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-2019-03996

May 1, 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 Deer Harbor Marina Float Addition Project, San Juan County, Washington, COE Number: NWS-2019-50, Sixth Field HUC: 171100030700 – Haro Strait - Strait of Georgia.

Dear Ms. Walker:

Thank you for your letter of January 31, 2020, 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 Deer Harbor Marina Float Addition 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, Puget Sound/Georgia Basin (PS/GB) bocaccio, and designated critical habitat for both species, but is not likely to jeopardize the continued existence of those species, or to result in the destruction or adverse modification of their designated critical habitats. 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.

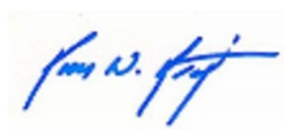
This Opinion also documents our conclusion that the proposed action is not likely to adversely affect Hood Canal Summer-run (HCSR) chum salmon, PS steelhead, PS/GB yelloweye rockfish and its designated critical habitat, southern eulachon, southern green sturgeon, southern resident (SR) killer whales and its designated critical habitat, humpback whales, and leatherback sea turtles. Impacts on critical habitat for HCSR chum salmon, PS steelhead, southern eulachon, southern green sturgeon, humpback whales, and leatherback sea turtles were not considered in this opinion because critical habitat for those species doesn't occur within the action area, or as in the case of humpback whales, has not been designated.

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 2 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: Jordan Bunch, 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

Deer Harbor Marina Float Addition Project
San Juan County, Washington (6th Field HUC 171100030700 – Haro Strait - Strait of Georgia)
(COE Number: NWS-2019-50)

NMFS Consultation Number: WCRO-2019-03996

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
Chum Salmon (Oncorhynchus keta) Hood Canal Summer-run	Threatened	No	No	N/A	N/A
Steelhead (O. mykiss) PS	Threatened	No	No	N/A	N/A
Bocaccio (Sebastes paucispinis) Puget Sound /Georgia Basin (PS/GB)	Endangered	Yes	No	Yes	No
Yelloweye rockfish (S. ruberrimus) PS/GB	Threatened	No	No	No	No
Southern Eulachon (Thaleichthys pacificus)	Threatened	No	No	N/A	N/A
Southern Green Sturgeon (Acipenser medirostris)	Threatened	No	No	N/A	N/A
Killer whales (Orcinus orca) Southern resident (SR)	Endangered	No	No	No	No
Humpback whales (Megaptera novaeangliae)					
Mexico DPS	Threatened	No	No	N/A	N/A
Central American DPS	Endangered	No	No	N/A	N/A
Leatherback Sea Turtle (Dermochelys coriacea)	Endangered	No	No	N/A	N/A

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: May 1, 2020

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LIST OF ACRONYMS

ACZA – Ammoniacal Copper Zinc Arsenate (wood preservative)
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
HCSR – Hood Canal Summer-run (chum salmon)
HPA – Hydraulic Project Approval
HUC – Hydrologic Unit Code
ITS – Incidental Take Statement
mg/L – Milligrams per Liter
µg/L – Micrograms per Liter
MLLW – Mean Lower Low Water
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NTU – Nephlometric Turbidity Units
PAH – Polycyclic Aromatic Hydrocarbons
PBF – Physical or Biological Feature
PCB – Polychlorinated Biphenyl
PCE – Primary Constituent Element
PFMC – Pacific Fishery Management Council
ppt – Parts Per Thousand
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)
TSS – Total Suspended Solids

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 January 31, 2020, the NMFS received a letter from the U.S. Army Corps of Engineers (COE, (COE 2020) requesting formal consultation for the proposed action. That request included an enclosed biological assessment (BA) for the proposed action (Jen-Jay 2019). Because the information provided in the enclosed BA was sufficient to complete the requested consultation, formal consultation for the proposed action was initiated on that date.

No conference is required for this action concerning the September 19, 2019, proposed rulemaking by the NMFS to revise designated critical habitat for SR killer whales (84 FR 49214), because the proposed additional critical habitat is located well outside of the action area.

This Opinion is based on the information in the BA; recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon and PS/GB bocaccio; published and unpublished scientific information on the biology and ecology of those 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 Deer Harbor Marina, LLC. to install two new floats at their marina in Deer Harbor, Orcas Island, Washington (Figure 1). The new floats would comprise a combined total of 1,666 square feet of new over-water. To mitigate for the impacts of the 2 new over-water structures, the applicant would remove 2 creosote-treated timber piles, install grated decking on 2 solid-decked floats with a combined foot print of 464 square feet, relocate 1 of the re-decked floats to deeper water, remove 678 square feet of over-water structure, and relocate a 138-square foot solid-decked float to a location farther from shore and under an existing ramp.

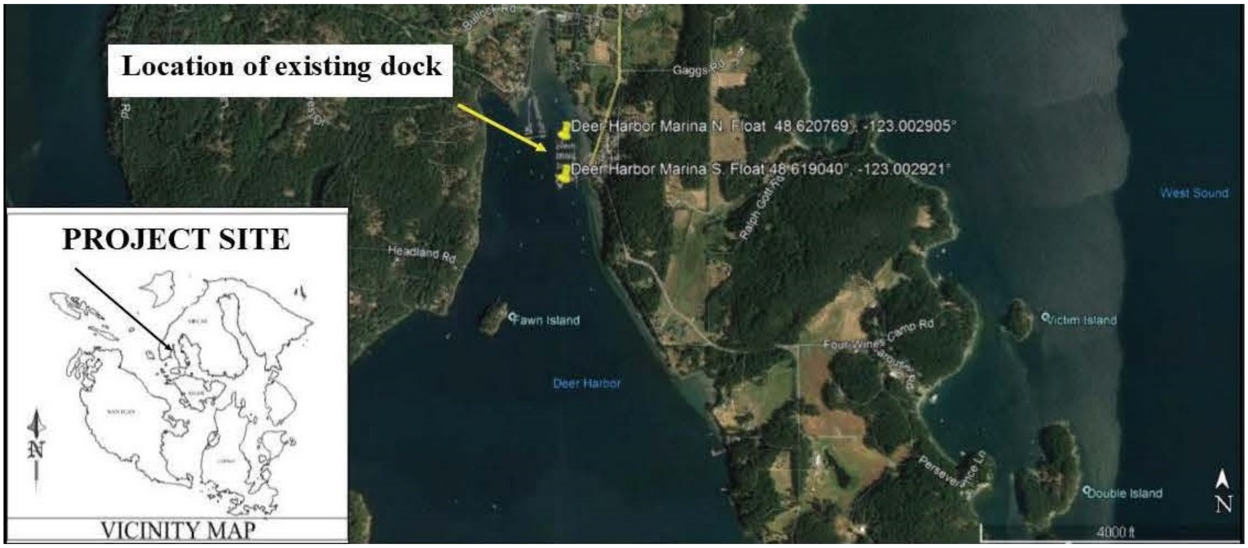

Figure 1. Google satellite photograph of the Deer Harbor Marina project site at Orcas Island, Washington. The lower left image shows the project site's relative position in the San Juan Islands (Adapted from Jen-Jay 2019, figure 1).

The applicant proposes to install new floats off the marina's north and south walkways (Figure 2). The new north float would be 70 feet long, 7 feet wide, and consist of alternating solid-decked steel floatation tubs and open sections. The steel tubs would be 7 feet wide, 5 feet long, and 5 feet deep. The open space sections would be 7 feet wide, 5 feet long, and fully decked with grating with a minimum of 60 percent (%) light penetration. The new float would be stabilized by 1 12-inch diameter steel pipe pile. The new south float would be 112 feet long, 10.5 feet wide, and also consist of alternating steel floatation tub units and open sections. Two 5-foot wide, 7-foot long, and 7-foot deep steel tubs would be joined side by side, with a 6-inch gap between, to form a 10.5-foot wide by 7-foot long unit. The open space sections between the tub units would be 7 feet long by 10.5 feet wide, and fully decked with grating with a minimum of 60% light penetration. The new south float would be stabilized by 4 18-inch diameter steel pipe piles.

The new north float would be installed off the north walkway, where the water depth is about 26 feet below mean lower low water (-26 feet re. MLLW), the substrate consists mostly of solid rock transitioning to mud, and the submerged aquatic vegetation (SAV) consists of 10 to 20% coverage by Saccharina kelp and macro algae species. The new south float would be installed off the end of the south walkway, where the water depth ranges from about -27 to -30 feet re. MLLW, the substrate consists of mud, and there is no SAV.

