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-2020-00009 (Wanzer)
WCRO-2020-00664 (Kelly)

August 24, 2020

Michelle Walker
Chief, Regulatory Branch
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 Wanzer and Kelly Floating Home Replacement Projects in Seattle, Washington (COE Nos. NWS-2019-259 and NWS-2020-73), HUC: 171100120400 – Portage Bay.

Dear Ms. Walker:

Thank you for your letters of November 25, 2019, and January 24, 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 for the Wanzer and Kelly Floating Home Replacement Projects. 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 but is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon and PS steelhead. The NMFS also concludes that the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon but is not likely to result in the destruction or adverse modification of that designated critical habitat.

This Opinion includes an incidental take statement (ITS) that describes reasonable and prudent measures (RPMs) the NMFS considers necessary or appropriate to minimize the incidental take associated with this action, and sets forth nondiscretionary terms and conditions that the COE must comply with to meet those measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

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. Therefore, we have provided 5 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: Alisa Ralph, COE
Kristin McDermott, COE

WCRO-2020-00009 (Wanzer)
WCRO-2020-00664 (Kelly)

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

Wanzer and Kelly Floating Home Replacement Projects
Seattle, Washington
(COE Numbers: NWS-2019-259 and NWS-2020-73, respectively)
(6th Field HUC: 171100120400 – Portage Bay)

NMFS Consultation Numbers: WCRO-2020-00009 (Wanzer)
WCRO-2020-00664 (Kelly)

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Chinook salmon (Oncorhynchus tshawytscha) Puget Sound (PS)	Threatened	Yes	No	Yes	No
Steelhead (O. mykiss) PS	Threatened	Yes	No	No	No

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

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

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: August 24, 2020

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LIST OF ACRONYMS

BE – Biological Evaluation
CFR – Code of Federal Regulations
COE – Corps of Engineers, U.S. Army
dB – Decibel (common unit of sound measurement)
DIP – Demographically Independent Population
DPS – Distinct Population Segment
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
HAPC – Habitat Area of Particular Concern
HUC – Hydrologic Unit Code
ITS – Incidental Take Statement
mg/L – Milligrams per Liter
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
PAH – Polycyclic Aromatic Hydrocarbons
PBDE – Polybrominated Diphenyl Ethers
PBF – Physical or Biological Feature
PCE – Primary Constituent Element
PFMC – Pacific Fishery Management Council
PS – Puget Sound
PSSTRT – Puget Sound Steelhead Technical Recovery Team
PSTRT – Puget Sound Technical Recovery Team
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SAV – Submerged Aquatic Vegetation
SEL – Sound Exposure Level
VSP – Viable Salmonid Population
WDFW – Washington State Department of Fish and Wildlife
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 November 26, 2019, the NMFS received a request from the U.S. Army Corps of Engineers to initiate informal ESA section 7 informal consultation for the Wanzer floating home replacement project (COE 2019). The initiation package included the applicant's abbreviated biological evaluation (BE), project drawings, Joint Aquatic Resources Permit Application Form (JARPA), JARPA photographs, piling best management practices (BMPs), and an email from the applicant to answer COE questions (Wanzer 2019a-f). That consultation request was assigned the NMFS tracking number WCRO-2019-03540. The NMFS requested additional information on December 11, 2019, which the COE provided on December 20, 2019 (COE 2020a), including revised project drawings (Wanzer 2019g). On January 6, 2020, the NMFS closed WCRO-2019-03540 with an email stating our non-concurrence. The COE requested formal consultation, and formal consultation was initiated the same day (COE 2020b). That request was assigned the NMFS tracking number WCRO-2020-00009.

On January 24, 2020, the NMFS received a request from the U.S. Army Corps of Engineers to initiate informal ESA section 7 informal consultation for the Kelly floating home replacement project (COE 2020c). The initiation package included the applicant's abbreviated BE and project drawings (Kelly 2019a & b). That consultation request was assigned the NMFS tracking number WCRO-2020-00111. The NMFS requested additional information on February 24, 2020, which the COE provided on March 11, 2020 (COE 2020d), including an attached document from the applicants' agent (ECCO 2020a). On March 20, 2020, the NMFS closed WCRO-2020-00111 with an email stating our non-concurrence. Subsequently, the COE requested formal consultation on March 25, 2020 (COE 2020e). That request was assigned the NMFS tracking number WCRO-2020-000664, and formal consultation was initiated the same day.

