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-2019-00255

February 20, 2020

Michelle Walker
Corps of Engineers, Seattle District
Regulatory Branch CENWS-OD-RG
P.O. Box 3755
Seattle, Washington 98124-3755

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the All American Marine I & J Float and Pier Project, Whatcom County, Washington, COE Number: NWS-2019-226, Sixth Field HUC: 171100040700 – Bellingham Bay.

Dear Ms. Walker:

Thank you for your letter of June 13, 2019, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for U.S. Army Corps of Engineers (COE) authorization of the All American Marine I & J Float and Pier Project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016). The enclosed document contains the biological opinion (Opinion) prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this Opinion, the NMFS concludes that the proposed action would adversely affect Puget Sound (PS) Chinook salmon and its designated critical habitat, but is not likely to jeopardize the continued existence of that species, or to result in the destruction or adverse modification of its designated critical habitat. This Opinion includes an incidental take statement (ITS) that describes reasonable and prudent measures (RPMs) the NMFS considers necessary or appropriate to minimize the incidental take associated with this action, and sets forth nondiscretionary terms and conditions that the COE must comply with to meet those measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species. This Opinion also documents our conclusion that the proposed action is not likely to adversely affect PS steelhead, Puget Sound/Georgia Basin (PS/GB) bocaccio, PS/GB yelloweye rockfish, southern resident (SR) killer whales, and designated critical habitat for PS/GB bocaccio, PS/GB yelloweye rockfish, and SR killer whales.

Section 3 of this document includes our analysis of the action's likely effects on EFH pursuant to Section 305(b) of the MSA. Based on that analysis, the NMFS concluded that the action would adversely affect designated EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species. Therefore, we have provided 3 conservation recommendations that can be taken by the COE to avoid, minimize, or otherwise offset potential adverse effects on EFH.

Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving this recommendation. If the response is inconsistent with the EFH conservation recommendations, the COE must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and recommendations. 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 request that in your statutory reply to the EFH portion of this consultation you clearly identify the number of conservation recommendations accepted.

Please contact Donald Hubner in the North Puget Sound Branch of the Oregon/Washington Coastal Office at (206) 526-4359, or by electronic mail at Donald.Hubner@noaa.gov if 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: Randel Perry, COE

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

The All American Marine I & J Float and Pier Project
Whatcom County, Washington (6th Field HUC 171100040700 – Bellingham Bay)
(COE Number: NWS-2019-226)

NMFS Consultation Number: WCRO-2019-00255

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?
Chinook salmon (Oncorhynchus tshawytscha) Puget Sound (PS)	Threatened	Yes	No	Yes	No
Steelhead (O. mykiss) PS	Threatened	No	No	No	No
Bocaccio (Sebastes paucispinis) Puget Sound /Georgia Basin (PS/GB)	Endangered	No	No	No	No
Yelloweye rockfish (S. ruberrimus) PS/GB	Threatened	No	No	No	No
Killer whales (Orcinus orca) Southern resident (SR)	Endangered	No	No	No	No

Affected Essential Fish Habitat (EFH) and NMFS' Determinations:

Fishery Management Plan That Describes EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes
Pacific Coast Groundfish	Yes	Yes
Coastal Pelagic Species	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: February 20, 2020

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LIST OF ACRONYMS

BA – Biological Assessment
BMP – Best Management Practices
CFR – Code of Federal Regulations
COE – Corps of Engineers, U.S. Army
DO – Dissolved Oxygen
DQA – Data Quality Act
EF – Essential Feature
EFH – Essential Fish Habitat
ESA – Endangered Species Act
ESU – Evolutionarily Significant Unit
FR – Federal Register
FMP – Fishery Management Plan
GB – Georgia Basin
HAPC – Habitat Area of Particular Concern
HPA – Hydraulic Project Approval
HUC – Hydrologic Unit Code
ITS – Incidental Take Statement
mg/L – Milligrams per Liter
MFS – Memorandum for the Services
MLLW – Mean Lower Low Water
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
MTCA – Model Toxics Control Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NTU – Nephlometric Turbidity Units
OHW – Ordinary High Water
PAH – Polycyclic Aromatic Hydrocarbons
PBF – Physical or Biological Feature
PCB – Polychlorinated Biphenyl
PCE – Primary Constituent Element
PFMC – Pacific Fishery Management Council
PS – Puget Sound
PSTRT – Puget Sound Technical Recovery Team
RL – Received Level
RMS – Root Mean Square
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SAV – Submerged Aquatic Vegetation
SEL – Sound Exposure Level
SL – Source Level
SR – Southern Resident (Killer Whales)
TTS – Total Suspended Solids
USCG – U.S. Coast Guard

VSP – Viable Salmonid Population
WCR – West Coast Region (NMFS)
WDFW – Washington State Department of Fish and Wildlife
WDNR – Washington State Department of Natural Resources
WDOE – Washington State Department of Ecology

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 USC 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 within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon Washington Coastal Office.

1.2 Consultation History

On April 9, 2019, the NMFS received a letter from the U.S. Army Corps of Engineers (COE, (COE 2019a) requesting informal consultation for the proposed action. That request was based on the determination made in the attached memorandum for the services (MFS) that the proposed action would be not likely to adversely affect: PS Chinook salmon and their critical habitat, PS steelhead and their critical habitat, PS/GB bocaccio, PS/GB yelloweye rockfish, and SR killer whales, but would have no effect on the designated critical habitats for the last three species (COE 2019b). A biological assessment (BA) for the proposed action (Anchor 2019) was also enclosed with the letter.

On April 25, 2019, the NMFS informed the COE that the proposed action would require formal consultation because the NMFS considered it likely that the proposed action would adversely affect PS Chinook and their critical habitat. The NMFS also requested additional information, and an acoustic monitoring plan. On May 16, 2019, the COE requested formal consultation and provided most of the requested information, but stated that some was in development (COE 2019c). On September 19, 2019, the NMFS proposed rulemaking to revise designated critical habitat for SR killer whales (84 FR 49214). However, no conference is required for this action because the proposed additional critical habitat is located well outside of the action area. On September 26, 2019 and on October 10, 2019, the NMFS reminded the COE about the outstanding information needs. On October 25, 2019, the COE provided the final requested information. The NMFS initiated formal consultation for the proposed action that day.

On October 28, 2019, updates to the regulations governing interagency consultation (50 CFR part 402) became effective [84 FR 44976]. This consultation was pending at that time, and we are applying the updated regulations to the consultation. As the preamble to the final rule adopting the regulations noted, "[t]his final rule does not lower or raise the bar on section 7 consultations, and it does not alter what is required or analyzed during a consultation. Instead, it improves clarity and consistency, streamlines consultations, and codifies existing practice." We have reviewed the information and analyses relied upon to complete this biological opinion in light of the updated regulations and conclude that the Opinion is fully consistent with the updated regulations.

This Opinion is based on the information in the BE and MFS; supplemental materials and responses to NMFS questions; recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon; published and unpublished scientific information on the biology and ecology of that species; and relevant scientific and gray literature (see Literature Cited).

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), whereas the EFH definition of a federal action is any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910).

The COE proposes to authorize All American Marine (the applicant) to install a new pier, gangway (ramp), and float (mooring structure), with a total over-water footprint of 1,850 square feet, in the I & J Waterway near the applicant's recently constructed boat-manufacturing facility in Bellingham, Washington (Figure 1).

Figure 1. Google satellite photographs of the All American Marine project and mitigation sites in Bellingham Bay, Washington. The lower left image shows the proposed construction site near the northeast end of the I & J Waterway. The lower right image shows the proposed mitigation site at the Bellingham Shipping Terminal.

All project components would be constructed off-site and delivered by truck and/or barge. The new pier would be steel-framed, 55 feet long and 10 feet wide (550 square feet), and fully decked with 60% open area grating. The new ramp would be aluminum-framed, 46 feet long and 5 feet wide (230 square feet), and fully decked with 62% open area grating. The new float would be 120 feet long and 11 feet wide (1,320 square feet), and solid-decked, consisting of floating concrete modules. When installed, about 75 square feet of the pier would extend over land above ordinary high water (OHW), and about 175 square feet of the ramp would overlap with the footprint of the float (Figure 2).

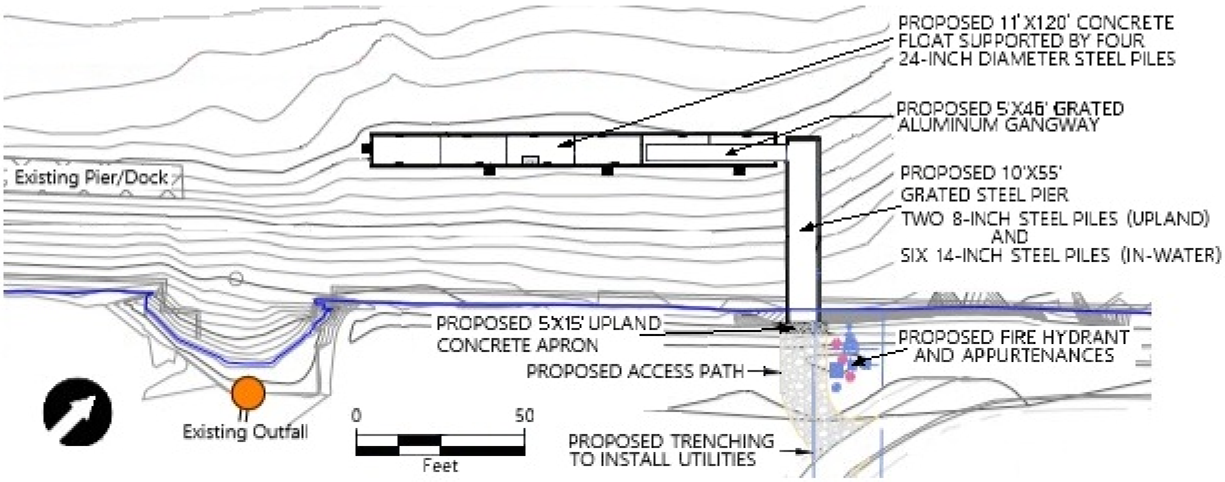

Figure 2. The proposed pier, ramp, and float (Adapted from Sheet 3 of 7 in Anchor 2019).

The project would include the installation of two light fixtures to support safe night work. One would be a photocell-controlled 14-watt fluorescent light installed near the center of the float. That fixture would be aimed in a manner intended to illuminate the float, but limit overwater illumination. The second light fixture would be installed on land adjacent to the entrance gate. That light would include a 70-watt LED lightbulb within a "shoebox" type luminaire aimed to illuminate the gate and the access area, but to limit overwater illumination.

The applicant's contractors would operate land-based and barge-mounted construction equipment to construct the upland and in-water portions of the new mooring structure, and to install utilities on that structure. The contractors would perform upland work to remove the upper portion of existing timber bulkhead lagging and to excavate soils. They would use an impact pile driver to install two 8-inch-diameter steel pipe piles inland of the bulkhead, with each pile requiring about 100 strikes to install. They would also install temporary watertight plywood forms and pour concrete to construct an upland concrete apron behind the bulkhead. They would also conduct upland excavation to install electrical, water, and communication lines to the pier, and to install a fire hydrant, then backfill the excavation.

The contractors would install 4 in-water 24-inch-diameter steel pipe piles and 6 in-water 14-inch-diameter steel pipe piles. The BA indicates that a combination of vibratory pile driving and impact proofing would be used for all in-water piles. However, the COE reports that no impact proofing of the 24-inch piles would be done (COE 2019c), and that each 14-inch pile may require up to 100 strikes. Bubble curtains cannot be used because they would mobilize contaminated sediments. Therefore, sound attenuation for impact driving would be limited to the use of cushion blocks. Following pile installation, the workers would install steel pile caps on the 14-inch piles, position the pier by crane, and attach it to the pile caps. They would place the float sections on the water by crane, connect them to each other, and attach them to the 24-inch piles. Then, they would use the crane to position the ramp and attach it to the pier and the float. They would then work on top of the structure to install and connect the utility lines.

As mitigation for the new structure, the applicant would remove the shoreward-most 135 feet of the Pipeline Wharf at the Bellingham Shipping Terminal (Figures 1 and 3).

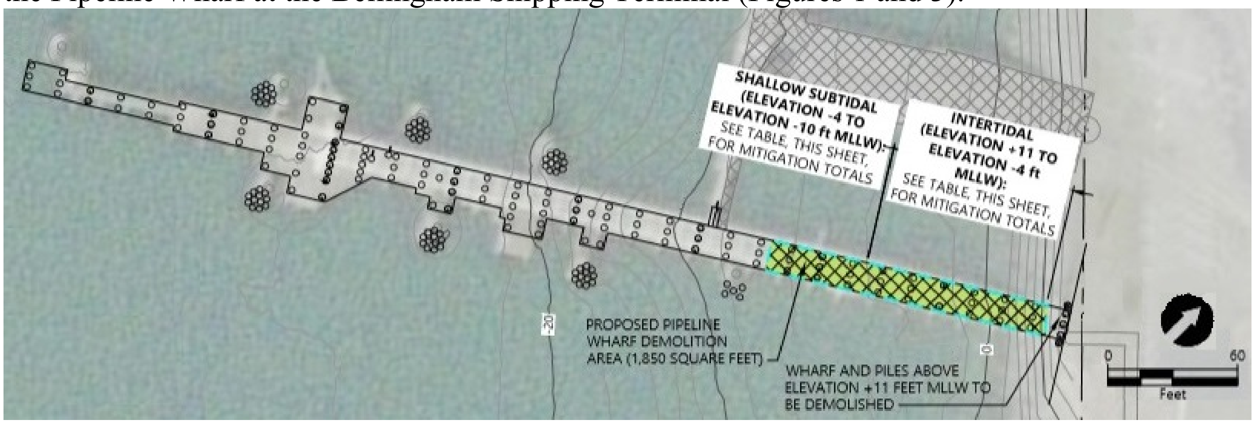

Figure 3. Overhead photo of the Pipeline Wharf at the Bellingham Shipping Terminal with drawing overlay. The wharf section and piles to be removed are highlighted in green and blue (Adapted from Sheet 6 of 7 in Anchor 2019).