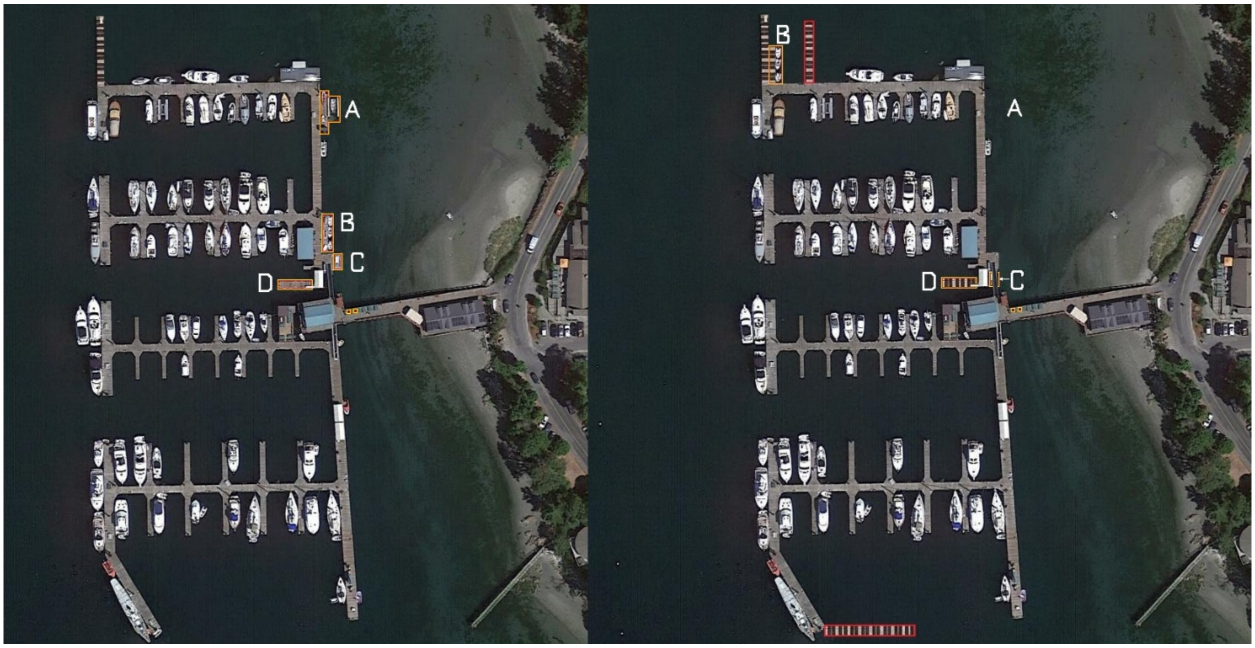

Figure 2. Google satellite photographs of the Deer Harbor Marina. The left image shows the existing conditions, and the right shows the post-project conditions. The new north and south floats are outlined in red in the right image. The “A” in both images indicates the float and lift to be fully removed. The “B” indicates the float to be re-decked with grating then relocated to deeper water. The “C” indicates the solid-decked float to be relocated under the walkway. The “D” indicates the float to be re-decked with grating but left in-place. The two red dots south of the “C” indicate the locations of the 2 timber piles to be removed.

Site access for construction would be from the water via the contractor’s spud barge, from existing roadways, and from existing marina floats. The new floats would be pre-fabricated off-site and towed into place. The steel piles would be brought to the site by barge, and installed using a barge-mounted crane with a vibratory pile driver and/or rock drill. The contractor’s barge is equipped with 2 16-inch square spuds, and it is expected to deploy spuds a total of five times, once for each pile installation. No spuds will be deployed in areas with SAV. The applicant estimates that a maximum of 22 minutes of vibratory/drill pile installation would be required per pile, and that no impact proofing would be done. Up to 4 piles may be installed in a single day, but pile installation may occur over 2 to 3 days. Following pile installation, work boats would tow the new floats into place, where they would be secured to the piles with steel hoop restraints.

The contractor would temporarily remove pier decking to access and remove 2 creosote-treated timber piles (red dots in the walkway south of float “C” in Figure 2). They would pull the piles with a barge-mounted crane and a vibratory pile extractor, then fill the resulting holes with clean sand. Working from the barge and/or existing walkways, the contractors would use hand tools to remove the solid-wood decking from a 252-square-foot dingy dock (“B” in Figure 2) and from a 212-square foot boat rental dock (“D” in Figure 2), and replace the decking with grating with a minimum of 60% light penetration. They would also relocate the re-decked dingy dock to deeper water near the northwest end of the north walkway. The boat rental dock would remain in its current location. They would tow the 138-square-foot, solid-decked work float to a location under the adjacent solid-decked ramp ("C" in Figure 2). They would also use the crane to permanently remove the 378-square foot shearwater dock and 299-square foot boatlift ("A" in Figure 2). All debris, including the timber piles, would be placed by crane onto the barge or onto land for transportation to appropriate upland disposal facilities.

The project would require about 2 weeks of work to be done during the September 1 through March 1 in-water work window for the area, most likely to be done between the late September and the end of October. The applicant would require their contractor to comply with all protective measures and best management practices (BMP) identified in the project BA, as well as those identified by state regulators, including the Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) for this project (WDFW 2019). The project also includes a marine mammal monitoring plan that includes an observation vessel positioned at the mouth of Deer Harbor and requires the postponement or halt of pile installation if any whale approaches to within 656 yards (600 m) of the marina (Jen-Jay 2018a; 2020), and a 5-year kelp monitoring and mitigation plan that is designed to detect potential changes in the density and/or distribution of kelp and macroalgae at the new north float installation site (Jen-Jay 2018b). The kelp monitoring and mitigation plan also includes a commitment to consult with State biologists and to mitigate for kelp and macroalgae reduction if it occurs.

We also considered whether or not the proposed action would cause any other activities. The stated purpose for this action is to increase the available moorage space at the marina. The marina currently has 110 slips for vessels averaging 38 feet in length. The new floats would add 364 feet of new moorage space where about 10 more similar sized vessels could moor. We believe that increased transient vessel traffic and moorage at the marina would be a direct consequence of the proposed action because that additional activity would not readily occur without the increased moorage availability. Therefore, we have also analyzed the effects of increased transient vessel traffic and moorage at the marina 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.

The COE determined that the proposed action is likely to adversely affect PS Chinook salmon, PS/GB bocaccio, and designated critical habitat for both species. The COE also determined that the proposed action is not likely to adversely affect HCSR chum salmon, PS steelhead, PS/GB yelloweye rockfish and its designated critical habitat, southern eulachon, southern green sturgeon, SR killer whales and its designated critical habitat, humpback whales, and leatherback sea turtles. Because the proposed action is likely to adversely affect listed species, the NMFS has proceeded with formal consultation. As described in section 2.12, the NMFS concurs with the COE's not likely to adversely affect determinations identified above (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)
bocaccio (*Sebastes paucispinis*) Puget Sound/Georgia Basin	Endangered	LAA	LAA	04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041)
ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Chum Salmon (Oncorhynchus keta) Hood Canal Summer-run	Threatened	NLAA	N/A	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
steelhead (*O. mykiss*) Puget Sound	Threatened	NLAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)
yelloweye rockfish (*S. ruberrimus*) PS/GB	Threatened	NLAA	NLAA	04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041)
Southern Eulachon (Thaleichthys pacificus)	Threatened	NLAA	N/A	03/18/10 (75 FR 13012) / 10/20/11 (76 FR 65324)
Southern Green Sturgeon (Acipenser medirostris)	Threatened	NLAA	N/A	04/07/06 (71 FR 17757) / 10/09/09 (74 FR 52300)
killer whales (*Orcinus orca*) southern resident	Endangered	NLAA	NLAA	11/18/05 (70 FR 57565) / 11/29/06 (71 FR 69054)
Humpback whales (Megaptera novaeangliae)				
Mexico DPS	Threatened	NLAA	N/A	09/08/16 (81 FR 62260) / N/A
Central American DPS	Endangered	NLAA	N/A	09/08/16 (81 FR 62260) / N/A
Leatherback Sea Turtle (Dermochelys coriacea)	Endangered	NLAA	N/A	06/02/70 (35 FR 8491) / 01/26/12 (77 FR 4170)

LAA = likely to adversely affect NLAA = not likely to adversely affect N/A = not in the action area or not designated

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 to assess the viability of the populations that constitute the species (McElhany et al. 2000). 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.

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).

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.

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 2017a).

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: No rivers or streams within the San Juan Islands support spawning of Chinook or other salmon. However adults and juveniles from any of the PS Chinook salmon populations, especially populations in the Strait of Georgia and Whidbey Basin MPGs could be present within the action area. Those populations include spring, summer, and fall-run fish (WDFW 2020; NWFSC 2015). Sub-adult and adult PS Chinook salmon may utilize the action area for forage or other resources during anytime of the year.

Low numbers of juveniles from some of those populations also enter the action area where they may shelter and forage during their migration toward the ocean. Beamer and Fresh (2012) report that relatively large (< 50 mm) juvenile Chinook salmon are present in the San Juan Islands between April and October. Peak abundance is in June, with abundance slowly diminishing through October. The information in Beamer and Fresh (2012) also suggests that juvenile Chinook salmon likely utilize the San Juan Islands mostly as migratory habitat on their way to the ocean, tending to move along the outer shores of the islands more than holding and rearing in shoreline areas of the inside passages.

Of 11 broad geographic areas Beamer and Fresh identified in the San Juan Islands, the density of juvenile Chinook salmon was greatest along the northwestern shores of the islands (Waldron Island - President Channel). The three next highest densities were just over 20 percent of that found along the northwestern shores. Those three areas are along the outer shores of the islands along Rosario Strait and along the south shore of Lopez Island. The next highest densities were found along the outer south shore of San Juan Island and in East Sound, at about 10 percent of the density found along the northwestern shores. The densities within Deer Harbor and West Sound were the lowest of the 11 areas sampled, at about 0.01 individuals per hectare.

Puget Sound/Georgia Basin (PS/GB) Bocaccio

The PS/GB bocaccio distinct population segment (DPS) was listed as endangered on April 28, 2010 (75 FR 22276). In April 2016, we completed a 5-year status review that recommended the DPS retain its endangered classification (Tonnes et al. 2016), and we released a recovery plan in October 2017 (NMFS 2017b).

The VSP criteria described by McElhaney et al. (2000), and summarize at the beginning of Section 2.2, identified spatial structure, diversity, abundance, and productivity as criteria to assess the viability of salmonid species because these criteria encompass a species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. These viability criteria reflect concepts that are well founded in conservation biology and are generally applicable to a wide variety of species because they describe demographic factors that individually and collectively provide strong indicators of extinction risk for a given species (Drake et al. 2010), and are therefore applied here for PS/GB bocaccio.