This Opinion is based on the information in the BEs, project drawings, and other sources identified above, as well as on the recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon and PS steelhead; 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).

In separate actions, the COE proposes to authorize the replacement of the Wanzer and Kelly floating homes in Portage Bay, Seattle Washington (Figure 1).

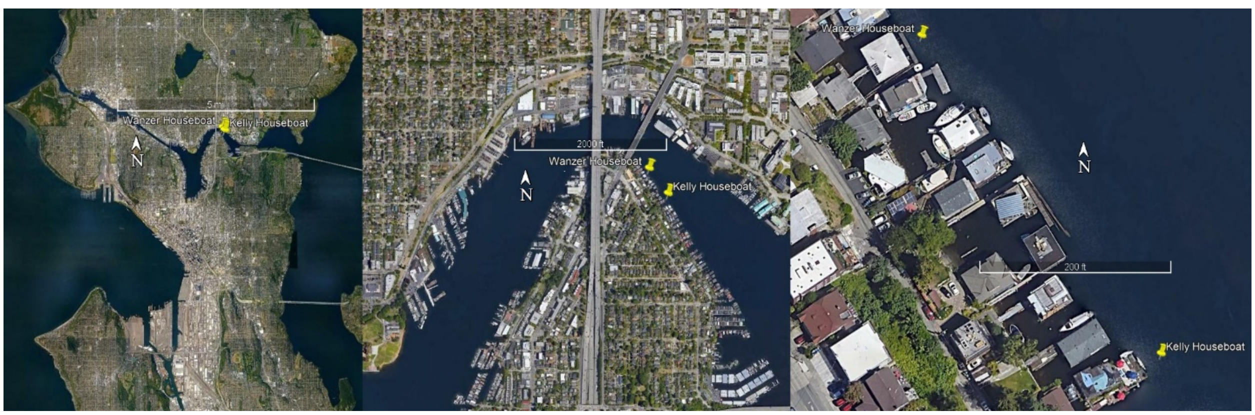

Figure 1. Google satellite photographs of the Wanzer and Kelly floating home project sites in Portage Bay, along the Lake Washington Ship Canal, Seattle, Washington.

The Wanzer project (NWS-2019-259) would require about a week of in-water work that would be done between November 1 and April 15. The project would remove and replace an existing 1,543-square foot log raft float and the house it currently supports. The applicant would also remove a 5-foot wide, 110-square foot, wood-decked walkway and its 8 supporting posts, and replace it with a 4-foot wide, 84-square foot walkway that would be fully decked with 60% open area grating. The applicant would also permanently remove 1 untreated timber pile, a 93-square foot wood-decked accessory float, and 4 floating logs with a combined overwater area of about 284 square feet (Figure 2). All work would be done in compliance with the conservation measures identified in the applicant’s BE, the USEPA pile BMPs (Wanzer 2019e), and the provisions of the Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) for this project (WDFW 2019).

The new floating home and walkway would be constructed at a nearby boatyard, and would have very similar dimensions as the existing structures but with slightly less overwater coverage. The new 1,505-square foot concrete displacement float would be positioned almost exactly where the existing float is moored. The new home would have the same height and roof area as the existing home (20 feet above the waterline and slightly less than 1,505 square feet). The new roof would consist of a mix of concrete pavers and vegetated areas. The new house would have a recessed front porch with 10 recessed, 1-inch diameter 1.8-watt (80-lumen) LED lights. Five would be oriented upward, and 5 would be oriented downward. Eight 3-inch diameter 16-watt (1,100-lumen) LED downlights would be recessed into the soffit of the main level deck. One shielded incandescent 40-watt (330-lumen) porch light would be installed over the upper level door. All fixtures would be located and oriented to avoid shining directly on the water. The new 4-foot wide walkway would be aluminum-framed and installed slightly east of the current walkway's location. (Figure 2).