The contractors would use land-based and/or barge-mounted construction equipment to cut-up, disconnect, and remove 1,850 square feet of the solid-decked, creosote-treated timber upper wharf structures. They would then operate a vibratory pile extractor to pull the 26 12-inch diameter, creosote-treated timber piles that currently support the wharf section to be removed. All debris would be craned to trucks or a debris barge for transportation and disposal at approved upland facilities.

The project would require about 1 month of work to complete. The applicant plans to limit in-water work to the period between August 1 and February 15, and would require their contractors to comply with all avoidance and minimization measures, and best management practices (BMP) and conservation measures identified in their BA, and with the guidance and BMPs identified in the Washington State Department of Natural Resources (WDNR) BMP for Piling Removal and Disposal (WDNR 2017), and with the provisions identified in the Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) for this project, as modified (WDFW 2019a & b).

We considered whether or not the proposed action would cause any other activities, and determined that the action would increase vessel movement and shipboard work within the I & J Waterway. We based this determination on the applicant's reported purpose for the new mooring structure (a.k.a. fit-up float), which is to moor newly constructed vessels in a convenient location where they would perform fit-up work on those vessels.

The applicant reports that fit-up work would be limited to interior work such as engine calibration, interior panel installation, and similar activities required to prepare new vessels for sea trials and acceptance. They also report that no exterior painting or corrosion control work would be done at the new fit-up float. The applicant expects to work on about 6 new vessels annually, with the largest vessels being 150-foot long by 45-foot wide catamarans, but vessels would typically range from 72 to 90 feet long.

We believe that these activities would be consequence of the proposed action because they would not occur at the site without the presence of the new fit-up float, and therefore have also analyzed the effects of the fit-up activities in the effects section of this Opinion.

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 non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

As described in section 1.2, the COE initially determined that the proposed action may affect but would not adversely affect PS Chinook salmon, PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish, SR killer whales and the designated critical habitats for PS Chinook salmon and PS steelhead. The COE later revised their determination to likely to adversely affect PS Chinook salmon and their designated critical habitat, and requested formal consultation. As described in section 2.12, the NMFS concurs that the proposed action is not likely to adversely affect PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish, SR killer whales. Further, as described in sections 2.3 and 2.12, the NMFS has concluded that the proposed action may affect, but is not likely to adversely affect designated critical habitat for SR killer whales, PS/GB bocaccio, and PS/GB yelloweye rockfish, and that no designated critical habitat for PS steelhead occurs within the action area (Table 1).

Table 1. ESA-listed species and critical habitats that may be affected by the proposed action.

ESA-listed species and critical habitat likely to be adversely affected (LAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound	Threatened	LAA	LAA	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
steelhead (*O. mykiss*) Puget Sound	Threatened	NLAA	NLAA	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)
bocaccio (*Sebastes paucispinis*) Puget Sound/Georgia Basin	Endangered	NLAA	NLAA	04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041)
yelloweye rockfish (*S. ruberrimus*) PS/GB	Threatened	NLAA	NLAA	04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041)
killer whales (*Orcinus orca*) southern resident	Endangered	NLAA	NLAA	11/18/05 (70 FR 57565) / 11/29/06 (71 FR 69054)

LAA = likely to adversely affect NLAA = not likely to adversely affect

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 CFR402.02). 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 as a whole for the conservation of a listed species" (50 CFR 402.02).

Critical habitat designations prior to 2016 used the terms "primary constituent element" (PCE) or "essential feature" (EF) to identify important habitat qualities. However, the 2016 critical habitat regulations (50 CFR 424.12) replaced those terms with "physical or biological features" (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, EFs, or PBFs. In this biological opinion, we use the term PBF to mean PCE or EF, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.
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 range-wide 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 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' "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 function of the essential PBFs that help to form that conservation value.

The summaries that follow describe the status of the ESA-listed species, and their designated critical habitats, that occur within the action area and are considered in this opinion. More detailed information on the biology, habitat, and conservation status and trend of these listed resources can be found in the listing regulations and critical habitat designations published in the Federal Register and in the recovery plans and other sources at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered, and are incorporated here by reference.

Listed Species

Viable Salmonid Population (VSP) Criteria: For Pacific salmonids, we commonly use four VSP criteria (McElhany et al. 2000) to assess the viability of the populations that 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.

"Abundance" generally refers to the number of naturally-produced adults that return to their natal spawning grounds.

"Productivity" refers to 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 in decline.

For species with multiple populations, we assess the status of the entire species based on the biological status of the constituent populations, 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 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.

Puget Sound (PS) Chinook Salmon: The PS 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 (SSPS 2007) and the final supplement to the Shared Strategy's Puget Sound salmon recovery plan (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 (Table 2) 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 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 all the Viable Salmon Population (VSP) parameters are sustained to provide ecological functions and preserve options for ESU recovery.

Table 2. Extant PS Chinook salmon populations in each biogeographic region (Ruckelshaus *et al*. 2002, 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

General Life History: Chinook salmon are anadromous fish that require well-oxygenated water that is typically less than 63º F (17º C), but some tolerance to higher temperatures is documented with acclimation. Adult Chinook salmon spawn in freshwater streams, depositing fertilized eggs in gravel "nests" called redds. The eggs incubate for three to five months before juveniles hatch and emerge from the gravel. Juveniles spend from three months to two years in freshwater before migrating to the ocean to feed and mature. Chinook salmon spend from one to six years in the ocean before returning to their natal freshwater streams where they spawn and then die.

Chinook salmon are divided into two races, stream-types and ocean-types, based on the major juvenile development strategies. Stream-type Chinook salmon tend to rear in freshwater for a year or more before entering marine waters. Conversely, ocean-type juveniles tend to leave their natal streams early during their first year of life, and rear in estuarine waters as they transition into their marine life stage. Both stream- and ocean-type Chinook salmon are present, but ocean-type Chinook salmon predominate in Puget Sound populations.

Chinook salmon are further grouped into "runs" that are based on the timing of adults that return to freshwater. Early- or spring-run chinook salmon tend to enter freshwater as immature fish, migrate far upriver, and finally spawn in the late summer and early autumn. Late- or fall-run Chinook salmon enter freshwater at an advanced stage of maturity, move rapidly to their spawning areas, and spawn within a few days or weeks. Summer-run fish show intermediate characteristics of spring and fall runs, without the extensive delay in maturation exhibited by spring-run Chinook salmon. In Puget Sound, spring-run Chinook salmon tend to enter their natal rivers as early as March, but do not spawn until mid-August through September. Returning summer- and fall-run fish tend to enter the rivers early-June through early-September, with spawning occurring between early August and late-October.

Yearling stream-type fish tend to leave their natal rivers late winter through spring, and move relatively directly to nearshore marine areas and pocket estuaries. Out-migrating ocean-type fry tend to migrate out of their natal streams beginning in early-March. Those fish rear in the tidal delta estuaries of their natal stream for about two weeks to two months before migrating to marine nearshore areas and pocket estuaries in late May to June. Out-migrating young of the year parr tend to move relatively directly into marine nearshore areas and pocket estuaries after leaving their natal streams between late spring and the end of summer.

Spatial Structure and Diversity: The PS 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 (MPGs), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 2).

Hatchery-origin spawners are present in high fractions in most populations within the ESU, with the Whidbey Basin the only MPG with consistently high fractions of natural-origin spawners. Between 1990 and 2014, the fraction of natural-origin spawners has declined in many of the populations outside of the Skagit watershed (NWFSC 2015).

Abundance and Productivity: Available data on total abundance since 1980 indicate that abundance trends have fluctuated between positive and negative for individual populations, but productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit watershed. Available data now show that most populations have declined in abundance over the past 7 to 10 years. Further, escapement levels for all populations remain well below the PSTRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the PSTRT as consistent with recovery (NWFSC 2015). The current information on abundance, productivity, spatial structure and diversity suggest that the Whidbey Basin MPG is at relatively low risk of extinction. The other four MPGs are considered to be at high risk of extinction due to low abundance and productivity (NWFSC 2015). The most recent 5-year status review concluded that the ESU should remain listed as threatened (NMFS 2017).

Limiting Factors: Factors limiting recovery for PS Chinook salmon 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
- Severely altered flow regime

PS Chinook Salmon within the Action Area: The PS Chinook salmon most likely to occur in the action area would be adult and juvenile spring- and fall-run fish from the Nooksack River basin, and juvenile spring-, summer-, and fall-run fish from the Skagit River basin (Beamer et al. 2016; WDFW 2018c). Both stream- and ocean-type Chinook salmon are present in these basins, with the majority being ocean-types.

In the Nooksack River basin, between 1984 and 2012, the total abundance for PS Chinook salmon has fluctuated with the average trend being relatively stable. However, abundance has been dominated by hatchery returns since 1996, with the proportion of natural-origin fish declining (NWFSC 2015; WDFW 2018d). In the North Fork Nooksack River, escapement during that time fluctuated between about 10 and 3,748 fish (1990 and 2002, respectively, WDFW 2018d). Between 1996 and 2012, natural-origin spawner abundance wavered between 37 and 334 fish, whereas hatchery-origin spawners exceeded 500 fish for 12 of those 16 years, and accounted for about 94% of the 3,748 fish in 2002. Total abundance was 758 fish in 2012, with natural-origin fish accounting for only 37% of the return. In the South Fork Nooksack River, between 1984 and 2010, escapement fluctuated between about 103 and 625 fish (1992 and 2002, respectively, WDFW 2018d). Since origin counts began in 1999, spawning by natural-origin fish in the South Fork Nooksack River has fluctuated between 10 and 159 fish, accounting for about 6 to 38% of the total count for returning adults. Natural-origin strays from the North Fork consistently comprised a significant proportion of the annual counts, and those strays have outnumbered South Fork natural-origin spawners since 2004. Total abundance was 548 fish in 2010, with South Fork natural-origin spawners (24 fish) accounting for only 4% of the return, 49 fish were natural-origin strays from the North Fork.

In the Skagit River basin, between 1974 and 2015, the total abundance trend for PS Chinook salmon was slightly negative. However, the fraction of natural-origin spawners was over 90% (the highest in the ESU), and the trend has been slightly positive since the early 1990s (NWFSC 2015; WDFW 2018d). Since 1974, the estimated abundance for returning natural spawners has fluctuated between about 409 and 5,590 fish in the Lower Skagit River basin, and about 3,586 and 20,040 fish in the Upper Skagit River basin (WDFW 2018d).

Returning adults tend to enter the Nooksack River and migrate upstream early-June through early-September. In Nooksack and Skagit River basins, yearling stream-type fish tend to leave their natal rivers late winter through spring, and move relatively directly to nearshore marine areas and pocket estuaries. Ocean-type fry tend to migrate out of their natal streams beginning in early-March. Those fish rear in the tidal delta estuaries of their natal stream for about two weeks to two months before migrating to marine nearshore areas and pocket estuaries in late May to June. Out-migrating young of the year parr tend to move relatively directly into marine nearshore areas and pocket estuaries after leaving their natal streams between late spring and the end of summer. Juveniles from the Skagit River begin to arrive within Bellingham Bay in the summer (Beamer et al. 2016).

Adult PS Chinook salmon from the Nooksack River basin are likely to migrate past the I & J Waterway and the Pipeline Wharf in route to their spawning habitats, and some individuals may briefly enter the waterway. Juveniles from the Nooksack and Skagit River basins are likely to temporarily shelter and forage at both sites as they adapt to marine waters during their migration to the sea.

Critical Habitat

This section describes the status of designated critical habitat that would be affected by the proposed action by examining the condition and trends of physical or biological features (PBFs) that are essential to the conservation of the listed species throughout the designated areas. The PBFs are essential because they support one or more of the species' life stages (e.g., sites with conditions that support spawning, rearing, migration and foraging). The proposed project would affect critical habitat for PS Chinook salmon.

The NMFS designated critical habitat for PS Chinook salmon on September 2, 2005 (70 FR 52630). That critical habitat is located in 16 freshwater subbasins and watersheds between the Dungeness/Elwha Watershed and the Nooksack Subbasin, inclusively, as well as in nearshore marine waters of the Puget Sound that are south of the US-Canada border and east of the Elwha River, and out to a depth of 30 meters. Although offshore marine is an area type identified in the final rule, it was not designated as critical habitat for PS Chinook salmon.

The PBFs of salmonid critical habitat include: (1) Freshwater spawning sites with water quantity and quality conditions and substrate supporting spawning, incubation and larval development; (2) Freshwater rearing sites with: (i) Water quantity and floodplain connectivity to form and maintain physical habitat conditions and support juvenile growth and mobility; (ii) Water quality and forage supporting juvenile development; and (iii) Natural cover such as shade, submerged and overhanging large wood, log jams and beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks; (3) Freshwater migration corridors free of obstruction and excessive predation with water quantity and quality conditions and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels, and undercut banks supporting juvenile and adult mobility and survival; (4) Estuarine areas free of obstruction and excessive predation with: (i) Water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh- and saltwater; (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, side channels; and (iii) Juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation; (5) Nearshore marine areas free of obstruction and excessive predation with: (i) Water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and (ii) Natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and (6) Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation. The PBF for PS Chinook salmon CH are listed in Table 3.