General Life History: The life history of bocaccio includes a larval/pelagic juvenile stage that is followed by a juvenile stage, and subadult and adult stages. As with other rockfish, bocaccio fertilize their eggs internally and the young are extruded as larvae that are about 4 to 5 mm in length. Females produce from several thousand to over a million offspring per spawning (Love et al. 2002). The timing of larval parturition in PS/GB bocaccio is uncertain, but likely occurs within a five to six month window that is centered near March (Greene and Godersky 2012; NMFS 2017b; Palsson et al. 2009). Larvae are distributed by prevailing currents until they are large enough to actively swim toward preferred habitats, but they can pursue food within short distances immediately after birth (Tagal et al. 2002). Larvae are distributed throughout the water column (Weis 2004), but are also observed under free-floating algae, seagrass, and detached kelp (Love et al. 2002; Shaffer et al. 1995). Unique oceanographic conditions within Puget Sound likely result in most larvae staying within the basin where they are released rather than being broadly dispersed (Drake et al. 2010).

At about 3 to 6 months old and 1.2 to 3.6 inches (3 to 9 cm) long, juvenile bocaccio gravitate to shallow nearshore waters. Rocky or cobble substrates with kelp is most typical, but sandy areas with eelgrass are also utilized for rearing (Carr 1983; Halderson and Richards 1987; Hayden-Spear 2006; Love et al. 1991 & 2002; Matthews 1989; NMFS 2017b; Palsson et al. 2009). Young of the year rockfish may spend months or more in shallow nearshore rearing habitats before transitioning toward deeper water habitats (Palsson et al. 2009). As bocaccio grow, their habitat preference shifts toward deeper waters with high relief and complex bathymetry with rock and boulder-cobble complexes (Love et al. 2002), but they also utilize non-rocky substrates such as sand, mud, and other unconsolidated sediments (Miller and Borton 1980; Washington 1977). Adults are most commonly found between 131 to 820 feet (40 to 250 m) (Love et al. 2002; Orr et al. 2000). The maximum age of bocaccio is unknown, but may exceed 50 years, and they reach reproductive maturity near age six.

Spatial Structure and Diversity: The PS/GB bocaccio DPS includes all bocaccio from inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia. The waters of Puget Sound and Straits of Georgia can be divided into five interconnected basins that are largely hydrologically isolated from each other by relatively shallow sills (Burns 1985; Drake et al. 2010). The basins within US waters are: (1) San Juan, (2) Main, (4) South Sound, and (4) Hood Canal. The fifth basin consists of Canadian waters east and north of the San Juan Basin into the Straights of Georgia (Tonnes et al. 2016). Although most individuals of the PS/GB bocaccio DPS are believed to remain within the basin of their origin, including larvae and pelagic juveniles, some movement between basins occurs, and the DPS is currently considered a single population.

Abundance and Productivity: The PS/GB bocaccio DPS exists at very low abundance and observations are relatively rare. No reliable range-wide historical or contemporary population estimates are available for the PS/GB bocaccio DPS. It is believed that prior to contemporary fishery removals, each of the major PS/GB basins likely hosted relatively large, though unevenly distributed, populations of bocaccio. They were likely most common within the South Sound and Main Basin, but were never a predominant segment of the total rockfish abundance within the region (Drake et al. 2010). The best available information indicates that between 1965 and 2007, total rockfish populations have declined by about 70 percent in the Puget Sound region, and that bocaccio have declined by an even greater extent (Drake et al. 2010; Tonnes et al. 2016; NMFS 2017b).

Limiting Factors: Factors limiting recovery for PS/GB bocaccio include:

- Fisheries Removals (commercial and recreational bycatch)
- Derelict fishing gear in nearshore and deep-water environments
- Degraded water quality (chemical contamination, hypoxia, nutrients)
- Climate change
- Habitat disruption

PS/GB Bocaccio within the Action Area: Very little specific information is available to describe PS/GB bocaccio in the action area. However, bocaccio are believed to be very rare in the San Juan Islands and the best available information suggests that they were never very common near the action area. Further, they are now considered rare in Puget Sound, including in the areas where they were historically most common, such as the South Sound (Palsson et al. 2009). Therefore, for the foreseeable future, very few individuals are likely to be present within the action area for this project.

The information available in the BA and satellite imagery of Deer Harbor suggests that habitat conditions in the bay are suitable for juvenile bocaccio settlement and early growth. The bay is shallow, with a maximum depth of about 42 feet (NOAA 2020a). The shoreline along the east side and north end of the bay consists of gently sloping substrate of mostly sand and gravel near the high water line, transitioning to patches of solid rock and mud as the water gets deeper. The shoreline along the west side of the bay consists of boulders and rocks that slope more steeply. The State's Department of Natural Resources (WDNR 2020) documents a patchy fringe of eelgrass along the east side of the bay, starting just south of the project site. The applicant's habitat survey documented macroalgae and kelps on the subtidal rocks at the marina, and satellite imagery of the bay indicates that intertidal macro algae and kelps are common around the fringes of the bay.

The closest deep-water habitat with characteristics that may support adult bocaccio is located south of the harbor, and north of Reef Island, about 1,150 yards southwest of the project site (NOAA 2020a; 2020b). Therefore, the bocaccio that may be present at the project site would likely be limited to pelagic larvae that may be carried in by the currents and young of the year juveniles that may rear in the macroalgae and kelp at the site. Based on bocaccio life history characteristics, larva and/or young of the year juvenile bocaccio could be present at the project site almost year round, but are most likely to be present between March and October.

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 and PS/GB bocaccio.

Puget Sound Chinook Salmon Critical Habitat

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.

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).

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

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).

Puget Sound/Georgia Basin Bocaccio Critical Habitat

The NMFS designated critical habitat for PS/GB bocaccio on November 13, 2014 (79 FR 68042). That critical habitat includes marine waters and substrates of the US in Puget Sound east of Green Point in the Strait of Juan de Fuca. Nearshore critical habitat is defined as areas that are contiguous with the shoreline from the line of extreme high water out to a depth no greater than 98 feet (30 m) relative to mean lower low water. The PBF of nearshore critical habitat include settlement habitats with sand, rock, and/or cobble substrates that also support kelp. Important site attributes include: (1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and (2) Water quality and sufficient levels of dissolved oxygen (DO) to support growth, survival, reproduction, and feeding opportunities. Deepwater critical habitat is defined as areas at depths greater than 98 feet (30 m) that possess or are adjacent to complex bathymetry consisting of rock and/or highly rugose habitat. Important site attributes include: (1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; (2) Water quality and sufficient levels of DO to support growth, survival, reproduction, and feeding opportunities; and (3) The type and amount of structure and rugosity that supports feeding opportunities and predator avoidance. Both nearshore and deepwater critical habitat include the entire water column above those substrates. Table 5 lists the PBF and corresponding life history events for PS/GB bocaccio critical habitat.

Table 4. Physical or biological features (PBFs) of designated critical habitat for PS/GB bocaccio, and corresponding life history events.

Physical or Biological Features		
Site Type	**Site Attributes**	**Species Life History Event**
Nearshore habitats with substrate that supports kelp	Prey quantity, quality, and availability Water quality and sufficient DO	Juvenile settlement, growth, and development
Deepwater habitats with Complex bathymetry	Prey quantity, quality, and availability Water quality and sufficient DO	Adult growth and reproduction,

Designated critical habitat for PS/GB bocaccio encompasses a total of about 1,083 square miles (1,743 sq. km) of marine habitat in Puget Sound, comprised of about 645 square miles (1,037 sq. km) of nearshore habitat, and about 438 square miles (706 sq. km) of deepwater habitat. Overall, nearshore critical habitat has been degraded in many areas by shoreline development. Both nearshore and deepwater critical habitat has been degraded by the presence of derelict fishing gear and reduced water quality that is widespread throughout Puget Sound.

Over 25 percent of the shoreline within Puget Sound has been impacted by development and armoring (Broadhurst 1998, WDOE 2010a). Shoreline armoring has been linked to reductions in invertebrate abundance and diversity, reduced forage fish reproduction, and reductions in eelgrass and kelp (Dethier et al. 2016; Heerhartz and Toft 2015; Rice 2006; Sobocinski et al. 2010).

Thousands of lost fishing nets and shrimp and crab pots (derelict fishing gear) have been documented within Puget Sound. Most derelict gear is found in waters less than 100 feet deep, but several hundred derelict nets have also been documented in waters deeper than 100 feet (NRC 2014). Derelict fishing gear degrades rocky habitat by altering bottom composition and killing encrusting organisms. It also kills rockfish, salmon, and marine mammals, as well as numerous species of fish and invertebrates that are rockfish prey resources (Good et al. 2010).

Over the last century, human activities have impacted the water quality in Puget Sound predominantly though the introduction of a variety of pollutants. Pollutants enter via direct and indirect pathways, including surface runoff; inflow from fresh and salt water, aerial deposition, discharges from wastewater treatment plants, oil spills, and migrating biota. In addition to shoreline activities, fourteen major river basins flow into Puget Sound and deliver contaminants that originated from upland activities such as industry, agriculture, and urbanization. Pollutants include oil and grease, heavy metals such as zinc, copper, and lead, organometallic compounds, chlorinated hydrocarbons, phenols, polychlorinated biphenyls (PCBs), polybrominated diphenyl ethers (PBDEs), and Polycyclic Aromatic Hydrocarbons (PAHs) (WDOE 2010b; COE 2015). Some of these contaminants are considered persistent bioaccumulative toxics (PBTs) that persist in the environment and can accumulate in animal tissues or fat. The Washington State Department of Ecology (WDOE) estimates that Puget Sound receives between 14 and 94 million pounds of toxic pollutants annually (WDOE 2010b).

Critical Habitat within the Action Area: Deer Harbor has been designated nearshore marine critical habitat for PS Chinook salmon and PS/GB bocaccio. This critical habitat primarily supports migration of juvenile and adult PS Chinook salmon, and juvenile settlement, growth, and development for P/GB bocaccio (NOAA 2020b; WDFW 2020).