The project would include the use of tugboats and barge-mounted equipment. The contractors would disconnect the main float and the accessory float from their moorings. They would use a barge-mounted crane to remove the existing walkway, and to pull 1 timber pile. Demolition debris including the pile and walkway would be placed on the existing float and/or a barge. The floating home, the accessory float, floating logs and the demolition debris would be towed to a nearby boatyard to be dismantled and properly disposed of.

The barge-mounted crane would be equipped with a vibratory pile driver and used to remove the 1 timber pile and to install 2 12-inch steel pipe piles. The applicant estimates that pile installation would require a maximum of 2 days and 120 minutes of vibratory work per day. The pre-constructed new floating home and walkway would be towed to the project site after the existing floating home has been removed and the new piles are installed. The new floating home would be moored to the new steel piles, and connected to the existing adjacent accessory float, and connected to the dock via the new walkway (Figure 2).

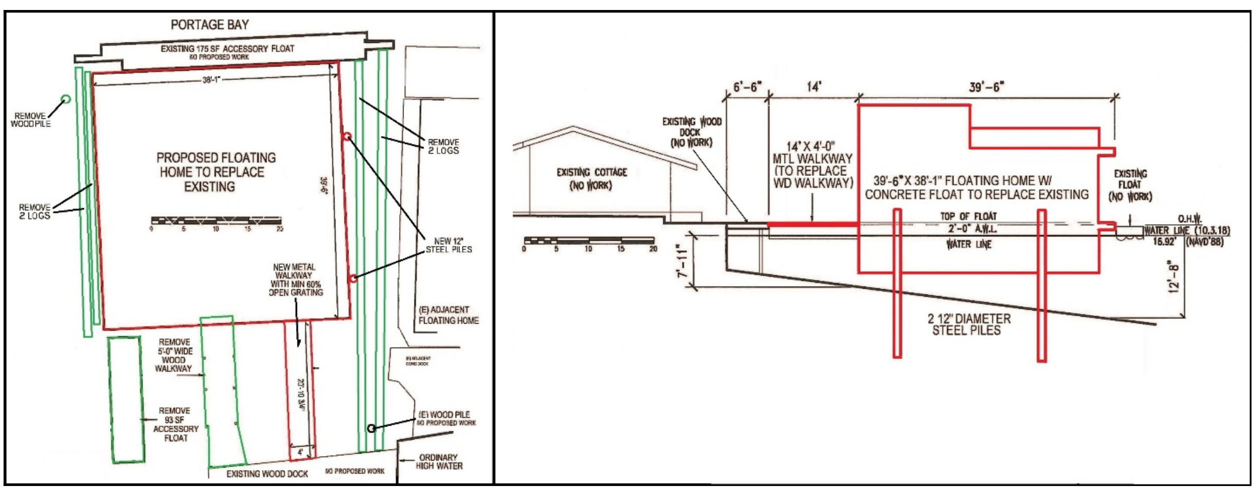

Figure 2. Overhead and side-view drawings of the Wanzer project site. New or replaced structures are outlined in red. Permanently removed structures are outlined in green.

The Kelly project (NWS-2020-73) would require about 6 to 8 months of work to complete, with all in-water work, including tugboat and barge operations limited to October 15 through April 15

(ECCO 2020b). The applicant's contractor would demolish an existing 745-square foot single-story residence, permanently remove a 331-square foot float, re-deck about 201 square feet of the main access walkway, repair the upper portions the existing 1,636-square foot (36.5-foot X 44.83-foot) log raft float, remove all un-encapsulated foam from under the float and replace it with encapsulated floatation (defrag the floatation). They would then construct a new 1.5 story residence on the repaired float. The roof of the new home would come close to covering the entire float, but no part of the new roof would extend beyond the edges of the float (ECCO 2020c) (Figures 2 & 3). All work would be done in compliance with the conservation measures identified in the applicant's BE, with the measures identified in the agent's response to NMFS (ECCO 2020a), and the provisions of the WDFW HPA for this project (WDFW 2020a).

