS assesses the extent of take as an amount of modified habitat and exempts take based only on that extent. This extent is readily observable and therefore suffices to trigger reinitiation of consultation, if exceeded and necessary (see H.R. Rep. No 97-567, 97th Cong., 2d Sess. 27 (1982).

The extent of take in the form of harm from elevated suspended sediment is:

The zone of injury from turbid plumes drifting up to 300 feet downstream (the direction will be subject to tidal flows), at which point increases cannot lawfully exceed ambient conditions (which will harm listed fish).

The extent of take in the form of injury or death from elevated underwater noise is:

The area of the Snohomish River channel subject to harmful or injurious levels of noise from impact pile driving that would affect all life stages of PS Chinook salmon and PS steelhead. The NMFS determined that this area, where noise exceeds 183 dB, would extend up to 236 feet from the source of noise; we estimate that zone to be 1 acre of aquatic habitat from the point of construction. The area of take will decrease the closer to shore pile driving occurs where shallow water and land blocks the transmission of noise.

The extent of take in the form of harm from impacted benthic habitat is:

The area of the Snohomish River channel subject to the temporary and permanent loss of benthic habitat that would affect all life stages of PS Chinook salmon and PS steelhead. The NMFS determined that fish will be excluded from the work trestle support piles, isolation coffer dams, and the new bridge support piers. The area is 451 square feet of excluded habitat from temporary piles and coffer dams, and 680 square feet of excluded habitat from permanent bridge support piers.

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" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

The USACE shall minimize take of PS Chinook salmon and PS steelhead. These reasonable and prudent measures are necessary and appropriate to minimize the take of PS Chinook salmon and PS steelhead. The USACE shall:

1. minimize incidental take from turbidity;

2. minimize incidental take from underwater sound;

3. minimize incidental take of benthic habitat;

2.9.4 Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The USACE 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 whom 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. The following terms and conditions implement reasonable and prudent measure 1 (turbidity):
    a. Monitor turbidity levels in a line downstream of the source of potential turbidity during in-water work to ensure that the turbidity does not exceed 5 NTUs above background at 300 feet from the source. The USACE shall report the results of the turbidity monitoring to NMFS within 60 days of the completion of each in-water work season.

2. The following terms and conditions implement reasonable and prudent measure 2 (underwater sound):

a. Use a vibratory hammer to drive piles to the maximum extent practicable;
b. Limit the number of impact strikes to 1000 per day;
c. Have a minimum 12-hour rest period between daily limits of impact pile driving;
d. Use a sound attenuation system on piles located in three feet of water or deeper composed of confined bubble curtain using air compressor(s), supply lines to deliver the air, distribution manifolds or headers, perforated aeration pipe(s);
e. Use a means of confining the bubbles for impact pile driving that:
    i. Extends the bubble confinement method (e.g. fabric, plastic or metal sleeve, or equivalent) from the substrate to a sufficient elevation above the maximum water level expected during pile installation such that when the air delivery system is adjusted properly, the bubble curtain does not act as a water pump (i.e., little or no water should be pumped out of the top of the confinement system);
    ii. Contains resilient pile guides that prevent the pile and the confinement from coming into contact with each other and do not transmit vibrations to the confinement sleeve and into the water column (e.g. rubber spacers, air filled cushions);
    iii. Use a single aeration ring at the substrate level in water less than 15 meters deep. In waters greater than 15 meters deep, the system shall have at least two rings, one at the substrate level and the other at mid-depth.
    iv. Ensures that the lowest layer of perforated aeration pipe shall be designed to contact with the substrate without sinking into the substrate and shall accommodate for sloped conditions.
    v. Sizes the air holes 1.6 mm (1/16-inch) in diameter and space them approximately 20 mm (3/4 inch) apart. Air holes with this size and spacing shall be placed in four adjacent rows along the pipe to provide uniform bubble flux.
    vi. Provides a bubble flux of 3.0 cubic meters per minute per linear meter of pipe in each layer (32.91 cubic feet per minute per linear foot of pipe in each layer). The total volume of air per layer is the product of the bubble flux and the circumference of the ring:
    Vt = 3.0 m3/min/m * Circ of the aeration ring in m, OR
    Vt = 32.91 ft3/min/ft * Circ of the aeration ring in ft.
f. Provide meters as follows:
    i. Pressure meters shall be installed at all inlets to aeration pipelines and at points of lowest pressure in each branch of the aeration pipeline.
    ii. Flow meters shall be installed in the main line at each compressor and at each branch of the aeration pipelines at each inlet. In applications where the feed line from the compressor is continuous from the compressor to the aeration pipe inlet the flow meter at the compressor can be eliminated.
    iii. Flow meters shall be installed according to the manufacture's recommendation based on either laminar flow or non-laminar flow, or;
    iv. A functional equivalent. Submit the design specifications and monitoring reports or other information justifying equivalency to NMFS for review a minimum of 60 days prior to impact pile driving.