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 project site is located in the marine waters of Deer Harbor, near the southwest corner of Orcas Island, Puget Sound Washington. As described in sections 2.5 and 2.12, project-related noise would be the stressor with the greatest range of effects for ESA-listed species under our jurisdiction. All other project-related effects, including indirect effects would be undetectable beyond the range of acoustic effects. The loudest project related sound source would be the installation of 18-inch diameter steel pipe piles with vibratory and/or drilling techniques. The maximum theoretical range to where those sounds would be detectable by marine mammals (the most acoustically sensitive species considered in this consultation) is about 5.3 miles (8,600 m). However, project-related noise would be constrained by the harbor entrance, which relative to the new south float is about 70 degrees wide, and blocked by the numerous islands to the south of the harbor. This would limit project-related noise to about 4 miles, where San Juan Island would block further sound transmission. The maximum range for detectable effects in fish would be about 300 feet (91 m).

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 Deer Harbor and the San Juan Channel as described above and shown in Figure 3. 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.

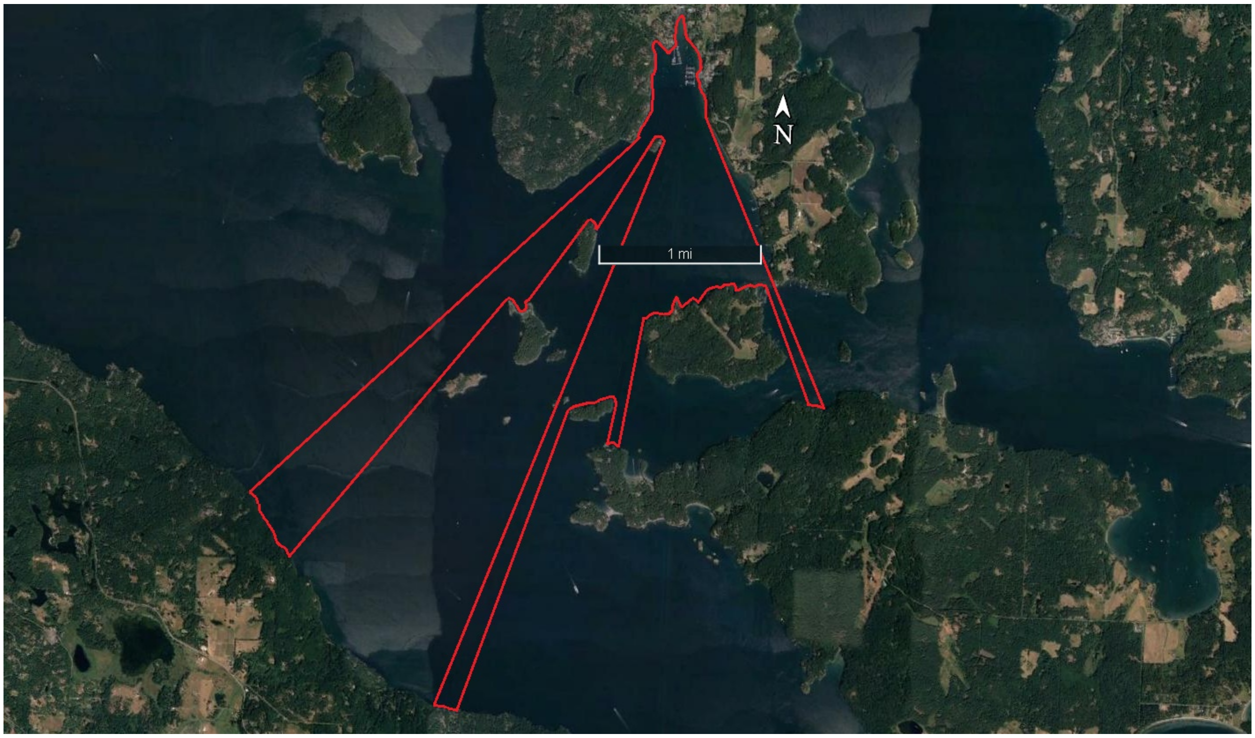

Figure 3. Google satellite photograph of the Action Area. The in-water areas of Deer Harbor and the San Juan Channel where project-related noise would be detectable by marine mammals is outlined in red.

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 site is located in Deer Harbor, near the southwest corner of Orcas Island (Figure 1). Deer Harbor is a relatively small marine embayment that opens to Wasp Pass and the San Juan Channel at its south end. The bay has a maximum depth of about 42 feet (NOAA 2020a).

The bay and the upland areas that surround it have been impacted by more than 100 years of low to moderate development, which began in the mid to late 1800s. The upland area west of the bay remains largely forested, but scattered homes, small farms, and a small resort are located in the upland areas to the north and east. Two marinas are located in the bay. The applicant's marina currently has 110 slips for vessels averaging 38 feet in length. It is very active with a mix of year-round and seasonal transient boat moorage. Private and commercial float planes also utilize the marina. The marina provides fueling and vessel septic pump-out services. It also has a store, restrooms, showers, and laundry facilities, and an upland facility with a restaurant. A second, similarly sized marina is located at the north end of the bay. Additionally, about 10 residential docks are installed around the bay, and a couple dozen private mooring buoys are scattered across it.

The shoreline along the east side of the bay consists of a gently sloping substrate of mostly sand and gravel near the high water line, transitioning to patches of solid rock and mud as the water gets deeper. An intertidal mudflat is located at the north end of the bay. The shoreline along the west side of the bay consists of boulders and rocks that slope more steeply. The State's Department of Natural Resources (WDNR 2020) documents a patchy fringe of eelgrass along the east side of the bay, starting just south of the applicant's project site. The applicant's habitat survey documented macroalgae (Graciliaria, Palmaria, and Saccharina spp.) and Saccharina kelp on the subtidal rocks at the marina. Satellite imagery of the bay indicates that intertidal macro algae and kelp are common around the fringes of the bay.

Along the north side of the applicant's marina, the substrate transitions from intertidal sands to solid rock outcroppings with SAV coverage of 1 to 60% coverage to about -30 feet re. MLLW, where the substrate becomes mostly mud with no SAV. At the south end of the marina, the substrate consist mostly of mud sloping gently past -30 feet re. MLLW. There is no SAV except for a small area of solid rock at about -27 feet re. MLLW with about 1% coverage by Saccharina algae.

The Washington Department of Ecology (WDOE) has designated the marine waters of San Juan County as Class AA, or Extraordinary Quality (appropriate for swimming, fishing, boating and aesthetic enjoyment). However, in 2016, the WDOE identified sediment samples in the northern part of the Deer Harbor Marina as sediments of concern (Category 2), which indicates that there is some evidence of a water quality problem, but that it is not serious enough to require the production of a water quality improvement project with an associated total maximum daily load (TMDL) limit. The waters south of the marina were found to meet the standards for clean water (Category 1) (WDOE 2020).

The intertidal sandy areas and the eelgrass beds of the bay are potential forage fish spawning habitat. However, the nearest documented forage fish spawning habitat is Pacific herring spawning about 1.4 miles to the southeast in Pole Pass, and surf smelt spawning about 2.4 miles to the south at Neck Point on Shaw Island (WDFW 2020b).

Low numbers of adult and juvenile PS Chinook salmon utilize the bay as migration habitat. The bay also provides habitat features that are suitable for juvenile bocaccio settlement and early growth, and as such very low numbers of juvenile PS/GB bocaccio may rear in the bay. The action area has also been designated as critical habitat for PS Chinook salmon, PS/GB bocaccio, PS/GB yelloweye rockfish, and SR killer whales. The past and ongoing anthropogenic impacts identified above have impacted and reduced the quantity and quality of the physical and biological features of the habitats within the action area. However, the bay and the surrounding waters continue to provide a combination of marine habitat features that are supportive of all of those listed species.

<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 DO 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 two new floats totaling about 1,666 square feet of new over-water in the nearshore marine waters of Deer Harbor. The applicant would also remove 678 square feet of over-water structure and 2 creosote-treated timber piles. They would also perform a mix of re-decking with grating and/or relocating to deeper water 3 floats with a combined over-water area of 586 square feet (Figure 2). The applicant commits to work between September 1 and March 1, and estimates that the project would require about 2 weeks of work using land-based and barge-mounted construction equipment, including vibratory pile drivers. To be conservative and to avoid the possible need to re-consult due to delays that mat occur once work starts, this assessment assumes that project-related work may occur over 4 weeks.

Returning adult PS Chinook salmon typically migrate through the action area between March and early-September. Juveniles typically move through the action area between April and October. Larval and young of the year juvenile PS/GB bocaccio are most likely to be in nearshore areas between March and October, but could be present year-round. Therefore, the proposed work window overlaps slightly with both ends of returning adult Chinook salmon, with the latter part of juvenile out-migration, and with the latter part of juvenile bocaccio nearshore rearing. However, given the rarity of PS/GB bocaccio in the San Juan Islands and the short duration of the in-water work, it is extremely unlikely that any bocaccio would be exposed to any construction-related direct effects.

Therefore, the planned construction is likely to cause direct effects on PS Chinook salmon, and on the PBFs of the critical habitats for PS Chinook salmon and PS/GB bocaccio, through exposure to construction-related noise, degraded water quality, and propeller wash. Construction would also cause indirect effects on juveniles of both species through exposure to contaminated forage. The new COE-authorized mooring floats are likely to remain in the action area for several decades. Over that time, the floats themselves and the vessel activities that would occur there would cause effects on PS Chinook salmon, PS/GB bocaccio, and on the PBFs of their critical habitats through impacts on water quality, and 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. It is extremely unlikely that any PS/GB bocaccio would be exposed to this stressor. 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, and barge spuds.