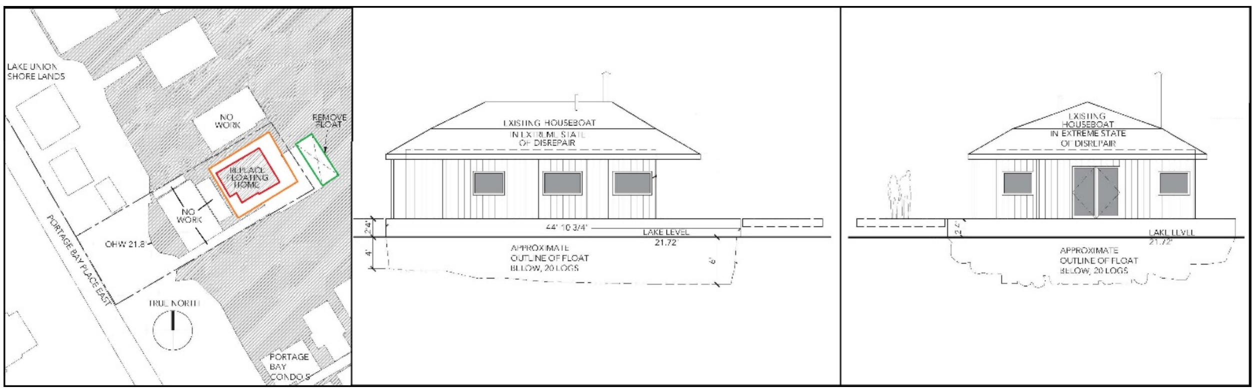

Figure 3. Drawings of the existing Kelly floating home project site. The overhead image shows the home outlined in red, the outline of the float in orange, and the float to be permanently removed outlined in green. The middle image shows the east side of the existing float and house. The right image shows the north side of the float and house as viewed from the water.

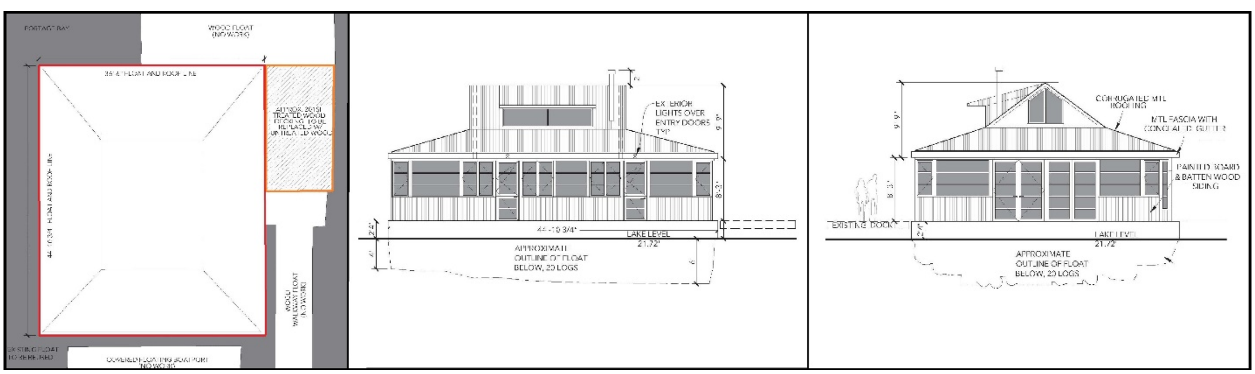

Figure 4. Drawings of the proposed Kelly floating home project site. The overhead image shows the roof of the new home outlined in red, and the re-decked dock area outlined in orange, and the float to be permanently removed outlined in green. The middle image shows the east side of the float and house. The right image shows the north side of the float and house as viewed from the water.

The project would include the use of tugboats, barges, a barge-mounted crane and other equipment, and hand-tools. The contractors would demolish the existing home, and remove damaged wood from the upper portions of the float and from the walkway. Also, divers would conduct 1 or 2 days of underwater work to defrag the floatation under float. All demolition and construction debris would be placed onto a debris barge by hand and/or by crane, and transported to appropriate upland disposal facilities.