Table 3. Physical or biological features (PBFs) of designated critical habitat for PS Chinook salmon, and corresponding life history events. Although offshore marine areas were identified in the final rule, none was designated as critical habitat.

Physical or Biological Features		
Site Type	**Site Attribute**	**Life History Event**
Freshwater spawning	Water quantity Water quality Substrate	Adult spawning Embryo incubation Alevin growth and development
Freshwater rearing	Water quantity and Floodplain connectivity Water quality and Forage Natural cover	Fry emergence from gravel Fry/parr/smolt growth and development
Freshwater migration	(Free of obstruction and excessive predation) Water quantity and quality Natural cover	Adult sexual maturation Adult upstream migration and holding Kelt (steelhead) seaward migration Fry/parr/smolt growth, development, and seaward migration
Estuarine	(Free of obstruction and excessive predation) Water quality, quantity, and salinity Natural cover Forage	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	(Free of obstruction and excessive predation) Water quality, quantity, and forage Natural cover	Adult growth and sexual maturation Adult spawning migration Nearshore juvenile rearing
Offshore marine	Water quality and forage	Adult growth and sexual maturation Adult spawning migration Subadult rearing

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. Critical habitat throughout the Puget Sound basin has been degraded by numerous activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of large wood from the waterways, 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 of critical habitat throughout the basin.

Land use practices have likely accelerated the frequency of landslides delivering sediment to streams. Fine sediment from unpaved roads also contributes 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 LW recruitment (SSPS 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 LW. 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. Thousands of acres of lowland wetlands across the region have been drained and converted to agricultural and urban uses, and forest wetlands are estimated to have diminished by one-third in Washington State (FEMAT 1993; Spence et al. 1996; SSPS 2007).

Loss of riparian habitat, elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus, and higher levels of suspended sediment, presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture or livestock impacts, have been documented in many Puget Sound tributaries (SSPS 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 (SSPS 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. 2011).

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, 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 LW to downstream areas (SSPS 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. 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 (SSPS 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 (SSPS 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 (HCCC 2005; SSPS 2007).

Critical Habitat within the Action Area: Bellingham Bay, including the I & J Waterway, has been designated nearshore marine critical habitat for PS Chinook salmon. The bay also has habitat features the estuary PBF. This critical habitat primarily supports migration of juvenile and adult PS Chinook salmon (NOAA 2019; WDFW 2019a).

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 proposed construction and mitigation sites are located in marine water along the northeast shoreline of Bellingham Bay. As described in sections 2.5 and 2.12, project-related noise would be the stressor with the greatest range of effects for fish and marine mammals. All other project-related effects, including indirect effects would be undetectable beyond the range of acoustic effects. The areas of Bellingham Bay that would be ensonified at levels capable of causing detectable effects in marine mammals (the most acoustically sensitive species considered in this consultation) are shown in Figure 4.

The loudest project related sound source would be impact driving of 14-inch steel pipe piles. The maximum theoretical range to where those sounds would be detectable by marine mammals (i.e. above ambient noise) is just over 21 miles. However, impact pile driving and other construction-related noise would originate from well within the narrow I & J Waterway, which would confine the noise to the waterway and to a narrow swath (about 10 degrees wide) that would project to the southwest to the shores of Lummi Island, which would block further transmission of the sound. Detectable in-water noise from mitigation work would extend about 1.6 miles (2,512 m) around the Pipeline Wharf mitigation site (Figure 4). The maximum range for detectable effects in fish would be about 328 feet (100 m) from the construction site, and 300 feet around the mitigation site.

Figure 4. Google satellite photograph of Bellingham Bay with the estimated in-water areas that would be ensonified by project-related noise at levels detectable by marine mammals during construction and mitigation work, respectively outlined in red and yellow. The near section of the red wedge is the limit of detectable non-impulsive noise, and the far section is the limit of detectable impulsive noise.

Based on the best available information, the NMFS estimates that the action area for this consultation would be limited to the waters and marine substrates of Bellingham Bay as described above and shown in Figure 4. The described area overlaps with the geographic ranges of the ESA-listed species and the boundaries of designated critical habitats identified in Table 1. The action area also overlaps with areas that have been designated, under the MSA, as EFH for Pacific Coast salmon, Pacific Coast Groundfish, and Coastal Pelagic Species.

2.4 Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. 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 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

Environmental conditions at the project site and the surrounding area: The project and proposed mitigation sites are both located along the northeast shoreline of Bellingham Bay, immediately adjacent to the City of Bellingham, Washington (Figure 1). Bellingham Bay is a partially enclosed marine embayment that receives freshwater from the Nooksack River and several smaller streams. Typical tidal elevations range from -1 foot to +11 feet relative to mean lower low water (MLLW). Whatcom Creek is the closest salmon-bearing stream to the project site, at about 630 yards (straight line) to the southeast. Next is Squalicum Creek at about 0.8 mile to the northwest, and the Nooksack River at about 2.6 miles beyond that.

The portion of Bellingham Bay and the upland areas that surround the project and mitigation sites have been impacted by more than 100 years of development. Dock building, dredging, and filling began in the area in the late 1800s. The railroad that still runs along the eastern shoreline of the bay was first built 1891. Salmon canning began in the bay in 1900, and by the 1920s waterfront industries included several lumber mills, large fish canneries, and shipping. The Port of Bellingham began official operations in 1920. By the mid-1950s, Bellingham's commercial fishery had largely disappeared, and most of the waterfront sawmills and canneries had closed. However, legacy shoreline hardening and other structures remain, and the area remains highly developed.

The Washington State Department of Ecology (WDOE) has identified the waters of the I & J Waterway, a large portion of the adjacent marina, and the nearshore area offshore from those areas on their 303(d) list of impaired water bodies (Category 5) for exceedance of national toxics rule criterion for 6 chemicals. The sediments in those same areas are identified as Category 4A for exceedance of the Sediment Management Standards CSL bioassay criterion. Numerous other sites in Bellingham Bay are identified as Category 4A for sediment contamination, especially in the southeast corner of the Bay (WDOE 2019). The I&J Waterway is one of two WDOE Model Toxics Control Act (MTCA) cleanup sites in the immediate vicinity. The other is the Central Waterfront upland cleanup site. Both sites are currently undergoing review for future cleanup efforts.

Ambient noise levels in Bellingham Bay are unreported, but likely to routinely exceed 120 dB_{RMS}. Typical sources of noise in and near the bay include high levels of daily vessel traffic that include commercial fishing boats, tour boats and ferries, and numerous recreational vessels.

Blackwell (2005) reported ambient noise in the frequency spectrum of 10 to 10,000 Hz were between 95 to over 120 dB in the absence of strong currents. Ambient noise in New York Harbor in the frequency spectrum of 20 to 20,000 Hz is reported to range between 98 and 129 dB_{RMS}, with an average of 117 dB_{RMS} (Reine et al. 2014a). Average ambient noise levels of 117 dB_{RMS} were also reported off the coast of Virginia Beach, while minimum and mean ambient noise levels of about 125 and 134 dB_{RMS}, respectively were reported in the Kennebec River, Maine (Reine et al. 2014b). Measured ambient noise in the frequency spectrum of 16 to 30,000 Hz in Admiralty Inlet, Puget Sound ranged from 94 to 144 dB, with ambient noise exceeding 100 dB 99% of the time (Bassett et al. 2010).

The I&J Waterway is located near the middle of a 1.7 mile wide highly developed area that includes the Port of Bellingham, a U.S. Coast Guard Station, two large marinas, commercial marine industries, restaurants, and other shoreline businesses. The waterway is about 1,400-foot-long and 250-foot-wide with a federally-authorized navigation channel depth of -18 feet re. MLLW. A culvert and drainage feature discharge stormwater at the head of the waterway.

The shoreline along the northwest side of the waterway consists of a rip rap armored slope that protects a peninsula that partially encloses a large marina. The upland properties on the peninsula consist of a U.S. Coast Guard (USCG) Station situated directly across from the project site. Numerous commercial shops and restaurants are located on the peninsula as well. A USCG pier that supports USCG small vessels is in the waterway (Figure 1). The shoreline along the southeast side of the waterway consists of a nearly continuous vertical bulkhead, with two small stretches where the shore consists of sloped rocks and gravel. A culvert discharges stormwater at the head of the waterway, which also consists of sloped rocks and gravel. The upland area at the project site consists of a relatively small unpaved area that is bounded a parking lot and the applicants boat-building facility to the southeast. A fish processing plant is situated immediately southwest of the project site, followed by boatyard at the southeast end of the waterway. The fish processing plant and the boatyard both have relatively large mooring structures. The substrate within the waterway consists of a sand, mud, and cobble mix. The applicant's BA reports that no submerged aquatic vegetation (SAV) is documented within the I&J Waterway. However, the Washington State Department of Natural Resources (WDNR 2019a) reports a narrow strip of eelgrass along the northwest side of the waterway as well as an extensive bed to the southeast of mouth of the waterway.

The compensatory mitigation site is located along the southwest shoreline of the Bellingham Shipping Terminal, about 0.75 mile south of the project site (Figures 1 and 3). The terminal is actively used for commercial cargo operations. The shoreline at the terminal consists of a mix of rip rap armored slope, vertical bulkheads, and numerous overwater structures. The upland areas of the terminal area are highly developed. Several buildings, parking areas, and a lumber yard are present. Most of the surface area consists of asphalt pavement or gravel, and there is virtually no terrestrial vegetation in the area.

The Pipeline Wharf is a solid-decked derelict creosote-treated timber pile pier that is about 475 feet long and 12 feet wide. It is located near the middle of a 1,400-foot wide length of rip rapped shoreline, with a small pocket beach at its southeast end. The marine substrate in the area is a mix of rip rap, rock, sand, and shell fragments. An eelgrass bed extends along the shoreline to the southeast of the Pipeline Wharf (WDNR 2019a). Other SAV includes green algae, rockweed, and the invasive non-native brown algae, *Sargassum muticum*. A harbor seal haul-out is documented to the northwest of the wharf, and surf smelt and Pacific sand lance spawning is documented at the pocket beach about 590 feet to southeast of the wharf (WDNR 2019b).

Adult and juvenile PS Chinook salmon utilize the project and mitigation sites as migration habitat. Juvenile PS Chinook salmon also utilize both areas to shelter and forage while they adapt to the marine environment during their migration toward the ocean. The action area has also been designated as critical habitat for PS Chinook salmon, PS/GB bocaccio, a PS/GB yelloweye rockfish, and SR killer whales. The past and ongoing anthropogenic impacts described above have impacted PS Chinook salmon and have reduced quantity and quality of the physical and biological features of the habitats within the action area.

<u>Climate Change:</u> Climate change has affected the environmental baseline of aquatic habitats across the region and within the action area. However, the effects of climate change have not been homogeneous across the region, nor are they likely to be in the future. During the last century, average air temperatures in the Pacific Northwest have increased by 1 to 1.4° F (0.6 to 0.8º C), and up to 2° F (1.1º C) 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. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10° F (1.7 to 5.6º C), with the largest increases predicted to occur in the summer (Mote et al. 2014).

Decreases in summer precipitation of as much as 30% 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 and 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2014). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

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 3.5-5.3º C increases in Columbia Basin streams and a peak temperature of 26º C 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 (Isaak et al. 2012; Mantua et al. 2010). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic food webs (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; Raymondi et al. 2013; Winder and Schindler 2004). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Raymondi et al. 2013; Wainwright and Weitkamp 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 (Lawson et al. 2004; McMahon and Hartman 1989).

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.

2.5 Effects of the Action

Under the ESA, “effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action. A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered 50 CFR 402.17(a) and (b).

As described in Section 1.3, the COE proposes to authorize the applicant to install a new 1,850-square foot mooring structure in the nearshore marine waters of Bellingham Bay, and to remove an equal amount of over-water decking and the supporting piles from a nearby creosote-treated timber wharf (Figures 1-3). The applicant’s plans include about 1 month of in-water work to could be done any time between August 1 and February 15 using land-based and barge-mounted construction equipment, including both impact and vibratory pile drivers.

The proposed work window would avoid the expected peak out-migration of juvenile PS Chinook salmon. However, it overlaps with the expected presence of returning adults and with the latter part of juvenile nearshore marine rearing and migration. Adult PS Chinook salmon typically migrate through the area from early-June through early-September. Juvenile PS Chinook salmon are likely to be present in the area starting as early as January and to remain in the nearshore waters of Bellingham Bay through the end of summer (i.e. late August to early September).

Therefore, the planned construction is likely to cause direct effects on PS Chinook salmon and the PBFs of their critical habitat through exposure to construction-related noise, degraded water quality, and propeller wash. Construction would also cause indirect effects on juveniles through exposure to contaminated forage. The new COE-authorized mooring structure is likely to remain in the action area for several decades. Over that time, the fit-up work that would be done at the new structure would cause effects on PS Chinook salmon and the PBFs of their critical habitat through exposure to altered lighting, vessel noise, and propeller wash.