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 recent acoustic assessments for a similar projects (NMFS 2016; 2017c; 2018a) and in other sources (CalTrans 2009; COE 2011; DEA 2011; FHWA 2017). 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 (Table 5).

Table 5. 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 2 to 10 impacts per day over the duration of the project.		176 dB_{SEL}	150 @ 54 m
Vib. Install 4 18-inch Steel Pipe Piles	< 2.5 kHz Non-Impulsive	190 dB_{peak}	206 @ N/A
Estimate 88 minutes of cumulative vibratory noise.		175 dB_{SEL}	150 @ 46 m
Vib. Install 1 14-inch Steel Pipe pile	< 2.5 kHz Non-Impulsive	187 dB_{peak}	206 @ N/A
Estimate 22 minutes of cumulative vibratory noise.		172 dB_{SEL}	150 @ 29 m
Vib. Extract 2 12-inch Timber Piles	< 2.5 kHz Non-Impulsive	181 dB_{peak}	206 @ N/A
Estimate 44 minutes of cumulative vibratory noise.		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 applicant estimates about 22 minutes of vibratory work would be required per pile, which the NMFS considers reasonable based on the available information, including consultations for numerous similar projects. This assessment also assumes that installation and/or extraction of any of the various identified pile types may occur on any given day during an expected week-long period of pile work, that no more than 4 piles would be installed and/or extracted per day, and that a minimum of 12 hours would elapse between the daily cessation and resumption of pile work. Further, given the very low number of expected spud impulses, and the expectation that cumulative vibratory pile work would not exceed 88 minutes per day, this assessment uses the 150 dB_{SEL} threshold to estimate the range to the onset of effects, because the use of that threshold would avoid underestimating effects, and would therefore be protective of listed 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 SLs suggests that noise levels above the 150 dB_{SEL} threshold could extend to about 177 feet (54 m) from spud deployments, and to about 151 feet (46 m) from vibratory installation of 18-inch diameter steel pipe piles. The range to the onset of effects for all other construction-related sources would be less (Table 5).

Project activities would require the use of at least 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, small scale of the project suggests that barge movement would relatively limited. To be conservative, this assessment assumes that spud deployments could cause 2 to 10 impulsive noise events on any given work day. Noise levels above the 150 dB_{SEL} threshold would likely extend about 177 feet around spud deployment. During the week of pile work, up to 88 minutes of fish-detectable sound would extend up to 151 feet around the south float installation site, and to a bit less than 100 feet around the other 2 pile work sites. Due the differences in their frequencies and other sound characteristics, the various sound sources are very unlikely to have any additive effects with each other. 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 previously, the planned work window avoids the peak PS Chinook salmon migration periods. However, it overlaps with the ends of their typical migration periods for both juveniles and adults. Individual Chinook salmon 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 100 to 151 feet around the project site during project work. 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 more shoreline oriented than the adults, 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. It is doubtful that any individuals would approach close enough and remain long enough to accumulate sound energy in excess of 187 dB SEL_{cum} threshold. However, if any do, they may also experience some level of auditory- and non-auditory tissue injury, which could reduce their likelihood of their long-term 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 extremely low based on the project location, and on short duration and timing of the work. 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.

Construction-related Degraded Water Quality

Exposure to construction-related degraded quality would cause minor effects in PS Chinook salmon. It is extremely unlikely that any PS/GB bocaccio would be exposed to this stressor. Water quality would be temporarily affected through increased turbidity. It may also be temporarily affected by reduce 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 that may release creosote-related toxins into the water.

Turbidity: Pile removal and tugboat propeller wash 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.

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). 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. Bjornn and Reiser (1991) report that adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that may be mobilized during storm and snowmelt runoff episodes. However, empirical data from numerous studies report the onset of minor physiological stress in juvenile and adult salmon after one hour of continuous exposure to suspended sediment concentration levels between about 1,100 and 3,000 mg/L, or to three hours of exposure to 400 mg/L, and seven hours of exposure to concentration levels as low as 55 mg/L (Newcombe and Jensen 1996). The authors reported that serious non-lethal effects such as major physiological stress and reduced growth were reported after seven hours of continuous exposure to 400 mg/L and 24 hours of continuous exposures to concentration levels as low as about 150 mg/L.

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 2 12-inch 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.

Tugboat propeller wash would also mobilize bottom sediments. The intensity and duration of the resulting turbidity plumes are uncertain, and 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 below the concentrations 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 it is extremely unlikely that would exceed those described above. Project-related tugboat trips would be infrequent, and would likely last a low number of hours while it repositions the work barges. Therefore, the resulting propeller wash turbidity plumes would be low in number and episodic. The intensity and duration of the resulting turbidity plumes are uncertain. However, based on the information above, and on numerous consultations for similar projects in the region, sediment mobilization from tugboat propeller wash would likely consist of relatively low-concentration plumes that could extend up to about 300 feet from the site, and last a low number of hours hour after the disturbance ends.

Based on the best available information, construction-related turbidity concentrations would be too low and short-lived 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 any PS Chinook salmon that may be exposed to it. None of these potential responses, individually, or in combination would affect the fitness or meaningfully affect 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). Many of the fuels, lubricants, and other fluids commonly used in motorized vehicles and construction equipment are petroleum-based hydrocarbons that contain Polycyclic Aromatic Hydrocarbons (PAHs), which are known to be injurious to fish. Other contaminants can include metals, pesticides, Polychlorinated Biphenyls (PCBs), phlalates, 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).

The project includes BMPs specifically intended 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. Additionally, 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 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 2 creosote-treated piles would slightly reduce the number of similar piles that are sources of ongoing PAH contamination at the marina. Their removal is likely to cause some minor 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 similar 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. It is extremely unlikely that any PS/GB bocaccio would be exposed to this stressor. 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 in-water work with tugboats and other work boats, vessel 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 may be exposed to without any meaningful 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 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 extremely low based on the project location, on short duration and timing of the work, and on the relatively low number of tugboat trips that would occur. Therefore, the numbers of juvenile PS Chinook salmon that may be exposed to construction-related propeller wash 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 disturbances would be brief, the affected areas would likely consist of a tiny portion of the SAV-supporting substrate in the immediate area, and the 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 and PS/GB bocaccio. In addition to direct uptake of contaminants through their gills, fish can absorb contaminants through dietary exposure (Meador et al. 2006; Varanasi et al. 1993). The removal of creosote-treated 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.

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 applicant's project would remove 2 creosote-treated timber piles. Although sediment mobilization due to the planned work would be far less severe than was described by Romberg (2005), the sediments that would be mobilized by 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. Within that distance, mobilized contaminants would remain biologically available for years, but at ever decreasing concentration levels.

The number of years that detectable amounts of contaminants would be biologically available, as well as the annual number of juvenile PS Chinook salmon and PS/GB bocaccio that may be exposed to contaminated forage that would be attributable to this action is unquantifiable with any degree of certainty. Similarly, the amount of contaminated prey that any individual fish may consume, or the intensity of any effects that an exposed individual may experience is uncertain, and would be highly variable over time. However, based on the very low number of piles to be removed, a very small amount sediment would be mobilized, and the affected area would also be very small. This suggests that the number of years that detectable contaminants would be present would be low. It further 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 and PS/GB bocaccio that may be annually exposed to project-related contaminated prey would likely comprise such extremely small subsets of their respective cohorts that their loss would cause no detectable population-level effects.

Structure-related Impacts on Water Quality

Structure-related impacts on water quality would cause minor effects in PS Chinook salmon and PS/GB bocaccio. The applicant's new floats have no wood below the waterline, but they have deck framing that likely include wood that has been treated with ammoniacal copper zinc arsenate (ACZA). Also, some of the hulls of boats that would moor at the new floats may be painted with anti-fouling paints that contain copper, and some boats may discharge fuels and lubricants to the water while moored at the structure.

ACZA-treated wood and anti-fouling hull paints: Wet ACZA-treated wood leaches some of the metals used for wood preservation. Of these metals, dissolved copper is of most concern to fish because of its higher leaching rate compared to arsenic and zinc (Poston 2001). Anti-fouling hull paints also leach copper (Schiff *et al*. 2004). Exposure to dissolved copper concentrations between 0.3 to 3.2 μg/L above background levels has been shown to cause avoidance of an area, to reduce salmonid olfaction, and to induce behaviors that increase juvenile salmon's vulnerability to predators in freshwater (Giattina *et al*. 1982; Hecht *et al*. 2007; McIntyre *et al*. 2012; Sommers *et al*. 2016; Tierney *et al*. 2010). However, copper is much less toxic to fish in saltwater than in freshwater. Baldwin (2015) reports that dissolved copper's olfactory toxicity in salmon is greatly diminished with increased salinity. In estuarine waters with a salinity of 10 parts per thousand (ppt), no toxicity was reported for copper concentrations below 50 μg/L. Sommers et al. (2016) report no copper-related impairment of olfactory function in salmon in saltwater.

The in-water dissolved copper concentration from ACZA-treated wood depends on many factors, including the amount of treated wood present, its contact with the water, the wood's leaching rate, which is affected by the post-treatment procedures that are applied to the wood, and water chemistry. Copper leaching is highest when the treated wood is immersed in freshwater. The leaching rate decreases with reduced contact with the water. Further, the copper leaching rate from ACZA-treated wood decreases sharply to low levels during the first few weeks after installation. Further, approved post-treatment BMPs further reduce the intensity and duration of leaching, and the COE requires that any ACZA-treated wood used in projects like this must comply with those post-treatment BMPs. The initial dissolved copper concentration likely to be caused by the new floats is unknown. However, the average salinity in Puget Sound is about 28 ppt, and based on the project's limited amount of over-water treated wood, combined with the brief episodic exposures of that wood to rain and wave action it is extremely unlikely that dissolved copper concentrations would approach the concentrations necessary to cause effects in saltwater, and it would quickly decrease over time.