g. Submit a hydroacoustic monitoring plan to NMFS for review a minimum of 45 days before impact pile driving. The hydroacoustic monitoring plan must be prepared and implemented by someone with proven expertise in the field of underwater acoustics and data collection and shall include the name and qualifications of the biologist to be present during impact pile driving. Conduct a performance test of the sound attenuation system, before any impact pile driving. If a confined bubble curtain is used, the performance test shall confirm the calculated pressures and flow rates at each manifold ring.
h. Ensure that a qualified biologist is present during all impact pile driving operations to observe and report any indications of dead, injured or distressed fishes, including direct observations of these fishes or increases in bird foraging activity.
i. Document the effectiveness of the sound attenuation system through hydroacoustic monitoring of a minimum of five piles, as early in the project as possible. Factors to consider in identifying the piles to be monitored include, but are not limited to, bathymetry of project site, total number of piles to be driven, sizes of piles, and distance from shore.
j. Contact the NMFS within 24 hours if the hydroacoustic monitoring indicates that the SPLs will exceed the extent of take exempted in the Opinion. The USACE shall discuss options with NMFS regarding modifications to the proposed action to reduce the SPLs below the limits of take and continue hydroacoustic monitoring.
k. Submit a monitoring report to the consulting biologist(s) at projectreports.wcr@noaa.gov within 60 days of completing hydroacoustic monitoring.

3. The following terms and conditions implement reasonable and prudent measure 3 (benthic habitat):
    a. Minimize the number, area, and duration of temporary trestle piles and coffer dams to the extent practicable. The in-water work window is August 1 to October 31 for two seasons. The USACE will notify and discuss with NMFS any deviations from this time frame.

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).

1. NMFS recommends clear spanning the Snohomish River to avoid placing bridge support piers within the ordinary high-water mark. This will minimize anthropogenic obstacles in the river that can rack wood and create habitat for salmon predatory species. The structures also decrease unhindered migration passage (critical habitat) in the river.

2. NMFS recommends retrofitting stormwater treatment to TDA 4 (existing bridge that will become only northbound lanes). It currently is not included in the project footprint but contributes stormwater pollutants directly into the Snohomish River. The stormwater carries contaminates that are toxic to salmon and contributes to the diminishment of species recovery.

3. NMFS recommends exploring opportunities to create side channels in the lower Snohomish River to improve saline acclimation habitat for out-migrating juvenile Chinook salmon and steelhead. Side channel habitat is a limiting factor in the project action area due to extensive diking on both banks.

2.11 Reinitiation of Consultation

This concludes formal consultation for State Route 9 Marsh Road to 2nd Street Widening.

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.

If there are species or critical habitat that are not likely to be adversely affected, include the following section:

2.12 "Not Likely to Adversely Affect" Determinations

The Southern Resident killer whale (SRKW) Distinct Population Segment (DPS), composed of J, K and L pods, was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). A 5-year status review under the ESA completed in 2016 concluded that SRKW should remain listed as endangered and includes recent information on the population, threats, and new research results and publications (NMFS 2016).

The limiting factors described in the final recovery plan included reduced prey availability and quality, high levels of contaminants from pollution, and disturbances from vessels and sound (NMFS 2008). This section summarizes the status of SRKW throughout their range. This section summarizes information taken largely from the recovery plan (NMFS 2008), recent 5-year review (NMFS 2016), as well as new data that became available more recently.