2.5.1 Effects on Listed Species

Construction-related Noise

Exposure to construction-related noise would cause adverse effects in PS Chinook salmon Elevated in-water noise at levels capable of causing detectable effects in exposed fish would be caused by the in-water use of impact and vibratory pile installation, vibratory pile extraction, tugboats, barge spuds, and handheld underwater power saws.

The effects of a fishes' exposure to noise vary with the hearing characteristics of the exposed fish, the frequency, intensity, and duration of the exposure, and the context under which the exposure occurs. At low levels, effects may include the onset of behavioral disturbances such as acoustic masking (Codarin et al. 2009), startle responses and altered swimming (Neo et al. 2014), abandonment or avoidance of the area of acoustic effect (Mueller 1980; Picciulin et al. 2010; Sebastianutto et al. 2011; Xie et al. 2008) and increased vulnerability to predators (Simpson et al. 2016). At higher intensities and/or longer exposure durations, the effects may rise to include temporary hearing damage (a.k.a. temporary threshold shift or TTS, Scholik and Yan 2002) and increased stress (Graham and Cooke 2008). At even higher levels, exposure may lead to physical injury that can range from the onset of permanent hearing damage (a.k.a. permanent threshold shift or PTS) and mortality. The best available information about the auditory capabilities of the fish considered in this Opinion suggest that their hearing capabilities are limited to frequencies below 1,500 Hz, with peak sensitivity between about 200 and 300 Hz (Hastings and Popper 2005; Picciulin et al. 2010; Scholik and Yan 2002; Xie et al. 2008).

The NMFS uses two metrics to estimate the onset of injury for fish exposed to high intensity impulsive sounds. The metrics are based on exposure to peak sound level and sound exposure level (SEL), respectively. Both are expressed in decibels (dB). The metrics are: 1) exposure to 206 dB_{peak}; and 2) exposure to 187 dB SEL_{cum} for fish 2 grams or larger, or 183 dB SEL_{cum} for fish under 2 grams. Any received level (RL) below 150 dB_{SEL} is considered "Effective Quiet". The distance from a source where the RL drops to 150 dB_{SEL} is considered the maximum distance from that source where fishes can be affected by the noise, regardless of accumulation of the sound energy (Stadler and Woodbury 2009). Therefore, when there is a difference between the ranges to the isopleths for effective quiet and SEL_{cum}, the shorter range shall apply. The discussion in Stadler and Woodbury (2009) makes it clear that the thresholds likely overestimate the potential effects of exposure to impulsive sounds. Further, the assessment did not consider non-impulsive sound because it is believed to be less injurious to fish than impulsive sound. Therefore, any application of the criteria to non-impulsive sounds is also likely to overestimate the potential effects in fish. However, this assessment applies the criteria to both impulsive and non-impulsive sounds for continuity, and as a tool to gain a conservative idea of the sound energies that fish may be exposed to during the majority of this project.

The estimated in-water source levels (SL, sound level at 1 meter from the source) used in this assessment are based on the best available information, as described in a recent acoustic assessment for a similar project (NMFS 2018a), in other sources (CalTrans 2009; COE 2011; DEA 2011; FHWA 2017), and on the expectation that the contractors would use cushion blocks during impact pile driving. The best available information supports the understanding that all of the SLs would be below the 206 dB_{peak} threshold for the onset of instantaneous injury in fish.

In the absence of location-specific transmission loss data, variations of the equation RL = SL – #Log(R) are often used to estimate the received sound level at a given range from a source (RL = received level (dB); SL = source level (dB, 1 m from the source); # = spreading loss coefficient; and R = range in meters (m). Acoustic measurements in shallow water environments support the use of a value close to 15 for projects like this one (CalTrans 2009). This value is considered the practical spreading loss coefficient.

Application of the practical spreading loss equation to the expected project-related SLs suggests that noise levels above the 150 dB_{SEL} threshold could extend to about 328 feet (100 m) around the vibratory installation of 24-inch diameter steel pipe piles. Noise levels above the 150 dB_{SEL} threshold from all other construction-related sources would extend only about half as far or less around the project site (Table 4).

Table 4. Estimated in-water source levels for project-related work with the estimated ranges to the source-specific effects thresholds for fish.

Source	Acoustic Signature	Source Level	Threshold Range
Spuds	< 1,600 Hz Impulsive	201 dB_{peak}	206 @ N/A
Estimate about 4 impacts per day when barges are moved.		176 dB_{SEL}	150 @ 54 m
Imp. 14-inch Steel Pipe piles	< 1,600 Hz Impulsive	199 dB_{peak}	206 @ N/A
Estimate 10 & 6 dB attenuation for peak and SEL from use of blocks, and 1 day of work with up to 600 impacts.		176 dB_{SEL}	183 @ 24 m
		176 dB_{SEL}	187 @ 13 m
		176 dB_{SEL}	150 @ 54 m
Vib. Install 24-inch Steel Pipe Piles	< 2.5 kHz Non-Impulsive	193 dB_{peak}	206 @ N/A
Estimate 1 day with up to 4 hours of cumulative vibratory noise.		180 dB_{SEL}	150 @ 100 m
Imp. 8-inch Steel Pipe piles	< 1,600 Hz Impulsive	193 dB_{peak}	206 @ N/A
Estimate 10 & 6 dB attenuation for peak and SEL for use of blocks, and 1 day of work with up to 200 impacts.		170 dB_{SEL}	183 @ 5 m
		170 dB_{SEL}	187 @ 3 m
		170 dB_{SEL}	150 @ 22 m
Vib. 14-inch Steel Pipe piles	< 2.5 kHz Non-Impulsive	187 dB_{peak}	206 @ N/A
Estimate 1 day with up to 6 hours of cumulative vibratory noise.		172 dB_{SEL}	150 @ 29 m
Vib. Extract 12-inch Timber Piles	< 2.5 kHz Non-Impulsive	181 dB_{peak}	206 @ N/A
Estimate 3 days of up to 7 hours of cumulative vibratory noise per day.		171 dB_{SEL}	150 @ 25 m
Tug Propulsion	< 1 kHz Combination	185 dB_{peak}	206 @ N/A
Estimate 2 hours of vessel noise per day when barges are moved.		170 dB_{SEL}	150 @ 22 m

The time required to install a pile with a vibratory driver can vary greatly. Based on the best available information, less than an hour of vibratory driving is normally required to install a single pile. Therefore, to be conservative, this assessment assumes 1 hour of vibratory driving per pile. The assessment also assumes that any of the various pile types may be installed and/or extracted at any time during a typical work day that would not exceed about 10 hours, and that a minimum of 12 hours would elapse between the daily cessation and resumption of pile work. During pile work at the project site, in-water noise levels at or above the 150 dB_{SEL} threshold would likely extend to about 328 feet around the site during the vibratory installation of 24-inch steel pipe piles, and to about 177 feet (54 m) during impact proofing of 14-inch steel pipes. Sound levels at or above the 150 dB_{SEL} threshold may extend to about 82 feet (25 m) around the mitigation site during the vibratory extraction of 12-inch timber piles.

Construction and demolition would both likely require the use of 2 barges; a construction barge and a supply/debris barge. Most spud-barges have 2 spuds (steel pipes or girders) that they drop to the substrate and lock in place to hold their position (instead of using anchors). Spud deployment causes a brief impulsive sound event when the spud strikes the substrate. No information was provided about when or how often the barges would be moved. However, given the small sizes of the 2 sites, barge movement would likely be less than once per week. This suggests that spud deployment would cause less than 4 impulsive noise events about once every week at each site. Noise levels above the 150 dB_{SEL} threshold would likely extend about 177 feet around spud deployment. With the exception of the installation of 24- and 14-inch steel piles, fish-detectable sound levels from all other construction-related sources would extend only about half as far as spuds. Further, the various sound sources are very unlikely to have any additive effects with each other due the differences in their frequencies. At most, the combination of the various types of equipment during any given day may cause fish-detectable in-water noise levels across the entire workday.

As explained at the beginning of this section, the planned work window avoids the periods of peak juvenile out-migration. However, the work window overlaps with the expected presence of returning adults, and with juveniles that are adapting to the nearshore marine environment through the end of summer. Individuals that are beyond the 150 dB_{SEL} isopleth would be unaffected by the noise. However, fish within the 150 dB_{SEL} isopleth are likely to experience a range of impacts that would depend on their distance from the source and the duration of their exposure. All of the adults that may be exposed to construction noise would be much larger than 2 grams, independent of shoreline waters, and extremely unlikely to remain near enough to either site to accumulate injurious levels of sound energy. The most likely effect of exposure to project-related noise would be temporary minor behavioral effects, such as avoidance of the area within about 82 feet around the mitigation site during pile extraction, and up to 328 feet around the project site during pile installation. The exposure would cause no measurable effects on the fitness of exposed adults, wouldn't prevent adults from moving past the area, and wouldn't prevent access to important habitat resources.

The juvenile PS Chinook salmon that may be present would be relatively shoreline obligated, but most would be larger than 2 grams. All juveniles that are within the 150 dB_{SEL} isopleth, are likely to experience behavioral disturbance, such as acoustic masking, startle responses, altered swimming patterns, avoidance, and increased risk of predation. Individuals that remain within the range where accumulated sound energy would exceed the 183/187 dB SEL_{cum} thresholds may also experience some level of auditory- and non-auditory tissue injury, which could reduce their likelihood of survival. The numbers of juvenile PS Chinook salmon that may be impacted by this stressor is unquantifiable with any degree of certainty. However, it is expected to be very low because the work window avoids the out-migration peak, the noise producing components of the project would be relatively brief, and the affected areas would be very small. Therefore, the numbers of juvenile PS Chinook salmon that may be exposed to construction-related noise would comprise such small subsets of their respective cohorts, that should they be injured or killed due to the exposure, their loss would cause no detectable population-level effects.

<u>Construction-related Degraded Water Quality</u>

Exposure to construction-related degraded quality would cause minor effects in PS Chinook salmon. Water quality would be temporarily affected through increased turbidity. It may also be temporarily affected by reduce dissolved oxygen (DO) concentrations and by toxic materials that may be introduced to the water through construction-related spills and discharges, during the removal of creosote-treated piles and timbers that may release creosote-related toxins into the water.

<u>Turbidity:</u> Pile removal at the mitigation site would mobilize bottom sediments that would cause episodic, localized, and short-lived turbidity plumes with relatively low concentrations of total suspended sediments (TSS). The intensity of turbidity is typically measured in Nephlometric Turbidity Units (NTU) that describe the opacity caused by the suspended sediments, or by the concentration of TSS as measured in milligrams per liter (mg/L). A strong positive correlation exists between NTU values and TSS concentrations. Depending on the particle sizes, NTU values roughly equal the same number of mg/L for TSS (i.e. 10 NTU = ~ 10 mg/L TSS, and 1,000 NTU = ~ 1,000 mg/L TSS) (Campbell Scientific Inc. 2008; Ellison et al. 2010). Therefore, the two units of measure are easily compared.

The effects of turbidity on fish are somewhat species and size dependent. In general, severity typically increases with sediment concentration and duration of exposure, and decreases with the increasing size of the fish. Newcombe and Jensen (1996) reported minor physiological stress in juvenile salmon only after about three hours of continuous exposure to concentration levels of about 700 to 1,100 mg/l. Water quality is considered adversely affected by suspended sediments when turbidity is increased by 20 NTU for a period of 4 hours or more (Berg and Northcote 1985; Robertson et al. 2006).

Vibratory removal of hollow 30-inch steel piles in Lake Washington mobilized sediments that adhered to the piles as they were pulled up through the water column (Bloch 2010). Much of the mobilized sediment likely included material that fell out of the hollow piles. Turbidity reached a peak of about 25 NTU (~25 mg/L) above background levels at 50 feet from the pile, and about 5 NTU (~5 mg/L) above background at 100 feet. Turbidity returned to background levels within 30 to 40 minutes. Pile installation created much lower turbidity. The planned extraction of 12-inch derelict timber piles is extremely unlikely to mobilize as much sediment as described above, because the timber piles have much smaller surface areas for sediments to adhere to, and no tube to hold packed-in sediments. Therefore, the mobilization of bottom sediments, and resulting turbidity from the planned pile removal is likely to be less than that reported by Bloch. Lifting barge spuds would also mobilize sediments, but likely less than that of pile removal because the spuds would not be embedded as deeply as the piles described above.

Tugboats would also mobilize bottom sediments. Tugboat trips to the sites would be infrequent, likely less than weekly, and last a low number of hours while it repositions the work barges. Therefore, the resulting propeller wash turbidity plumes would be episodic and low in number. The intensity and duration of the resulting turbidity plumes are uncertain. They would depend on a combination of the tugboat's thrust, the water depth under it, and the type of substrate. The higher the thrust and the finer the sediment, the more mobilized sediment. Fine material (silt) remains mobilized longer than coarse material (sand). The shallower the water, the more thrust energy that would reach the substrate.

A recent study described the turbidly caused by large tugboats operating in Navy harbors (ESTCP 2016). At about 13 minutes, the plume extended about 550 yards (500 m) and had a TSS concentration of about 80 mg/L. The plume persisted for hours and extended far from the event, but the TSS concentration fell to 30 mg/L within 1 hour and to 15 mg/L within 3 hours. At its highest concentration, the plume was far below the 700 mg/L concentration required to elicit physiological responses reported by Newcombe and Jensen (1996). The exact extent of turbidly plumes from tugboat operations for this project are unknown, but the small scale of the project suggests that the tugboats and barges that would be used for the project would be much smaller than those observed during the Navy operations. Based on that information, and on the consultations for similar projects in the region, sediment mobilization from project-related propeller wash would likely consist of relatively low-concentration plumes that would extend no more than 300 feet from the site, and last less than an hour after the disturbance.