Copper-based anti-fouling paints leach copper into the water at fairly constant levels and can be a significant source of dissolved copper in harbors and marinas (Schiff *et al*. 2004). This is most notable under conditions of high boat occupancy in enclosed moorages where water flows are restricted. WDOE (2017) reports that dissolved copper concentrations from anti-fouling paints can be above 5 μg/L in protected moorages, but below 0.5 μg/L in open moorages with high flushing rates. Vessel occupancy applicant's marina is moderate (currently about 110 boats, and about 120 boats post-project), and the marina itself is unenclosed by any jetties, breakwaters, or groins, and is therefore open to good water exchange. Based on the available information, it is extremely unlikely that dissolved copper concentrations that would be attributable to the applicant's entire marina, including the 2 new floats would exceed 5 μg/L, and instead would most likely be closer to 0.5 μg/L. Given the salinity in the action area, the highest expected dissolved copper concentrations at the site would be well below the threshold of effect in salmonids and other fish like bocaccio.

Petroleum-based fuels and lubricants: The vessels that would utilize the floats may discharge fuels and lubricants into the water. However, those discharges would be very infrequent and the vast majority would be extremely small. The fuels and lubricants that may be discharged tend to evaporate quickly. Further, the moorage is open and exposed to tidal currents that would facilitate evaporation, dilution, and bioremediation of any discharges that may be occur. Therefore, detectable concentrations would be very low and very short-lived. Based on the low concentrations and short residence times of discharged pollutants, combined with the very low numbers of PS Chinook salmon and PS/GB bocaccio that would be periodically present within the action area, it is extremely unlikely that any individuals of either species would be exposed to high enough concentrations of structure-related discharged pollutants to cause any detectable effects on their fitness of normal behaviors.

Summary: Based on the best available information, the concentrations of structure-related dissolved copper and boat-discharged pollutants would be very low and it is extremely unlikely that any PS Chinook salmon or PS/GB bocaccio would be exposed to concentrations that would be high enough to cause any detectable effects on their fitness of normal behaviors.

Structure-related altered lighting

Structure-related altered lighting would cause minor effects in PS Chinook salmon and PS/GB bocaccio. The applicant's new mooring floats and the boats moored to them would create daytime shade that can alter normal behaviors, reduce fitness, and increase vulnerability to piscine predators. Nighttime artificial illumination of the structure and the moored vessels can also alter normal behaviors of juvenile salmon.

The new north mooring float would be installed about 450 feet from the shoreline, and have an over-water footprint of about 490 square feet. The new south mooring float would be installed about 310 feet from the shoreline, and have an over-water footprint of about 1,666 square feet (Figure 2). Half of the decking for both would consist of 60 % open-area grating. The water depth under both of them would be -27 feet re. MLLW or more. 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 slightly reduce productivity and the availability of SAV and forage resources under the new structures. However, due to the relatively small size of the shaded areas, and the very limited overlap of that shade with SAV resources, shade-related impacts on cover and forage availability would be too small to cause detectable effects on the fitness and normal behaviors of Chinook salmon and bocaccio in the action area.

Numerous studies demonstrate that juvenile salmonids are more likely to avoid the shadow of an overwater structure than to pass through it. That avoidance can reduced fitness and increase vulnerability to predators for juveniles in freshwater and during early marine life stages when they are strongly shoreline dependent (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).

However, the individuals that would be exposed to the new floats' shadows would be relatively shoreline independent fish that have swam across the Georgia Strait or other deep water to reach the action area on their way to the open ocean, or would be returning adults. Further, the location of the new floats would be more than 300 feet from the shoreline, where they would have no detectable effect on shoreline migration if shoreline obligated individuals were somehow present. Therefore, it is extremely unlikely that the new floats' shade would cause any measurable effects on the fitness of exposed individuals, or cause any meaningful change in their normal behaviors.

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 applicant's project description identified no lighting systems to be installed on the new floats. However, the NMFS expects that the new floats would be equipped with some form of lighting to ensure their safe use at night. Also, it is safe to assume that at least some of the vessels moored at those floats would have lighting systems. Based on personal site visits to numerous local marinas, the lighting most likely to be installed on the floats would consist of relatively low-intensity lights mounted in short housings, spaced out along the edges of the floats, and aimed in a manner intended illuminate the walkway and to limit overwater illumination. Similarly, vessel lighting systems would typically be aimed to illuminate the decks and interior areas of the vessel, not the water. Although some nighttime artificial illumination is likely to result from the new floats, it would likely be relatively low intensity, and virtually indistinguishable from the artificial light currently present at the marina. Therefore, it is very unlikely that artificial illumination from the new floats would cause any measurable effects on the fitness of exposed individuals, or cause any meaningful change in their normal behaviors.

<u>Structure-related vessel noise</u>

Structure-related noise would cause adverse effects in PS Chinook salmon and PS/GB bocaccio. The recreational and commercial vessels that would moor at the new floats would cause in-water noise capable of causing detectable effects in fish. Unlike construction noises, recreational and commercial vessel noise could occur year-round. Individual vessel operations around a mooring structure typically consists of brief periods of relatively low-speed movement as boats are driven to the float and tied up. Their engines are typically shut off within minutes of arrival. The engines of departing vessels are typically started a few minutes before the boats are untied and driven away.

Based on satellite imagery of the applicant's marina and on the consulting biologist's personal observations of many residential piers and commercial marinas in the region, the boats most likely to moor at the applicant's floats would be power boats and sailboats between 20 to 65 feet in length, but vessels approaching 100 feet in length may also moor at the south float. As describe earlier, exposure to noise may cause a range of physiological effects in fish, which would depend largely on the intensity of the sound and the duration of the exposure.

Numerous sources describe sound levels for ocean-going ships, tugboats, and recreational vessels (Blackwell and Greene 2006; McKenna et al. 2012; Picciulin et al. 2010; Reine et al. 2014; Richardson et al. 1995). The best available information about the source levels from vessels close in size to those that would operate at the marina is described in the acoustic assessment done for a similar project (NMFS 2018). In the current assessment, we used vessel noise from an 85-foot long ferry, tugboats, and a 23-foot long power boat as surrogates for the mix of commercial and recreational vessels likely to moor at the applicant's new floats.

All of the expected peak source levels are below the 206 dB_{peak} threshold for instantaneous injury in fish. Application of the practical spreading loss equation to the expected SEL SLs suggests that noise levels above the 150 dB_{SEL} threshold would extend between about 33 feet (10 m) and 207 feet (63 m) from the representative vessels (Table 6).

Table 6. Estimated in-water source levels for vessels with noise levels similar to those likely to moor at the applicant's new floats, 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
23 foot Boat w/ 2 4~ 100 HP Outboard Engines.	< 2 kHz Combination	175 dB_{peak}	206 @ N/A
Episodic brief periods measures in minutes		165 dB_{SEL}	150 @ 10 m

It is extremely unlikely that vessels would be run at anything close to full speed while near the marina. Therefore, sound levels above the 150 dB_{SEL} threshold would likely remain well within 72 feet (22 m) around the new floats, but may episodically extend to about 207 feet (63 m) when vessels close to 100 feet in length operate near the south float. Vessel noise levels would be non-injurious. However, juvenile Chinook salmon and bocaccio that are within the 150 dB_{SEL} isopleth, are likely to experience behavioral disturbances, such as acoustic masking, startle responses, altered swimming patterns, avoidance, and increased risk of predation. Further, the intensity of these effects would increase with increased proximity to the source and/or duration of exposure. Response to this exposure would be non-lethal in most cases, but some individuals may experience stress and fitness effects that could reduce their long-term survival, and individuals that are eaten by predators would obviously be killed.

The annual numbers of individual juvenile PS Chinook salmon and PS/GB bocaccio that would be exposed to this stressor is unquantifiable with any degree of certainty, and would be highly variable over time. Similarly, the specific effects and the intensity of those effects that would be experience by exposed individuals would be highly variable over time. However, based on the low numbers of individuals from either species that occur in the action area, and on the small area of affect, 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 juvenile PS Chinook salmon, but would cause only minor effects in juvenile PS/GB bocaccio and adults of both species. 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 floats may be operated at any time during the year.

Juvenile Chinook salmon in the action area are likely to be close to the surface where they may be exposed to spinning propellers and powerful propeller wash near the new floats. Conversely, juvenile bocaccio are likely to remain near the substrate. The water depth under the new floats is about -27 feet re. MLLW, and powerboats would likely operate at low power levels when they operate near the floats. Therefore, any propeller wash that reaches the bottom would be too weak to cause detectable effects on juvenile bocaccio and benthic resources. Propeller wash is also unlikely to affect adults of either species because they would be able to swim against the propeller wash without any meaningful effect on their fitness or normal behaviors.

Although the likelihood of this interaction is very low for any individual fish or individual boat trip, it is likely that over the life of the new floats, at least some juvenile PS Chinook salmon would experience reduced fitness or mortality from exposure to spinning propellers and/or propeller wash at the site. 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 extremely low based on the low density of this species in the action area. Therefore, the numbers of juvenile PS Chinook salmon that may be annually exposed to structure-related propeller wash would represent such small subsets of their respective cohorts that their loss would cause no detectable population-level effects.

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.

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 and for PS/GB bocaccio as described below.

Critical Habitat for Puget Sound Chinook Salmon: The proposed action is likely to cause impacts on the estuarine and nearshore marine areas free of obstruction and excessive predation PBFs of PS Chinook salmon critical habitat as described below. Benthic habitat and waters deeper than 98 feet (30 m) are outside of the range of the proposed action's expected effects on fish. Therefore, it is highly unlikely that the action would cause any impacts on the off shore marine areas PBF.