The damaged wood components would be replaced with new wood, and the 201 square feet of new walkway decking would be replaced with untreated wood. After the float and walkway are repaired, the contractors would construct the new home on top of the repaired float. The exterior surfaces of the new home would contain no treated wood. The new roofing would consist of coated corrugated metal, and all other exterior metal surfaces would also be coated. Exterior lighting on the house would consist of a light that would be mounted over the each of the 2 entry doors on the east side of the new home. Those lights and any dock lights would be limited to 40 watt fixtures that would be shielded and aimed to prevent direct illumination of the water's surface.

The proposed action would cause no other activities.

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

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

As described in Section 1.2, the COE initially determined that both proposed actions were not likely to adversely affect PS Chinook salmon, their critical habitat, and PS steelhead. The NMFS did not concur, and the COE subsequently requested formal consultation for both actions without specifically revising their effects determinations. The NMFS takes the COE's request for formal consultation to mean that their revised determination is that both actions are likely to adversely affect PS Chinook salmon, their critical habitat, and PS steelhead (Table 1). Because the proposed action is likely to adversely affect listed species, the NMFS has proceeded with formal consultation.

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)
steelhead (*O. mykiss*) Puget Sound	Threatened	LAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)

LAA = likely to adversely affect NLAA = not likely to adversely affect
N/A = not applicable. The action area is outside designated critical habitat, or critical habitat has not been 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 (McElhany et al. 2000) to assess the viability of the populations that constitute the species. These four criteria (spatial structure, diversity, abundance, and productivity) encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment.

"Spatial structure" refers both to the spatial distributions of individuals in the population and the processes that generate that distribution. A population's spatial structure depends on habitat quality and spatial configuration, and the dynamics and dispersal characteristics of individuals in the population.

"Diversity" refers to the distribution of traits within and among populations. These range in scale from DNA sequence variation in single genes to complex life history traits.

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

"Productivity" refers to the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is in decline.

For species with multiple populations, we assess the status of the entire species based on the biological status of the constituent populations, using criteria for groups of populations, as described in recovery plans and guidance documents from technical recovery teams. Considerations for species viability include having multiple populations that are viable, ensuring that populations with unique life histories and phenotypes are viable, and that some viable populations are both widespread to avoid concurrent extinctions from mass catastrophes and spatially close to allow functioning as metapopulations (McElhany et al. 2000).

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

Puget Sound (PS) Chinook Salmon: The PS Chinook salmon evolutionarily significant unit (ESU) was listed as threatened on June 28, 2005 (70 FR 37160). We adopted the recovery plan for this ESU in January 2007. The recovery plan consists of two documents: the Puget Sound salmon recovery plan (SSPS 2007) and the final supplement to the Shared Strategy's Puget Sound salmon recovery plan (NMFS 2006). The recovery plan adopts ESU and population level viability criteria recommended by the Puget Sound Technical Recovery Team (PSTRT) (Ruckelshaus et al. 2002). The PSTRT's biological recovery criteria will be met when all of the following conditions are achieved:

- The viability status of all populations in the ESU 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.

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

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

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

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

Spatial Structure and Diversity: The PS Sound Chinook salmon ESU includes all naturally spawning populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. The ESU also includes the progeny of numerous artificial propagation programs (NWFSC 2015). The PSTRT identified 22 extant populations, grouped into five major geographic regions, based on consideration of historical distribution, geographic isolation, dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity. The PSTRT distributed the 22 populations among five major biogeographical regions, or major population groups (MPGs), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 2).

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

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).

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

Limiting Factors: Factors limiting recovery for PS Chinook salmon include:

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

PS Chinook Salmon within the Action Area: The PS Chinook salmon that are likely to occur in the action area would be fall-run Chinook salmon from the Cedar River population and from the North Lake Washington / Sammamish River population (NWFSC 2015; WDFW 2020b). Both stream- and ocean-type Chinook salmon are present in these populations, with the majority being ocean-types.