Based on the best available information, construction-related turbidity would be very short-lived and at concentrations too low to cause more than temporary, non-injurious behavioral effects such as avoidance of the plume, mild gill flaring (coughing), and slightly reduced feeding rates in the juvenile PS Chinook salmon that may be exposed to it. None of these potential responses, individually, or in combination would affect the fitness or normal behaviors in exposed fish.

Dissolved Oxygen (DO): Mobilization of anaerobic sediments can decrease dissolved oxygen (DO) levels (Hicks et al., 1991; Morton 1976). The impact on DO is a function of the oxygen demand of the sediments, the amount of material suspended in the water, the duration of suspension, and the water temperature (Lunz and LaSalle 1986; Lunz et al. 1988). Reduced DO can affect salmonid swimming performance (Bjornn and Reiser 1991), as well as cause avoidance of water with low DO levels (Hicks 1999). However, the small amount of sediments that would be mobilized and the high level of water mixing that would occur due to river currents suggests that any DO reductions would be too small and short-lived to cause detectable effects in exposed fish.

Toxic Materials: Toxic materials may enter the water through construction-related spills and discharges, the mobilization of contaminated sediments, and/or the release of PAHs from creosote-treated timber piles during their removal. Fish can uptake contaminants directly through their gills, and through dietary exposure (Karrow et al. 1999; Lee and Dobbs 1972; McCain et al. 1990; Meador et al. 2006; Neff 1982; Varanasi et al. 1993). Petroleum-based fuels, lubricants, and other fluids commonly used by construction-related equipment contain Polycyclic Aromatic Hydrocarbons (PAHs). Other contaminants can include metals, pesticides, Polychlorinated Biphenyls (PCBs), phthalates, and other organic compounds. Depending on the pollutant, its concentration, and/or the duration of exposure, exposed fish may experience effects that can range from avoidance of an affected area, to reduced growth, altered immune function, and mortality (Beitinger and Freeman 1983; Brette et al. 2014; Feist et al. 2011; Gobel et al. 2007; Incardona et al. 2004, 2005, and 2006; Mcintyre et al. 2012; Meadore et al. 2006; Sandahl et al. 2007; Spromberg et al. 2015).

Many of the fuels, lubricants, and other fluids commonly used in motorized vehicles and construction equipment are petroleum-based hydrocarbons with PAHs that are known to be injurious to fish. However, the project includes BMPs to reduce the risk and intensity of discharges and spills during construction. In the unlikely event of a construction-related spill or discharge, the event would likely be very small, quickly contained and cleaned. Also, non-toxic and/or biodegradable lubricants and fluids are strongly encouraged by the State, and are commonly used by many of the local contractors. Based on the best available information, the in-water presence of spill and discharge-related contaminants would be very infrequent, very short-lived, and at concentrations too low to cause detectable effects should a listed fish be exposed to them.

The sediments that would be mobilized during derelict pile removal very likely contain PAHs from the creosote-treated piles. PAHs may also be released directly from timber piles should they break during their removal (Evans et al. 2009; Parametrix 2011; Smith 2008; Werme et al. 2010). As described above, the amount of sediment that would be mobilized by construction activities would be small, and any PAHs that may be mobilized would likely dissipate within a few hours, through evaporation at the surface, dilution in the water column (Smith 2008; Werme et al. 2010), or by settling out of the water with the sediments. Therefore, in-water contaminant concentrations would be very low and short-lived. The NMFS estimates that all detectable water quality impacts would limited to the extent of the project-related visible turbidity, which wouldn’t exceed 300 feet and one hour from the cessation of work. In the unlikely event of exposure to waterborne contaminants, the in-water concentrations would be too low, and exposure too brief to cause detectable effects in exposed individuals.

The planned removal of about 26 creosote-treated piles would reduce the number of derelict piles that are sources of ongoing PAH contamination at the mitigation site. Their removal is likely to cause some long-term improvement of water quality within the action area. However, the amount of improvement and the exact effects it may have on salmonids and their habitat resources within the action area is uncertain, particularly given the large number of derelict timber piles and other sources of contamination that would remain in the area after the project is complete.

Based on the best available information, as described above, any fish that may be exposed to construction-related water quality impacts would experience no more than temporary low-level behavioral effects, which individually, or in combination would not affect the fitness of exposed individuals.

Construction-related Propeller Wash

Construction-related propeller wash is likely to adversely affect juvenile PS Chinook salmon. Spinning boat propellers kill fish and small aquatic organisms (Killgore et al. 2011; VIMS 2011). Spinning propellers also generate fast-moving turbulent water that is known as propeller wash. Exposure to propeller wash can displace and disorient small fish. It can also mobilize sediments and dislodge aquatic organisms and SAV, particularly in shallow water and/or at high power settings. This is called propeller scour.

During construction, tugboat operations would cause propeller wash within the action area. Adult Chinook salmon that migrate through the action area are likely to avoid construction-related noise and activity. Further, they would be able to swim against most propeller wash they might be exposed to without any measurable effect on their fitness or normal behaviors. Conversely, juvenile Chinook salmon that are within the area are likely to be relatively close to the surface and too small to effectively swim against the propeller wash. Individuals that are struck or very nearly missed by the propeller would be injured or killed by the exposure. Farther away, propeller wash may displace and disorient fish. Depending on the direction and strength of the thrust plume, displacement could increase energetic costs, reduce feeding success, and may increase the vulnerability to predators for individuals that tumble stunned and/or disoriented in the wash.

The number of individuals that would be affected by propeller wash is unquantifiable with any degree of certainty. However, based on the timing and location of the work, and on the relatively low number of tugboat trips that would occur, the numbers of affected individuals would represent such small subsets of their respective cohorts that their loss would cause no detectable population-level effects.

Construction-related propeller scour may also reduce SAV and diminish the density and diversity of the benthic community at the project site. However, the affected area at the project site would be limited to a regularly dredged navigation channel where very little SAV is believed to exist. Propeller scour may impact algae at the mitigation site. However, the disturbance would be brief, and the affected area would likely consist of a tiny portion of the SAV-supporting substrate in the immediate area, and disturbed benthic algae and invertebrates would likely recover very quickly after work is complete. Therefore, the effects of propeller scour would be too small to cause any detectable effects on the fitness and normal behaviors of juvenile Chinook salmon in the action area.

Construction-related Contaminated Forage

Exposure to contaminated forage is likely to adversely affect juvenile PS Chinook salmon. In addition to direct uptake of contaminants through their gills, salmonids can absorb contaminants through dietary exposure (Meador et al. 2006; Varanasi et al. 1993). The removal of creosote-treated derelict timber piles would mobilize small amounts of contaminated subsurface sediments that would settle onto the top layer of the substrate, where contaminants such as PAHs and PCBs may remain biologically available for years.

Romberg (2005) discusses the spread of contaminated sediments that were mobilized by the removal of creosote-treated piles from the Seattle Ferry Terminal, including digging into the sediment with a clamshell bucket to remove broken piles. Soon after the work, high PAH levels were detected 250 to 800 feet away, across the surface of a clean sand cap that had been installed less than a year earlier. Concentrations decreased with distance from the pile removal site, and with time. However, PAH concentrations remained above pre-contamination levels 10 years later. Lead and mercury values also increased on the cap, but the concentrations of both metals decreased to background levels after 3 years.

The applicant's project would remove about 26 creosote-treated timber piles. Although sediment mobilization due to the planned work would be much less severe than was described by Romberg (2005), the sediments that would be mobilized the project are almost certainly contaminated by PAHs of creosote origin. Most of the sediment, and therefore the highest concentrations of contaminants, would likely settle out of the water close to where the piles would be pulled from. However, tugboat propeller wash may act to spread contaminated sediments as far away as 300 feet.

Amphipods and copepods uptake PAHs from contaminated sediments (Landrum and Scavia 1983; Landrum et al. 1984; Neff 1982), and pass them to juvenile Chinook salmon and other small fish through the food web. Varanasi et al. (1993) found high levels of PAHs in the stomach contents of juvenile Chinook salmon in a contaminated waterway (Duwamish). They also reported reduced growth, suppressed immune competence, as well as increased mortality in juvenile Chinook salmon that was likely caused by the dietary exposure to PAHs. Meador et al. (2006) demonstrated that dietary exposure to PAHs caused "toxicant-induced starvation" with reduced growth and reduced lipid stores in juvenile Chinook salmon. The authors surmised that these impacts could severely impact the odds of survival in affected juvenile Chinook salmon.

The annual number of juvenile PS Chinook salmon that may be exposed to contaminated forage that would be attributable to this action is unquantifiable with any degree of certainty, as is the amount of contaminated prey that any individual fish may consume, or the intensity of any effects that an exposed individual may experience. However, the relatively small affected area suggests that the probability of trophic connectivity to the contamination would be very low for any individual fish. Therefore, the numbers of juvenile Chinook salmon that may be annually exposed to contaminated prey would likely comprise extremely small subsets of the cohorts from their respective populations, and the numbers of exposed fish would be too low to cause detectable population-level effects.

<u>Structure-related altered lighting</u>

Structure-related altered lighting is likely to adversely affect PS Chinook salmon. The applicant's new mooring structure and the boats moored to it would create daytime shade that is likely to alter normal behaviors, reduce fitness, and increase vulnerability to piscine predators for some of the juvenile salmonids that encounter it. Nighttime artificial illumination of the structure and the moored vessels is also likely to alter normal behaviors of juvenile salmon, which may prolong their exposure to adverse habitat conditions in the waterway.

The new mooring structure would extend about 55 feet from the existing bulkhead, and have an over-water footprint of about 1,850 square feet. The pier and ramp would be fully-decked with 60 % open-area grating. However, the 1,320-square foot float would be solid-decked. The water depth under the new mooring structure would range from about 0 to -10 feet re. MLLW (Figure 2). The new structure would shade the water and substrate under it, and the vessels that moor against the float would add to the size and intensity of the shade. The intensity of shadow effects are likely to vary based on the brightness and angle of the sun. They would be most intense on sunny days, and less pronounced to possibly inconsequential on cloudy days.

Structure-related shade may reduce the availability of SAV and forage resources under the new structure. However, due to the limited amount of SAV at the site and on the relatively small size of the structure, structure-related impacts on cover and forage availability would be too small to cause detectable effects on the fitness and normal behaviors of juvenile salmonids in the area.

Structure-related shade is likely to alter normal behaviors in that it would cause some individuals to swim away from the shoreline. Numerous studies demonstrate that juvenile salmonids, in both freshwater and marine habitats, are more likely to avoid the shadow of an overwater structure than to pass through it (Celedonia et al. 2008a and b; Kemp et al. 2005; Moore et al. 2013; Munsch et al. 2014; Nightingale and Simenstad 2001; Ono et al. 2010; Southard et al. 2006). The shade of the new structure and moored boats is likely to induce some juvenile Chinook salmon to swim away from the shore to go around the shadow. This would place the juveniles in relatively deep water where foraging is likely to have higher energetic costs than in shallow shoreline waters (Heerhartz and Toft 2015), resulting in some degree of reduced fitness in the exposed individuals.

Swimming in deeper water is also likely to increase juvenile salmonid exposure and vulnerability to predators because deeper water favors larger predatory fish in both freshwater and marine environments (Celedonia et al. 2008a; Tabor et al. 2010; Willette 2001). Willette (2001) reports that marine piscivorous predation of juvenile salmon increased fivefold when the juveniles were forced to leave shallow nearshore habitats. Individuals that fail to escape a predatory attack would be killed. Individuals that escape would experience reduced fitness due to increased energetic costs and stress-related effects that may reduce their overall likelihood of survival.

The likelihood that any individual juvenile Chinook salmon would be injured or killed due to shade-related increased energetic costs and/or increased vulnerability to predators is expected to be very low, and that likelihood would vary greatly over time due to the complexities of predator/prey dynamics as well as variations in environmental conditions at the site over time. However, over the life of the new mooring structure, it is extremely likely that at least some individuals would be injured or killed due to the shade of the new mooring structure.

In the absence of artificial illumination, juvenile Chinook salmon in lacustrine environments are typically active during the day and inactive at night. They tend to become increasingly active at dawn when light levels reach 0.8 to 2.1 lumens per square meter (Tabor and Piaskowski 2002). Nighttime artificial illumination of the water's surface attracts fish (positive phototaxis) in marine and freshwater environments, it shifts nocturnal behaviors toward more daylight-like behaviors, and it can affect light-mediated behaviors such as migration timing (Becker et al.

2013; Celedonia and Tabor 2015; Ina et al. 2017; Tabor and Piaskowski 2002; Tabor et al. 2017). Celedonia and Tabor (2015) found that juvenile Chinook salmon were attracted to artificially lit areas at 0.5 to 2.5 lumens per square meter, and that attraction to artificial lights can delay the onset of early morning migration of juvenile Chinook salmon by up to 25 minutes. Tabor et al. (2017) found that sub yearling Chinook, coho, and sockeye salmon exhibit strong nocturnal phototaxis when exposed to 5.0 to 50.0 lumens per square meter, with phototaxis positively correlated with light intensity.