The SRKW spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and then move south into Puget Sound in early autumn. While these are seasonal patterns, SRKW have the potential to occur throughout their range (from central California north to the Queen Charlotte Islands) at any time during the year.

Critical habitat for the SRKW includes approximately 2,560 square miles of Puget Sound, excluding areas with water less than 20 feet deep relative to extreme high water. The three specific areas designated as critical habitat are (1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; (2) Puget Sound; and (3) the Strait of Juan de Fuca.

SRKWs and SRKW critical habitats do not occur in the proposed project action area. The proposed project action area is not within SRKW critical habitat and SRKWs will not be present in the action area. However, Snohomish River salmon, particularly Chinook salmon, serve as primary prey for SRKWs. The proposed project construction and long-term operation and maintenance of the pump are expected to adversely affect four listed species of salmonids: Chinook salmon, coho salmon, chum salmon, and steelhead. Though deleterious effects to these species are anticipated to be low, some individuals of each species may experience a risk of exposure and thus diminish available prey for SRKW recovery. And, as stated above in Section 2.5, the total number of individuals, particularly Chinook salmon, affected by this project are expected to be inconsequential to supporting sufficient prey abundance to measurably affect SRKWs. Therefore, prey quantity as a habitat feature is only insignificantly affected. Based on this analysis, the proposed action is not likely to adversely affect SRKW, or their designated critical habitat.

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. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10).

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) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by the USACE and descriptions of EFH for Pacific Coast salmon (PFMC 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

3.1 Essential Fish Habitat Affected by the Project

The NMFS determined that the proposed action will adversely affect EFH that supports migration and rearing features necessary for Chinook salmon, pink salmon, and coho salmon, based on information provided in the BA and the analysis of effects presented in the ESA portion of this document.

3.2 Adverse Effects on Essential Fish Habitat

The NMFS determined that the proposed action will adversely affect EFH by temporarily elevating suspended sediment levels, temporarily increasing underwater noise during impact pile driving, and temporarily and permanently precluding fish access to migration and rearing habitats.

Turbid plumes may drift downstream during pile installation and removal. The plume may exceed ambient levels to the point of compliance (5 NTUs over background) 300 feet downstream of the source.

Impact pile driving may affect EFH with sound pressure levels exceeding disturbance thresholds up to 3,600 feet upstream and 2,600 feet downstream (approximately 35 acres) of the proposed project. A confined bubble curtain and limiting the number of strikes to a daily maximum of 975 will help reduce the area of injurious noise (greater than 183 dB $\text{cumulative}_{\text{SEL}}$) to a maximum of 75 percent (approximately one acre) of the channel width. Underwater noise from pile driving may preclude listed species from using migration and rearing habitats the zone of elevated noise.

Work trestles and pier isolation piles will temporarily occupy 451 square feet of benthic habitat while the permanent bridge support pier will occupy 680 square feet of benthic habitat in the Snohomish River.

3.3 Essential Fish Habitat Conservation Recommendations

NMFS determined that the following conservation recommendations are necessary to avoid, minimize, mitigate, or otherwise offset the impact of the proposed action on EFH.

1. Monitor turbidity levels during in-water work to ensure that the turbidity does not exceed 5 NTUs above background at 300 feet from the source. Minimizing the extent of turbidity decreases the area of exposure on habitats for listed salmonids.

2. Strive to exceed 10 dB reduction of underwater noise attenuation. The greater attenuation decreases to extent of disruptive and potentially harmful levels of sound pressures on habitats for listed species.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the U.S. Army Corps of Engineers 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 action if the response is inconsistent with any of NMFS' EFH Conservation Recommendations unless NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency 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, the Federal agency 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 your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The U.S. Army Corps of Engineers 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. They are utility, integrity, and objectivity. This section of the opinion addresses these 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 U.S. Army Corp of Engineers. Other interested users could include FHWA, WSDOT, Tribes, the residents of Snohomish County, the state of Washington, and the general public. Individual copies of this opinion were provided to the Army Corp of Engineers and WSDOT. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. 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 reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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