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 attribute. Vessel noise at the new mooring floats is likely to slightly increase the predation risk for juveniles in close proximity to the floats. Conversely, the planned combination of removal, grating, and relocation of more than 1,100 square feet solid-decked nearshore over-water structure is likely to slightly reduce migratory impacts and vulnerability to predators along the shoreward side of the marina.
   b. Water quality – The proposed action would cause ephemeral minor adverse effects and long-term minor beneficial effects on this attribute. The action would cause no measurable changes in water temperature, but construction would briefly increase suspended solids and may introduce low levels of contaminants. Conversely, the removal of 2 creosote-treated timber piles would reduce ongoing PAH contamination at the marina. Detectable water quality impacts would be limited to within 300 feet of the marina, with construction-related impacts lasting a low number of hours after work stops.
   c. Water quantity – The proposed action would cause no effect on this attribute.
   d. Salinity – The proposed action would cause no effect on this attribute.
   e. Natural Cover – The proposed action may cause long-term minor adverse and beneficial effects on this PBF. Increased shade under the 2 new floats may slightly reduce SAV growth. Conversely, the planned combination of removal, grating, and relocation of more than solid-decked nearshore over-water structures is likely to slightly improve it along the shoreward side of the marina.
   f. Forage – The proposed action would cause long term minor adverse effects on this attribute. Pile removal 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 be limited to the area within 300 feet around the marina, with detectable levels of contaminants decreasing over several years.

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 – Outside of the expected range of effects for fish.

PS/GB Bocaccio Critical Habitat: The proposed action is likely to cause impacts on the nearshore juvenile settlement habitats PBF of PS/GB bocaccio critical habitat as described below. Benthic habitat and waters deeper than 98 feet (30 m) are outside of the range of the proposed action's expected effects on fish. Therefore, it is highly unlikely that the action would cause any impacts on the deep-water benthic habitat PBF.

1. Juvenile settlement habitats located in the nearshore (shoreline to 98 feet (30 m) deep) with substrates such as sand, rock, and/or cobble compositions that support kelp
   a. Quantity, quality, and availability of prey species – The proposed action would cause long-term minor effects on this attribute. Pile removal would mobilize small amounts of PAH-contaminated sediments that could be taken up by benthic invertebrates that are forage resources for juvenile bocaccio. Sediment distribution would be limited to the area within 300 feet around the marina, with detectable levels of contaminants decreasing over several years.
   b. Water quality – The proposed action would cause ephemeral minor adverse effects and long-term minor beneficial effects on this attribute. Construction would briefly increase suspended solids and may introduce low levels of contaminants. Conversely, the removal of 2 creosote-treated timber piles would reduce ongoing PAH contamination at the marina. Detectable water quality impacts would be limited to within 300 feet of the marina, with construction-related impacts lasting a low number of hours after work stops.

2. Benthic habitats and sites deeper than 98 feet (30 m) – Outside of the expected range of effects for fish.

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 shoreline development in the action area, as well as upland agriculture, urbanization, and road construction. 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 species within the watersheds that flow into Puget Sound, as well as along many shoreline areas of the sound itself. 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 their 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 DO, 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, substrates, 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

Both of the species considered in this Opinion 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. Both 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, summer, and fall-run fish from the Nooksack River basin, and spring-, summer-, and fall-run fish from populations within the Strait of Georgia and Whidbey Basin MPGs. The Whidbey Basin MPG is considered to be at relatively low risk of extinction. However, the Strait of Georgia and the three MPGs of the ESU are considered to be at high risk of extinction due to low abundance and productivity.

The project site is located in the nearshore marine waters of Deer Harbor, near the southwest corner of Orcas Island. The environmental baseline within the action area has been degraded by low to moderate shoreline development, maritime activities, upland agriculture, urbanization, and road building and maintenance. However, low numbers of adult and juvenile PS Chinook salmon continue to utilize the action area primarily for adult and juvenile migration, and juvenile growth in marine waters.

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 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.

PS/GB bocaccio

No reliable population estimates are available for PS/GB bocaccio. The best available information indicates that they were never a predominant segment of the total rockfish abundance in Puget Sound, and that abundance has declined by more than 70 percent since 1965. They are considered rare in the San Juan Islands, and it is uncertain whether or not they currently utilize the habitat within the action area. Fishing removals and derelict fishing gear, combined with degraded water quality appear to be the greatest threats to the recovery of the DPS.

The project site is located in the nearshore marine waters of Deer Harbor, near the southwest corner of Orcas Island. The environmental baseline within the action area has been degraded by low to moderate shoreline development, maritime activities, upland agriculture, urbanization, and road building and maintenance. However, the action area continues to provide habitat features that are considered supportive of juvenile rearing.

Based on the rarity of bocaccio in the action area, and the short duration of the planned work, it is extremely unlikely that any bocaccio would be directly exposed to construction-related stressors. However, over time, low numbers of individuals may be exposed to ever-decreasing levels of contaminated forage, and over the life of the new floats, very low numbers of juvenile bocaccio may be exposed to structure-related noise. These stressors, both individually and collectively, are likely to cause some combination of altered behaviors, reduced fitness, and mortality in some exposed individuals. However, the annual numbers of individuals that are likely to be impacted by action-related stressors is expected to be extremely 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 population (abundance, productivity, distribution, or genetic diversity) for the PS/GB bocaccio DPS. 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 and PS/GB bocaccio.

PS Chinook salmon critical habitat

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, with the exception of forage, 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. The proposed action would cause long-term minor adverse effects on forage. All impacts would be limited to about 300 feet around the project site.

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 habitat will maintain their current level of functionality, and retain its current ability for PBFs to become functionally established, to serve the intended conservation role for PS Chinook salmon.

PS/GB bocaccio critical habitat

Nearshore rockfish critical habitat has been degraded by past and ongoing shoreline development that has altered shoreline substrates, and reduced eelgrass and kelp habitats in many areas of Puget Sound. Agriculture, industry, urbanization, and maritime activities have reduced water quality throughout Puget Sound, and the widespread presence of derelict fishing gear in both nearshore and deep-water critical habitat areas has altered bottom composition, reduces prey availability, and directly kills rockfish.

Rising sea levels, caused by climate change, are expected to increase coastal erosion and alter the composition of nearshore critical habitat for PS/GB bocaccio. Elevated sea surface temperatures and increased ocean acidification may also reduce the quality of nearshore marine habitats, and reduce prey availability by reducing ocean productivity.

Future non-federal actions and climate change are likely to increase and continue acting against the quality of PS/GB bocaccio critical habitat. The intensity of those influences is uncertain, as is the degree to which those impacts may be tempered by adoption of more environmentally acceptable practices, by restoration activities such as efforts to remove derelict fishing gear, and by efforts to address the effects of climate change.

The PBF for PS/GB bocaccio critical habitat in the action area is limited to nearshore settlement habitats with sand, rock, and/or cobble substrates that also support kelp. The site attributes of that PBF that would be affected by the action are limited to prey quantity, quality, and availability, and water quality. As described above, with the exception of forage, 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. The proposed action would cause long-term minor adverse effects on forage. All impacts would be limited to about 300 feet around the project site.

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, this critical habitat will maintain its current level of functionality, and retain its current ability for PBF to become functionally established, to serve the intended conservation role for PS/GB bocaccio.

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 and PS/GB bocaccio, nor would it destroy or adversely modify designated critical habitat for either species.

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 PS Chinook salmon from exposure to:

- construction-related noise,
- construction-related propeller wash,
- construction-related contaminated forage,
- structure-related noise, and
- structure-related propeller wash.

Harm of juvenile PS/GB bocaccio from exposure to:

- construction-related contaminated forage, and
- structure-related noise.

The NMFS cannot predict with meaningful accuracy the number of juvenile PS Chinook salmon and PS/GB bocaccio 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.

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, 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 and juvenile PS/GB bocaccio 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 and juvenile PS/GB bocaccio would increase, despite the low density and random distribution of juveniles of both of these species in the action area.

The sizes, locations, and configurations of the applicant’s new mooring floats are the best available surrogates for the extent of take of juvenile PS Chinook salmon and juvenile PS/GB bocaccio from exposure to structure-related. Size is appropriate because as the size of a mooring structure increases, the number of boats that could moor there increases. As the number of boats increase, boating activity would likely increase, causing a commensurate increase in the intensity and duration of related vessel noise exposure for juvenile PS Chinook salmon and juvenile PS/GB bocaccio, as well as increased potential for juvenile PS Chinook salmon exposure to propeller wash.

Location is appropriate because installation of the new floats closer to shore would increase the likelihood of exposing juvenile PS Chinook salmon to vessel noise and propeller wash, due to the floats increased proximity to preferred juvenile salmon habitat. Installation of the floats in shallower water would also increase the potential for propeller wash to meaningfully impact the substrate, which would increase the likelihood that juvenile PS/GB bocaccio would be exposed to currently unanticipated take. Float installation closer to shore would also increase impacts on SAV and other benthic resources, which would increase the likelihood that juvenile PS Chinook salmon and juvenile PS/GB bocaccio would be exposed to currently unanticipated take due to reduced availability of shelter and forage resources.

Similarly, configuration is appropriate because the new floats would cause more impacts on SAV and other benthic resources if light penetration through them was less than expected from the use of grated decking, which would increase the likelihood that juvenile PS Chinook salmon and juvenile PS/GB bocaccio would be exposed to currently unanticipated take from reduced availability of shelter and forage resources.

In summary:

The extent of PS Chinook salmon take for this action is defined as:
- Up to 4 weeks of in-water work to be done between September 1 and March 1;
- Vibratory or drilled installation of 5 in-water steel pipe piles up to 18-inches in diameter;
- Vibratory extraction of 2 timber piles;
- Visible turbidity plumes extending up to 300 feet from the marina; and
- The installation of two new mooring floats, as described in the proposed action section of this biological opinion.