The project would include the installation of a fluorescent light near the center of the float, and a 70-watt LED light fixture near the entrance gate to provide nighttime artificial illumination of the new mooring structure. The lights would be aimed in a manner intended to limit overwater illumination, but the intensity and lateral extent of the new lights' illumination of the water is uncertain, as are any additive effects the new lights may have when combined with the vessel that would moor there, and with the existing artificial illumination of the waterway.

To address the uncertainty, this assessment considered information from a recently completed a consultation for a bridge replacement project that included a lighting system designed to limit illumination of the water yet still meet roadway safety standards (NMFS 2019). Despite the measures taken to reduce overwater illumination, bridge lighting was predicted to illuminate the water's surface between 5 and 60 feet beyond the sides of the bridge at 1.08 lumens per square meter, which exceeds the 0.5 lumen per square meter level where phototaxis has been documented in Chinook salmon (Celedonia and Tabor 2015).

The intensity and lateral extent of over-water illumination from the new structure's planned lighting system is likely to be less intense than described above. However, given the low levels of light that have been shown to affect juvenile salmon, and on the need to be protective of the listed fish, the NMFS estimates that any juvenile Chinook salmon that are within 10 to 20 feet of the new mooring structure may experience some level of nocturnal phototaxis, and may experience other altered behaviors, such as delayed departure from the area, which would prolong their exposure to adverse habitat conditions created by boat operations and by poor water quality in the waterway. Over the life of the mooring structure, it is likely that a small subset of the exposed individuals would experience reduced fitness and/or altered behaviors that could reduce their overall likelihood of survival.

<u>Summary:</u> Structure-related shade and artificial illumination would cause a combination of altered behaviors and increased risk of predation that would reduce fitness or cause mortality for some juvenile PS Chinook salmon that enter the waterway. The annual numbers of individuals that would be impacted by this stressor is unquantifiable with any degree of certainty, and the numbers are likely to vary greatly over time. However, the available information suggests that the probability of exposure would be very low for any individual fish, and only a subset of the exposed individuals would be measurably affected. Therefore, the proportion of any year's cohort that would be killed or experience measurably reduced fitness due to this stressor would be too low to cause any detectable population-level effects.

Structure-related vessel noise

Structure-related noise would cause adverse effects in PS Chinook salmon. The applicant predicts mooring about 6 motorized vessels per year at the new structure. Vessels lengths would typically range between 72 and 90 feet long, but may occasionally be a long as 150 feet. Vessel operations would typically consist of episodic brief periods of relatively low-speed operations as boats are driven to and from the breakwater. Occasionally, the moored vessels' engines and auxiliary systems would also cause continuous in-water noises while various systems undergo checks and repairs. Unlike construction noises, vessel noise would occur year-round.

Numerous sources describe sound levels for ocean-going ships and tugboats operating at transit speeds (Blackwell and Greene 2006; McKenna et al. 2012; Picciulin et al. 2010; Reine et al. 2014b; Richardson et al. 1995). Table 5 summarizes the expected sound levels for vessels close in size to those that would moor at the new float, with ranges to applicable effects thresholds.

Table 5. Estimated in-water source levels for vessels with noise levels similar to those likely to moor at the applicant's float, and ranges to effects thresholds for fish.

Source	Acoustic Signature	Source Level	Threshold Range
85 foot Tourist Ferry	< 2 kHz Combination	187 dB_{peak}	206 @ N/A
Episodic periods measured in minutes to hours		177 dB_{SEL}	150 @ 63 m
Tugboat	< 2 kHz Combination	185 dB_{peak}	206 @ N/A
Episodic periods measured in minutes to hours		170 dB_{SEL}	150 @ 22 m

It is extremely unlikely that vessels within the waterway would be run at anything close to full speed, and most auxiliary systems would be quieter than the propulsion sounds. Therefore, no fish are likely to be injured from exposure to peak sound levels, and the 150 dB_{SEL} isopleth would likely remain well within 72 feet (22 m) around the new float. Although vessel noise levels would be non-injurious, juvenile Chinook salmon that are within the 150 dB_{SEL} isopleth, are likely to experience behavioral disturbance, such as acoustic masking, startle responses, altered swimming patterns, avoidance, and increased risk of predation. The intensity of these effects would increase with increased proximity to the source and/or duration of exposure.

The annual numbers of individual juvenile PS Chinook salmon that would be affected by this stressor is unquantifiable with any degree of certainty. However, the affected individuals would represent such small subsets of their respective cohorts that the numbers of exposed fish would be too low to cause detectable population-level effects.

Structure-related Propeller Wash

Structure-related propeller wash is likely to adversely affect PS Chinook salmon. The effects of propeller wash is described above for construction. The only difference between that discussion and this is that the vessels that would moor at the new float may be operated at any time during the year.

The number of juvenile Chinook salmon that would be affected by propeller wash is unquantifiable with any degree of certainty. However, very few vessels are expected to moor at the float annually (about 6), and the resulting number of annual propulsion operation events would also be very low, likely little more than twice the number of vessels to account for round trips. Further, the number of propulsion operations that would occur when juveniles are present would be a subset of the whole. Given that, and the expectation that only a very tiny subset of any cohort may be present at any time within the waterway, the numbers of affected individuals would represent such small subsets of their respective cohorts that their loss would cause no detectable population-level effects.

The combination of low numbers of low-power propulsion events, combined with the virtual absence of SAV at the project site supports the expectation that structure-related propeller scour would cause no detectable effects of Chinook salmon.

2.5.2 Effects on Critical Habitat

This assessment considers the intensity of expected effects in terms of the change they would cause in affected Physical or Biological Features (PBFs) from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Ephemeral effects are those that are likely to last for hours or days, short-term effects would likely last for weeks, and long-term effects are likely to last for months, years or decades.

Critical Habitat for Puget Sound Chinook Salmon: The proposed action, including full application of the planned conservation measures and BMPs, is likely to adversely affect designated critical habitat for PS Chinook salmon. The expected effects would be limited to the impacts on the PBFs of estuarine and nearshore marine areas free of obstruction and excessive predation as described below.

1. Freshwater spawning sites – None in the action area.

2. Freshwater rearing sites – None in the action area.

3. Freshwater migration corridors free of obstruction and excessive predation – None in the action area.

4. Estuarine areas free of obstruction and excessive predation:
    a. Obstruction and predation – The proposed action would cause long-term minor adverse and beneficial effects on this PBF. The new mooring structure is likely to cause some juveniles to leave the shoreline to swim around its shadow, and the combination of deeper water and vessel noise may increase vulnerability to predators. Conversely, the removal of the shoreward-most 140 feet of the Pipeline Wharf and 26 supporting piles is likely to reduce migratory impacts and vulnerability to predators at the mitigation site.
    b. Water quality – The proposed action would cause ephemeral minor adverse effects and long-term minor beneficial effects on this PBF. The action would cause no measurable changes in water temperature, but construction would briefly increase suspended solids and may slightly reduce DO and introduce low levels of contaminants. Conversely, the

removal of 26 creosote-treated timber piles would reduce ongoing PAH contamination at the mitigation site. Detectable water quality impacts are expected to be limited to the area within 300 feet around either site, with construction-related impacts persisting no more than an hour after work stops.

c. Water quantity – The proposed action would cause no effect on this PBF.
d. Salinity – The proposed action would cause no effect on this PBF.
e. Natural Cover – The proposed action may cause long-term minor adverse and beneficial effects on this PBF. Increased shade at the project site may slightly reduce SAV growth, while removal of the pier section at the mitigation site may slightly improve it.
f. Forage – The proposed action would cause long term minor adverse effects on this PBF. Construction would mobilize small amounts of PAH-contaminated sediments that could be taken up by benthic invertebrates that are forage resources for juvenile Chinook salmon. Sediment distribution would likely be limited to the area within 300 feet around the Pipeline Wharf, but detectable levels of contaminants may last for years at continuously decreasing concentrations.

5. Nearshore marine areas free of obstruction and excessive predation:
   a. Obstruction and predation – Same as above.
   b. Water quality – Same as above.
   c. Water quantity – Same as above.
   d. Forage – Same as above.
   e. Natural Cover – Same as above.

6. Offshore marine areas – None in the action area.

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.

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area's future environmental conditions caused by global climate change that are properly part of the environmental baseline *vs.* cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the environmental baseline section.

The current condition of ESA-listed species and designated critical habitat within the action area are described in the status of the species and critical habitat and the environmental baseline sections above. The contribution of non-federal activities to those conditions include past and on-going bankside development in the action area, as well as upstream forest management, agriculture, urbanization, road construction, water development, and restoration activities. Those actions were driven by a combination of economic conditions that characterized traditional natural resource-based industries, general resource demands associated with settlement of local and regional population centers, and the efforts of conservation groups dedicated to restoration and use of natural amenities, such as cultural inspiration and recreational experiences.

The NMFS is unaware of any specific future non-federal activities that are reasonably certain to affect the action area. However, the NMFS is reasonably certain that future non-federal actions such as the previously mentioned activities are all likely to continue and increase in the future as the human population continues to grow across the region. Continued habitat loss and degradation of water quality from development and chronic low-level inputs of non-point source pollutants will likely continue into the future. Recreational and commercial use of nearshore marine waters within the action area is also likely to increase as the human population grows.

The intensity of these influences depends on many social and economic factors, and therefore is difficult to predict. Further, the adoption of more environmentally acceptable practices and standards may gradually reduce some negative environmental impacts over time. Interest in restoration activities has increased as environmental awareness rises among the public. State, tribal, and local governments have developed plans and initiatives to benefit ESA-listed PS Chinook salmon within the watersheds that flow into the action area. However, the implementation of plans, initiatives, and specific restoration projects are often subject to political, legislative, and fiscal challenges that increase the uncertainty of their success.

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) appreciably reduce 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.

As described in more detail above at Section 2.4, climate change is likely to increasingly affect the abundance and distribution of the ESA-listed species considered in the Opinion. It is also likely to increasingly affect the PBFs of designated critical habitats. The exact effects of climate change are both uncertain, and unlikely to be spatially homogeneous. However, climate change is reasonably likely to cause reduced instream flows in some systems, and may impact water quality through elevated in-stream water temperatures and reduced dissolved oxygen, as well as by causing more frequent and more intense flooding events.

Climate change may also impact coastal waters through elevated surface water temperature, increased and variable acidity, increasing storm frequency and magnitude, and rising sea levels. The adaptive ability of listed-species is uncertain, but is likely reduced due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation. The proposed action will cause direct and indirect effects on the ESA-listed species and critical habitats considered in the Opinion well into the foreseeable future. However, the action's effects on water quality, substrate, and the biological environment are expected to be of such a small scale that no detectable effects on ESA-listed species or critical habitat through synergistic interactions with the impacts of climate change are expected.

2.7.1 ESA-listed Species

PS Chinook salmon are listed as threatened, based on declines from historic levels of abundance and productivity, loss of spatial structure and diversity, and an array of limiting factors as a baseline habitat condition. This species will be affected over time by cumulative effects, some positive – as recovery plan implementation and regulatory revisions increase habitat protections and restoration, and some negative – as climate change and unregulated or difficult to regulate sources of environmental degradation persist or increase. Overall, to the degree that habitat trends are negative, as described below, effects on viability parameters of each species are also likely to be negative. In this context we consider the effects of the proposed action's effect on individuals of the listed species at the population scale.

PS Chinook salmon

The long-term abundance trend of the PS Chinook salmon ESU is slightly negative. Reduced or eliminated accessibility to historically important habitat, combined with degraded conditions in available habitat due to land use activities appear to be the greatest threats to the recovery of PS Chinook salmon. Commercial and recreational fisheries also continue to impact this species.

The PS Chinook salmon most likely to occur in the action area would be spring- and fall-run fish from the Nooksack River basin, and spring-, summer-, and fall-run fish from the Skagit River basin. The total abundance trend for PS Chinook salmon in the Nooksack River basin has been relatively stable since 1984, but has been dominated by hatchery returns since 1996. Conversely, the total abundance trend for PS Chinook salmon in the Skagit River basin has been slightly negative since 1974, but the fraction of natural-origin spawners is very high, and the abundance trend since the early 1990s has been slightly positive.

The project and proposed mitigation sites are both located in the nearshore marine waters of the northeast portion of Bellingham Bay. Adult PS Chinook salmon utilize the project and mitigation sites as migration habitat. Juvenile PS Chinook salmon utilize both areas to shelter and forage while they adapt to the marine environment during their seaward migration. The environmental baseline within the action area has been degraded by the effects of intense streambank and shoreline development and by industrial and maritime activities. The baseline has also been degraded by upstream industry, urbanization, agriculture, forestry, water diversion, and road building and maintenance.

Short- and long-term construction-related impacts, and long-term structure-related impacts are likely to cause a range of effects that both individually and collectively would cause altered behaviors, reduced fitness, and possible mortality in low numbers of exposed juveniles for decades to come. However, the annual numbers of individuals that are likely to be impacted by action-related stressors is expected to be very low.

Based on the best available information, the scale of the direct and indirect effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause detectable effects on any of the characteristics of a viable salmon population (abundance, productivity, distribution, or genetic diversity) for the affected PS Chinook salmon populations. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

2.7.2 Critical Habitat

As described above at Section 2.5, the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon.

Past and ongoing land and water use practices have degraded salmonid critical habitat throughout the Puget Sound basin. Hydropower and water management activities have reduced or eliminated access to significant portions of historic spawning habitat. Timber harvests, agriculture, industry, urbanization, and shoreline development have adversely altered floodplain and stream morphology in many watersheds, diminished the availability and quality of estuarine and nearshore marine habitats, and reduced water quality across the region.

Global climate change is expected to increase in-stream water temperatures and alter stream flows, possibly exacerbating impacts on baseline conditions in freshwater habitats across the region. Rising sea levels are expected to increase coastal erosion and alter the composition of nearshore habitats, which could further reduce the availability and quality of estuarine habitats. Increased ocean acidification may also reduce the quality of estuarine habitats.

In the future, non-federal land and water use practices and climate change are likely to increase. The intensity of those influences on salmonid critical habitat is uncertain, as is the degree to which those impacts may be tempered by adoption of more environmentally acceptable land use practices, by the implementation of non-federal plans that are intended to benefit salmonids, and by efforts to address the effects of climate change.

The PBFs for PS salmonid critical habitat in the action area are limited to estuarine and nearshore marine areas that are free of obstruction and excessive predation. The site attributes of those PBFs that would be affected by the action are limited to obstruction and predation, water quality, natural cover, and forage. As described above, the proposed action would cause short- and long-term minor adverse effects, as well as long-term minor beneficial effects on the site attributes of those PBFs within about 300 feet around the project and mitigation sites.

Based on the best available information, the scale of the proposed action’s effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term negative changes in the quality or functionality of any of the site attributes of critical habitat PBFs in the action area. Therefore, the critical habitats will maintain their current level of functionality, and retain their current ability for PBFs to become functionally established, to serve the intended conservation role for PS Chinook salmon.

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, the effects of other activities caused by the proposed action, and cumulative effects, it is the NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon 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 incidental take statement (ITS).

2.9.1 Amount or Extent of Take

In the Opinion, the NMFS determined that incidental take is reasonably certain to occur as follows:

Harm of juvenile Puget Sound Chinook salmon from

- exposure to construction-related noise,
- exposure to construction-related propeller wash,
- exposure to construction-related contaminated forage, and
- exposure structure-related altered lighting,
- structure-related vessel noise, and
- structure-related propeller wash.

The NMFS cannot predict with meaningful accuracy the number of juvenile PS Chinook salmon that are reasonably certain to be injured or killed annually by exposure to any of these stressors. The distribution and abundance of the fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can the NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. Additionally, the NMFS knows of no device or practicable technique that would yield reliable counts of individuals that may experience these impacts. In such circumstances, the NMFS uses the causal link established between the activity and the likely extent and duration of changes in habitat conditions to describe the extent of take as a numerical level of habitat disturbance. The most appropriate surrogates for take are action-related parameters that are directly related to the magnitude of the expected take.

For this action, the timing and duration of work, the type and size of the piles to be extracted and installed, and the method of their extraction and installation are the best available surrogates for the extent of take of juvenile PS Chinook salmon from exposure to construction-related noise. The timing and duration of work is also the best available surrogate for the extent of take of juvenile PS Chinook salmon from exposure to construction-related propeller wash.

The timing and duration of in-water work is applicable for construction-related take because the requested in-water work window avoids the expected peak presence of juvenile Chinook salmon in the action area. Therefore, working outside of the in-water work window could increase the number of fish that would be exposed to construction-related noise and propeller wash, as would working for longer than planned. Also note that in the terms and conditions that follow, the NMFS has reduced the allowable in-water work window for this project to the period between September 1 and December 31. This has been done because that window would reduce the project's overlap with the presence of rearing juvenile Chinook salmon, yet still allow the applicant 4 months to accomplish the 4 weeks of construction required for their project.

The piles and the method of their extraction and installation are applicable for construction-related noise because the intensity of effect is positively correlated with the loudness of the sound, which is determined by the type and size of the pile and the method of extraction and/or installation. Further, the number of fish that would be exposed to the noise is positively correlated with the size of the area of acoustic effect and the number of days that the area would be ensonified. In short, as the sound levels increase, the intensity of effect and the size of the ensonified area increases, and as the size of the ensonified area increases, and/or as the number of days the area is ensonified increases, the number of juvenile Chinook salmon that would be exposed to the sound would increase despite the low density and random distribution of individuals of that species in the action area. Based on the best available information about the planned pile installation and extraction, as described in Section 2.5, the applicable ranges of effect for this project are driven by the type and size of the piles and the method of their extraction and installation, and the number of pile strikes, but not by the daily duration of vibratory work. Therefore, the daily duration of vibratory pile installation and extraction work is not considered a measure of take for this action.

The removal method and the extent of the visible turbidity plumes around that work are the best available surrogates for the extent of take of juvenile PS Chinook salmon from exposure to construction-related contaminated forage. This is because the intensity of surface sediment contamination would be positively correlated with the amount of contaminated subsurface sediments that would be brought to the surface, and the numbers of contaminated prey organisms and/or exposed fish would be positively correlated with the size of the affected area. The use of removal methods such as excavators or water-jetting would mobilize more contaminated sediments than the proposed vibratory extraction of the piles. As the amount of mobilized contaminated sediments increase, the amount of biologically available contaminants would increase. Also, as the size of the visible turbidity plume increases, the size of the area where contaminated sediments would be biologically available would increase. Therefore, as the amount of mobilized contaminated sediments and/or the size of the visible turbidity plumes increase, the number of prey organisms that may become contaminated and then eaten by juvenile PS Chinook salmon would increase, despite the low density and random distribution of juveniles of both of these species in the action area.

The size and configuration of the applicant's new mooring structure are the best available surrogates for the extent of take of juvenile PS Chinook salmon from exposure to structure-related altered lighting, vessel noise, and propeller wash. This is because the likelihood of avoidance and the distance required to swim around the structure would both increase as the size of a structures and the intensity of its shadow increase, which would increase the number of juveniles enter deeper water where forage efficiency would be reduced and vulnerability to predators would be increased. Similarly, increasing the number or intensity of new lights is likely to increase the number of individuals that would be exposed to nighttime phototaxis, and to increase the intensity of phototaxic effects. Also, as the size of a structure increases, the number of boats that could moor there increases. As the number of boats increase, boating activity would likely increase, and the potential for juvenile PS Chinook salmon to be exposed to the related noise and propeller wash effects also increases.

In summary, the extent of PS Chinook salmon take for this action is defined as:

- Up to 4 weeks of in-water work between September 1 and December 31;
- Vibratory installation of 10 in-water steel pipe piles (4 no larger than 24-inches in diameter, and 6 no larger than 14-inches in diameter);
- No more than 400 in-water pile strikes, combined, to proof 4 steel pipe piles that would be no larger than 24-inches in diameter;
- No more than 200 shoreline pile strikes, combined, to install 2 8-inch diameter steel pipe piles immediately inland of the existing bulkhead;
- Vibratory extraction of 26 timber piles;
- A visible turbidity plume not to exceed 300 feet from the project or mitigation sites during any portion of the project, including movement of the contractor's tugboats; and
- The size and configuration of the new mooring structure, as described in the proposed action section of this biological opinion.

Exceedance of any of the exposure limits described above would constitute an exceedance of authorized take that would trigger the need to reinitiate consultation.

Although these take surrogates could be construed as partially coextensive with the proposed action, they nevertheless function as effective reinitiation triggers. If the size and configuration of the structure exceeds the proposal, it could still meaningfully trigger reinitiation because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance, including post-construction (33 CFR 326.4).

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

The COE shall require the applicant to:

1. Minimize incidental take of PS Chinook salmon from exposure to construction-related noise and propeller wash.

2. Minimize incidental take of PS Chinook salmon from exposure to contaminated forage.

3. Minimize incidental take of PS Chinook salmon from exposure to structure-related altered light, vessel noise, and propeller wash.

4. Ensure the implementation of monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded.

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the COE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The COE 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. To implement RPM Number 1, Minimize incidental take of PS Chinook salmon from exposure to construction-related noise and propeller wash, the COE shall require the applicant to require their contractors to:
   a. Limit in-water work, including the use of tugboats, to 4 weeks between September 1 and December 31;
   b. Limit in-water pile installation to:
      i. 10 in-water steel pipe piles (4 no larger than 24-inches in diameter, and 6 no larger than 14-inches in diameter);
      ii. A combination of vibratory and impact installation equipment, and
      iii. No more than 400 in-water pile strikes total.
   c. Limit shoreline pile installation to 2 steel pipe piles no larger than 8-inches, and no more than 200 total strikes; and
   d. Limit pile extraction to vibratory pulling of 26 timber piles.

2. To implement RPM Number 2, Minimize incidental take of PS Chinook salmon from exposure to contaminated forage, the COE shall require the applicant to require their contractors to:
   a. Extract piles slowly by pulling. No water-jetting or clamshell digging shall be used;
   b. Ensure that extracted piles are not shaken, hosed off, left hanging to dry, or that any other actions are taken to remove adhering material from piles while they are suspended over the water; and
   c. Adjust pile extraction and tugboat operations to ensure that the visible turbidity plume does not exceed 300 feet from the project site, and to halt work should the visible turbidity plume approach and that range.

3. To implement RPM Number 3, Minimize incidental take PS Chinook salmon from exposure to structure-related effects, the COE shall require the applicant to ensure that the size and configuration of the new mooring structure does not exceed the dimensions described in the proposed action section above. In particular:
   a. The new mooring structure shall have a total over-water area of no more than 1,850 square feet, and extend no more than 50 feet from the existing bulkhead;
   b. The new pier and ramp shall be fully decked with a minimum of 60% open area grating;
   c. The new float shall have be no longer than 120 feet, and have an over-water area of no more than 1,320 square feet; and
   d. The new structure shall include no more than 10 in-water steel pipe piles (4 no larger than 24-inches in diameter, and 6 no larger than 14-inches in diameter).

4. To implement RPM Number 4, Implement monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded, the COE shall require the applicant to develop and implement a plan collect and report details about the take of listed fish. That plan shall:
   a. Require the contractor to maintain and submit construction logs to verify that all take indicators are monitored and reported. Minimally, the logs should include:
      i. The dates (with workday start and stop times) and descriptions of all in-water work;
      ii. The type, size, and number of piles installed and/or extracted per day;
      iii. The method of pile installation and/or extraction;
      iv. The number of pile strikes;
      v. A description of best management practices and conservation measures employed; and
      vi. The extent (feet) and duration of visible turbidity plumes around pile work and during tugboat operations.
   b. Require the contractor to establish procedures for the submission of the construction logs and other materials to the appropriate COE office and to NMFS; and
   c. Require the contractor to submit an electronic post-construction report to NMFS within six months of project completion. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2019-00255 in the subject line.

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. The COE should encourage the applicant limit in-water work to October 1 through December 31.

2. The COE should require the applicant to install full-depth sediment curtains to fully enclose pile extraction work;

3. The COE and the applicant should encourage contracted tugboat operator(s) to use the lowest safe maneuvering speeds and power settings when maneuvering in shallow waters close to the shoreline to minimize propeller wash and mobilization of sediments.

4. The COE should encourage the applicant to install perching deterrent devices on the tops of the new piles and light fixtures.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S Army Corps of Engineers' authorization of the All American Marine I & J Float and Pier Project in Bellingham, Washington, (NWS-2019-226).

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service 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 identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

This assessment was prepared pursuant to section 7(a)(2) of the ESA, implementing regulations at 50 CFR 402 and agency guidance for preparation of letters of concurrence.

As described in section 1.2, the COE determined the proposed action would be not likely to adversely affect PS steelhead and its critical habitat, PS/GB bocaccio, PS/GB yelloweye rockfish, and SR killer whales, but would have no effect on the designated critical habitats for the last three species. However, the NMFS has concluded that the proposed action may affect designated critical habitat for PS/GB bocaccio, PS/GB yelloweye rockfish, and SR killer whales because the action area overlaps with areas that have been designated as critical habitat for all three species. Further, the NMFS has concluded that the action would have no effect on designated critical habitat for PS steelhead, because no marine waters were designated as critical habitat for that species. Detailed information about the biology, habitat, and conservation status and trends of these listed resources can be found in the listing regulations and critical habitat designations published in the Federal Register, as well as in the recovery plans and other sources at: http://www.nmfs.noaa.gov/pr/species/fish/, and are incorporated here by reference.

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. The effects analysis in this section relies heavily on the descriptions of the proposed action and project site conditions discussed in Sections 1.3 and 2.4, and on effects analyses presented in Section 2.5.

2.12.1 Effects on Listed Species

PS steelhead: Action-related stressors would cause no measurable effects on fish beyond about 328 feet around the project site within the I & J Waterway, and 300 feet around the mitigation site at the Bellingham Shipping Terminal. It is very unlikely that PS steelhead would be within those distances at either site. Juvenile steelhead are generally independent of shallow nearshore areas soon after entering marine water (Bax et al. 1978, Brennan et al. 2004, Schreiner et al. 1977), and are not commonly caught in beach seine surveys. Recent acoustic tagging studies (Moore et al. 2010) have shown that smolts migrate from rivers to the Strait of Juan de Fuca from one to three weeks. Returning adults typically migrate in relatively deepwater well away from shore until the near the entrance of their natal streams. Therefore, the action is not likely to adversely affect PS steelhead.

PS/GB bocaccio and PS/GB yelloweye rockfish: Based on the expected range of effects on fish, and the location of the project site relative to the closest habitats that are reasonably likely to support any life stage of PS/GB bocaccio and PS/GB yelloweye rockfish, it is extremely unlikely that any individuals of either of these marine species would be exposed to any action-related stressors capable of causing measurable effects. Therefore, the action is not likely to adversely affect those species.