The extent of PS/GB bocaccio take for this action is defined as:
- Vibratory extraction of 2 timber piles;
- Visible turbidity plumes extending up to 300 feet from the marina; and
- The installation of two new mooring floats, 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 and PS/GB bocaccio from exposure to contaminated forage.

3. Minimize incidental take of PS Chinook salmon and PS/GB bocaccio from exposure to structure-related effects.

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 March 1;
   b. Limit in-water pile installation to:
      i. 5 steel pipe piles no larger than 18-inches in diameter; and
      ii. Vibratory and/or drilled installation work with no impact proofing.
   c. Limit pile extraction to vibratory pulling of 2 timber piles.

2. To implement RPM Number 2, Minimize incidental take of PS Chinook salmon and PS/GB bocaccio 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;
   c. Fill pile extraction holes with clean sand; and
   d. Adjust pile extraction and tugboat operations to ensure that visible turbidity plumes do 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 of PS Chinook salmon and PS/GB bocaccio from exposure to structure-related effects, the COE shall require the applicant to ensure that the size, location, and configuration of the new mooring floats do not exceed their characteristics as described in the proposed action section above. Specifically:
   a. The new north float shall be no wider than 7 feet, have a total area of no more than 490 square feet, include only 1 pile, and be installed no closer to shore than the western-most finger pier along the north walkway (about 200 feet from the east end of the walkway);
   b. The new south float shall be no wider than 10.5 feet, have a total over-water area of no more than 1,176 square feet, include no more than 4 piles, and shall extend no more than 112 feet east from the southwestern corner of the marina's southwestern walkway; and
   c. Half of the decking for each new float shall consist of grating with a minimum of 60% open area.

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 to 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. A description of best management practices and conservation measures employed; and
      v. The extent (feet) and duration of all project-related visible turbidity plumes.
   b. Require the applicant 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 applicant 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-2019-03996 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 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.

2. The COE should encourage the applicant to install full-depth sediment curtains to fully enclose pile extraction work, unless that work would be done out of the water during low tide.

3. The COE should encourage the applicant to limit any lighting systems that may be installed on the new floats to low-intensity lights that are aimed and shielded in a manner intended illuminate the walkway while minimizing overwater illumination.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S Army Corps of Engineers' authorization of the Deer Harbor Marina Float Addition Project on Orcas Island, Washington, (NWS-2019-50).

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 is not likely to adversely affect HCSR chum salmon, PS steelhead, PS/GB yelloweye rockfish and its designated critical habitat, southern eulachon, southern green sturgeon, southern resident (SR) killer whales and its designated critical habitat, humpback whales, and leatherback sea turtles. Impacts on critical habitat for HCSR chum salmon, PS steelhead, southern eulachon, southern green sturgeon, humpback whales, and leatherback sea turtles were not considered in this opinion because critical habitat for those species doesn't occur within the action area, or as in the case of humpback whales, has not been designated. 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

As described in the analysis of action's effects (Section 2.5), project-related stressors would cause no measurable effects on fish beyond about 300 feet around the Deer Harbor Marina on Orcas Island. Based on the best available information concerning species distribution, habitat availability, and life history characteristics of HCSR chum salmon, PS steelhead, PS/GB yelloweye rockfish, southern eulachon, and southern green sturgeon, it is very unlikely that individuals of any of these species would be present within 300 feet of the Marina, and extremely unlikely that any would be present during the short period of in-water work when the effects of the action would be most intense. Therefore, the proposed action is not likely to adversely affect any of these species.

Based on the best available information concerning species distribution and life history characteristics of leatherback sea turtles, it is extremely unlikely that any individuals of this species would be present within action area for this project. Further, in the extremely unlikely situation where leatherback sea turtles would be present within the action area, project related stressors would be very unlikely to cause detectable effects on the fitness or normal behaviors of the exposed individuals. Therefore, the proposed action is not likely to adversely affect leatherback sea turtles.

SR killer whales are sighted relatively frequently within San Juan Channel and Harney Channel, but are infrequently sighted in or near Deer Harbor. Humpback whale sightings are relatively uncommon within the channels between the San Juan Islands. Based on the best available information about the distribution and habitat use by both of these species, and on the small scale the project-related work, it is very unlikely that individuals of either of the species would be exposed to any project-related effects other than noise and to possible indirect effects through the trophic web.

Where would not constrain by the bay or blocked by intervening islands, detectable project-related in-water noise would extend in narrow swathes between the Deer Harbor Marina and the east side of San Juan Island, four miles to the southeast (Figure 3). SR killer whales and humpback whales that are within those swaths could theoretically detect project-related noise.

As described in Section 2.5, project-related in-water noise would be caused by 1 week of vibratory and/or rock-drill installation of 5 steel pipe piles up to 18 inches in diameter, and by vibratory extraction of 2 12-inch timber piles. About 22 minutes of work is expected per pile, and no more than 4 piles would be installed and/or extracted per day. Therefore, pile work would cause 7 22-minute periods of non-impulsive vibratory and/or drilling noise over 1 week, with no more than 4 22-minute noise events occurring during any single day. Other in-water noise would be caused by tugboat and spud-barge operations.

The peak noise levels of all sources would be non-injurious to SR killer whales, humpback whales, and other marine mammals (NMFS 2018b). The loudest project-related impulsive noise (barge spuds) would attenuate to about 160 dB_{RMS} at about 177 feet (54 m) from the marina. The loudest non-impulsive noise (vibratory installation of 18-inch piles) would not attenuate below 120 dB_{RMS} before reaching San Juan Island, about 4 miles to the southeast of the marina.

However, given the relatively high ambient noise levels that are expected to occur in the area (Bassett et al. 2010), project-related noise below 135 dB_{RMS} would nearly undetectable by whales and other marine mammals. Therefore, it is most likely that the loudest non-impulsive noise would be undetectable by whales much beyond 940 yards (858 m) from the marina.

Should any SR killer whales or humpback whales approach close enough to hear and respond to project-related noise, they would, at most, experience infrequent and brief periods of low-level acoustic masking, and they may exhibit temporary minor avoidance of the area within about 250 yards around the entrance to Deer Harbor. The exposure would cause no impacts on their fitness, and it would cause no meaningful impacts on their normal behaviors. To further reduce the potential effects on listed whales, the applicant's project includes a marina mammal monitoring plan that requires the deployment of two radio-equipped marine mammal observers positioned in a boat at the entrance to the harbor during all pile-related work, with the postponement or halt of that work required if whales are detected within 656 yards (600 m) of the harbor entrance (Jen-Jay 2018a; 2020). Therefore, project-related noise is not likely to adversely affect SR killer whales and humpback whales.

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).

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.

The action area extends about 4 miles from the Deer Harbor Marina for its potential effects on marine mammals. The entire action area has been excluded from designation as critical habitat for HCSR chum salmon, PS steelhead, southern eulachon, southern green sturgeon, and leatherback sea turtles. No critical habitat has been designated to date for humpback whales. Therefore, the COE determined that the proposed action would have no effects on the designated critical habitats for any of those species.

Critical habitat for PS/GB yelloweye rockfish has been designated within the action area about 1,150 yards southwest of the Deer Harbor Marina. However, as described in the analysis of action's effects (Section 2.5), project-related stressors would cause no measurable effects on fish or their habitat resources beyond about 300 feet. Therefore, the proposed action is not likely to adversely affect designated critical habitat for PS/GB yelloweye rockfish.

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 large portions of Deer Harbor. 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, and structure-related vessel activity would be a persistent low-level source of contaminants. Minor effects may be detectable within about 300 feet of the marina, but would not persist past several hours following individual events.

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 annually injure very 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 1, construction-related noise would radiate out of Deer Harbor. Exposure to this noise would, at most, cause brief episodic periods of low-level acoustic masking, and minor avoidance of the ensonified areas near the harbor's entrance. 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 HCSR chum salmon, PS steelhead, PS/GB yelloweye rockfish and its designated critical habitat, southern eulachon, southern green sturgeon, SR killer whales and its designated critical habitat, humpback whales, and leatherback sea turtles.

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 Deer Harbor (Figure 3). 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., DO, 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 likely due to 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 habitats, 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 periodic ephemeral minor adverse effects and long-term minor beneficial effects on water quality. Pile removal would briefly increase suspended solids and may temporarily introduce low levels of contaminants. Also, low levels of pollutants may enter the water during construction as well as from the additional vessels that would moor at the new floats. Conversely, the removal of 2 creosote-treated timber piles would very slightly reduce ongoing PAH contamination at the marina. 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 marina. The new mooring floats and their piles may slightly alter the direction and velocity of water flowing past them. Conversely, removal of 2 piles may cause very minor long-term beneficial effects on water velocity close to the shoreline. 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 pile removal site. Installation of the new north float may also slightly reduce the SAV and invertebrate communities within its shadow.

6. Cover and habitat complexity: The proposed action would cause long term minor adverse effects on cover and habitat complexity. Installation of the new north float may slightly reduce SAV growth within its shadow.

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 678 square feet of over-water structure and 2 creosote-treated timber piles, as well as a mix of re-decking with grating and/or relocating to deeper water of 3 floats with a combined over-water area of 586 square feet. 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:

1. Require their contractors to install full-depth sediment curtains to fully enclose pile extraction work, unless that work would be done out of the water during low tide; and

2. Require tugboat operators to operate at the lowest safe maneuvering speeds and power settings when maneuvering in shallow waters close to the shoreline.

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 Deer Harbor Marina, LLC., WDFW, the government and citizens of San Juan County and the City of Deer Harbor, 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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