SR killer whale: SR killer whale sightings within Bellingham Bay are uncommon. Based on that, and the short duration of project-related work, it is very unlikely that any SR killer whales would approach close enough to either project site to be exposed to any project-related effects other than noise and to possible indirect effects through the trophic web.

Pile installation in the I & J Waterway would cause 3 days of mixed impulsive and non-impulsive noise, consisting of up to 6 60-minute periods of non-impulsive vibratory noise, and up to 600 impacts. Pile extraction at the mitigation site would cause 3 days of non-impulsive noise, consisting of numerous periods of non-impulsive vibratory noise that could approach 7 hours of cumulative noise per day.

The peak noise levels of all project-related sound sources would be non-injurious to SR killer whales and other marine mammals (NMFS 2018b), but detectable in-water noise would extend from the I & J Waterway to Lummi Island. Sound levels at or above the 120 dBRMS threshold for the onset of behavior disturbance for exposure to non-impulsive noise would extend to about 6.2 miles from the construction site during vibratory installation of 24 inch steel pipe piles, and 1.6 miles around the mitigation site during vibratory extraction of 12-inch timber piles. In-water sound levels at or above the 160 dBRMS threshold for the onset of behavior disturbance for exposure to impulsive noise would extend to about 177 feet (54 m) around barge spud deployments. Based on the expectation that contractors would use blocks to attenuate the noise from impact pile driving, in-water sound levels at or above the 160 dBRMS threshold would be limited to areas within 95 and 243 feet (29 and 74 m), respectively for impact driving 8- and 14-inch diameter steel pipe piles (Table 6).

Table 6. Estimated in-water source levels for project-related source levels with the ranges to the source-specific effects thresholds for marine mammals and fish.

Source	Acoustic Signature	Source Level	Threshold Range
Spuds	< 1,600 Hz Impulsive	201 dB_{peak}	206 @ N/A
Estimate about 4 impacts per day when barges are moved.		186 dB_{RMS}	160 @ 54 m
		176 dB_{SEL}	150 @ 54 m
Imp. 14-inch Steel Pipe piles	< 1,600 Hz Impulsive	199 dB_{peak}	206 @ N/A
Estimate 1 day of work with up to 600 impacts, with 10 & 6 dB attenuation for peak, RMS, and SEL for use of blocks.		188 dB_{RMS}	160 @ 74 m
		176 dB_{SEL}	150 @ 54 m
Vib. Install 24-inch Steel Pipe Piles	< 2.5 kHz Non-Impulsive	193 dB_{peak}	206 @ N/A
Estimate 1 day with up to 4 hours of cumulative vibratory noise.		180 dB_{RMS}	120 @ 10,000 m
		180 dB_{SEL}	150 @ 100 m
Imp. 8-inch Steel Pipe piles	< 1,600 Hz Impulsive	193 dB_{peak}	206 @ N/A
Estimate 1 day of work with up to 200 impacts, with 10 & 6 dB attenuation for peak, RMS, and SEL for use of blocks.		182 dB_{RMS}	160 @ 29 m
		170 dB_{SEL}	150 @ 22 m
Vib. 14-inch Steel Pipe piles	< 2.5 kHz Non-Impulsive	187 dB_{peak}	206 @ N/A
Estimate 1 day with up to 6 hours of cumulative vibratory noise.		172 dB_{RMS}	120 @ 2,929 m
		172 dB_{SEL}	150 @ 29 m
Vib. Extract 12-inch Timber Piles	< 2.5 kHz Non-Impulsive	181 dB_{peak}	206 @ N/A
Estimate up to 3 days of work with up to 7 hours of cumulative vibratory noise per day.		171 dB_{RMS}	120 @ 2,512 m
		171 dB_{SEL}	150 @ 25 m
Tug Propulsion	< 1 kHz Combination	185 dB_{peak}	206 @ N/A
Estimate up to 2 hours of continuous vessel noise per day when barges are moved.		170 dB_{RMS}	120 @ 2,154 m
		170 dB_{SEL}	150 @ 22 m

In the very unlikely event that a killer whale would approach close enough to hear and respond to project-related noise, they would, at most, experience brief periods of low-level acoustic masking, and they may exhibit temporary minor avoidance of the narrow swath of water near the middle of Belling Bay and the waters within about 1.6 miles around the mitigation site (Figure 4). The exposure would cause no impacts on its fitness, and it would cause no meaningful impacts on its normal behaviors. Additionally, the proposed action would also cause no measurable trophic effects on SR killer whales because it would cause no population-level effects on the Chinook salmon that are their main prey resource (Section 2.5). Therefore, the action is not likely to adversely affect SR killer whales.

2.12.2 Effects on Critical Habitat

This assessment considers the intensity of expected effects in terms of the change they would cause in affected PBFs from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Ephemeral effects are those that are likely to last for hours or days, short-term effects would likely to last for weeks, and long-term effects are likely to last for months, years or decades.

PS/GB Bocaccio and PS/GB Yelloweye Rockfish Critical Habitat: The 8-mile long narrow wedge portion of the action area begins to overlap with designated nearshore critical habitat for PS/GB bocaccio at about 2.5 miles southwest from the waterway, and at about 6 miles it overlaps with deepwater critical habitat for PS/GB bocaccio and PS/GB yelloweye rockfish. However, the project's stressors would cause no measurable effects on fish or any of the PBF of rockfish critical habitat beyond about 328 feet from either project site. Therefore, the proposed action is not likely to adversely affect rockfish critical habitat.

SR killer whale Critical Habitat: Designated critical habitat for SR killer whales includes marine waters of the Puget Sound that are at least 20 feet deep, including all of Bellingham Bay. The expected effects on SR killer whale critical habitat from completion of the proposed action, including full application of the conservation measures and BMP, would be limited to the impacts on the PBF as described below.

1. Water quality to support growth and development
   The proposed work would cause ephemeral minor effects, and the structure would cause long-term minor effects on water quality. It would cause no measurable changes in water temperature and salinity. Construction would briefly introduce low-levels of contaminants that may be detectable within about 300 feet around the project site, but would not persist past several hours after work stops.

2. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth
   The proposed action would cause long-term minor effects on prey availability. Action-related impacts would injure low numbers of individual juvenile Chinook salmon (primary prey), but the impacts would be too small to cause population-level effects on that species. Therefore, it would cause no detectable reduction in prey availability.

3. Passage conditions to allow for migration, resting, and foraging
   The proposed action would cause ephemeral minor effects on passage conditions. Over 6 days, construction-related noise may radiate into Bellingham Bay from the construction and mitigation sites. Exposure to this noise would, at most, cause brief episodic periods of low-level acoustic masking, and minor avoidance of the ensonified areas. However, the temporary areal avoidance would not hinder migration, or limit access to important habitat resources.

Therefore, the proposed action is not likely to adversely affect SR killer whales critical habitat.

For the reasons expressed immediately above, the NMFS concurs with the COE's determination that the proposed action is not likely to adversely affect ESA-listed PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish, and SR killer whales, and has concluded that the action may affect, but is not likely to adversely affect designated critical habitat for those species.

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

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

This analysis is based, in part, on the EFH assessment provided by the COE and the descriptions of EFH for Pacific Coast Salmon (Pacific Fishery Management Council [PFMC] 2014), Pacific Coast Groundfish (PFMC 2005), and Coastal Pelagic Species (PFMC 1998) 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 project sites are located in the marine waters of Bellingham Bay (Figure 1). The action area includes waters and substrates that have been designated as EFH for various life-history stages of Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species. The action area also includes areas that qualify as habitat areas of particular concern (HAPC).

Marine EFH for Pacific Coast Salmon is identified and described in Appendix A to the Pacific Coast salmon fishery management plan (PFMC 2014). The major components of marine EFH are: Estuarine rearing; Ocean rearing; and juvenile and adult migration. The important features of this EFH are: (1) Water quality (e.g., dissolved oxygen, nutrients, temperature, etc.); (2) Water quantity, depth, and velocity; (3) Riparian-stream-marine energy exchanges; (4) Channel gradient and stability; (5) Prey availability; (6) Cover and habitat complexity (e.g., LWD, pools, aquatic and terrestrial vegetation, etc.); (7) Space; (8) Habitat connectivity from headwaters to the ocean (e.g., dispersal corridors); (9) Groundwater-stream interactions; (10) Connectivity with terrestrial ecosystems; and (11) Substrate composition. Pacific Coast Salmon HAPC include: Complex channels and floodplain habitats; Thermal refugia; Spawning habitat; Estuaries; and Marine and estuarine submerged aquatic vegetation.

Pacific Coast Groundfish EFH is identified as: All marine waters and substrate from mean higher high water (MHHW) or the upriver extent of saltwater intrusion out to depths less than or equal to 11,484 feet (3,500 m); Certain specifically identified seamounts in depths greater than 11,484 feet; and Areas designated as HAPCs not already identified by the above criteria (PFMC 2005). Pacific Coast Groundfish HAPC includes: Estuaries; Canopy Kelp; Seagrass; Rocky Reefs; and Areas of interest. For Coastal Pelagic Species, EFH is identified as all marine and estuarine waters from the shoreline to the offshore limits of the exclusive economic zone (EEZ) and above the thermocline where sea surface temperatures range between 10°C to 26°C (PFMC 1998).

Succinct identification of specific habitat features that are necessary to support the full life cycles of Groundfish and Pelagic Species are absent from their respective EFH descriptions. This is caused primarily by the large number of species, and the wide range of habitats that are considered in the associated fishery management plans (FMPs). However, the important features identified for Salmon EFH effectively address the habitat features that are necessary to support the full life cycle for all three species groups that may be affected by the proposed action. Therefore, the important features of Salmon EFH are used below to assess the impacts on EFH for all three species groups.

3.2 Adverse Effects on Essential Fish Habitat

The ESA portion of this document (Sections 1 and 2) describes the proposed action and its adverse effects on ESA-listed species and critical habitat, and is relevant to the effects on EFH. Based on the analysis of effects presented in Section 2.5 the proposed action will cause minor short- and long-term adverse effects, and minor long-term beneficial effects on EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species as summarized below.

1. Water quality: – The proposed action would cause a mix of ephemeral minor adverse effects and long-term minor beneficial effects on water quality. Construction would briefly increase suspended solids and may temporarily introduce low levels of contaminants. Also, low levels of pollutants from equipment may enter the water during construction. Conversely, the removal of 26 creosote-treated timber piles would reduce ongoing PAH contamination at the mitigation site. Detectable effects would be limited to the area within about 300 feet of the project sites. No changes in water temperature or salinity are expected.

2. Water quantity, depth, and velocity: – The proposed action may cause long-term minor adverse effects on water velocity within the I & J Waterway. The new mooring structure and its piles may slightly alter the direction and velocity of water flows immediately adjacent to it. Conversely, removal of the shoreward-most section of the Pipeline Wharf and the 26 supporting piles may cause long-term minor beneficial effects on water velocity along the shoreline at the mitigation site. No changes in water quantity or depth are expected.

3. Riparian-stream-marine energy exchanges: – No changes expected.

4. Channel gradient and stability: – No changes expected.

5. Prey availability: – The proposed action would cause long term minor adverse effects on prey availability. Mobilization of subsurface sediments during pile removal would slightly increase PAH contamination in the invertebrate prey organisms within about 300 feet of the mitigation site.

6. Cover and habitat complexity: – The proposed action may cause short-term minor impacts on SAV at the mitigation site, where SAV is limited to a few common macro algae species. No kelp is documented at either site, and documented eelgrass beds are outside of the range of expected effects. Work-related spud impacts and propeller scour may damage or destroy small amounts of macro algae at the mitigation site, but those resources would likely recover to pre-construction levels with 1 or 2 seasons, and over time, removal of the derelict pier section may improve conditions for SAV growth at the site.

7. Space: – No changes expected.
8. Habitat connectivity from headwaters to the ocean: – No changes expected.

9. Groundwater-stream interactions: – No changes expected.

10. Connectivity with terrestrial ecosystems: – No changes expected.

11. Substrate composition: – No changes expected.

Estuaries and marine SAV are the only HAPC likely to be affected by the proposed action. All effects on these HAPC are identified above at 1, 2, 5, and 6.

3.3 Essential Fish Habitat Conservation Recommendations

The proposed action includes conservation measures, BMP, and design features to reduce construction- and structure-related impacts on the quantity and quality of EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species. It also includes the removal of the shoreward most 1,850 square feet of solid-decked creosote-treated timber wharf and 26 supporting creosote-treated timber piles. With the exception of the following conservation recommendations to reduce impacts on water quality and prey availability, the NMFS knows of no other reasonable measures to further reduce effects on EFH.

To reduce adverse impacts on water quality and prey availability, the COE should require the applicant to require their contractors to:

1. Install full-depth sediment curtains to fully enclose pile extraction work;

2. Extract piles slowly by pulling with no use of water-jetting or clamshell digging;

3. Ensure that extracted piles are not shaken, hosed off, left hanging to dry, or that any other actions are taken to remove adhering material from piles while they are suspended over the water; and

4. Adjust pile extraction and tugboat operations to ensure that turbidity does not exceed 300 feet from the project site, and to halt work should the visible turbidity plume approach and that range.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the COE must provide a detailed written response in to the 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 the NMFS' EFH Conservation Recommendations unless the NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of 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 the 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, the 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 COE 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 is the COE. Other users could include the Port of Bellingham, WDFW, the government and citizens of Whatcom County and the City of Bellingham, and Native American tribes. Individual copies of this Opinion were provided to the COE. The document will be available within two weeks 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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