The Cedar River population is relatively small, with a total annual abundance fluctuating at close to 1,000 fish (NWFSC 2015; WDFW 2020c). Between 1965 and 2019, the total abundance for PS Chinook salmon in the basin has fluctuated between about 133 and 2,451 individuals, with the average trend being slightly negative. The 2015 status review reported that the 2010 through 2014 5-year geometric mean for natural-origin spawner abundance had shown a positive change since the 2010 status review, with natural-origin spawners accounting for about 82% of the population. WDFW data suggest that natural-origin spawners accounted for about 71% of a combined total return of 855 fish in 2019 (WDFW 2020c).

The North Lake Washington / Sammamish River population is also small, with a total abundance that has fluctuated between about 33 and 2,223 individuals from 1983 through 2019. Natural-origin spawners make up a small proportion of the total population, accounting for about 30% of the 365 total return in 2019, and the trend is rather flat to slightly negative (NWFSC 2015; WDFW 2020c).

Some returning adults and out-migrating juveniles from these populations, as well as individuals that spawn in some of the smaller streams around the lake, are likely to pass through the action area. Adult Chinook salmon pass through Chittenden Locks (aka Ballard Locks) between mid-June through September, with peak migration occurring in mid-August (City of Seattle 2008). Spawning occurs well upstream of the action area between early August and late October. Juvenile Chinook salmon are found in Lake Washington between January and July, primarily in the littoral zone (Tabor *et al*. 2006). Outmigration through the ship canal and through the locks occurs between late-May and early-July, with the peak occurring in June (City of Seattle 2008).

Puget Sound (PS) steelhead

The PS steelhead distinct population segment (DPS) was listed as threatened on May 11, 2007 (72 FR 26722). The recovery plan for this DPS is under development. In 2013, the Puget Sound Steelhead Technical Recovery Team (PSSTRT) identified 32 demographically independent populations (DIPs) within the DPS, based on genetic, environmental, and life history characteristics. Those DIPs are distributed among three geographically-based MPGs; Northern Cascades, Central and South Puget Sound; and Hood Canal and Strait de Fuca (Myers et al. 2015) (Table 3).

Table 3. PS steelhead Major Population Groups (MPGs), Demographically Independent Populations (DIPs), and DIP Viability Estimates (Modified from Figure 58 in Hard et al. 2015).

Geographic Region (MPG)	Demographically Independent Population (DIP)	Viability
Northern Cascades	Drayton Harbor Tributaries Winter Run	Moderate
	Nooksack River Winter Run	Moderate
	South Fork Nooksack River Summer Run	Moderate
	Samish River/Bellingham Bay Tributaries Winter Run	Moderate
	Skagit River Summer Run and Winter Run	Moderate
	Nookachamps River Winter Run	Moderate
	Baker River Summer Run and Winter Run	Moderate
	Sauk River Summer Run and Winter Run	Moderate
	Stillaguamish River Winter Run	Low
	Deer Creek Summer Run	Moderate
	Canyon Creek Summer Run	Moderate
	Snohomish/Skykomish Rivers Winter Run	Moderate
	Pilchuck River Winter Run	Low
	North Fork Skykomish River Summer Run	Moderate
	Snoqualmie River Winter Run	Moderate
	Tolt River Summer Run	Moderate
Central and South Puget Sound	Cedar River Winter Run	Low
	North Lake Washington and Lake Sammamish Winter Run	Moderate
	Green River Winter Run	Low
	Puyallup River Winter Run	Low
	White River Winter Run	Low
	Nisqually River Winter Run	Low
	South Sound Tributaries Winter Run	Moderate
	East Kitsap Peninsula Tributaries Winter Run	Moderate
Hood Canal and Strait de Fuca	East Hood Canal Winter Run	Low
	South Hood Canal Tributaries Winter Run	Low
	Skokomish River Winter Run	Low
	West Hood Canal Tributaries Winter Run	Moderate
	Sequim/Discovery Bay Tributaries Winter Run	Low
	Dungeness River Summer Run and Winter Run	Moderate
	Strait of Juan de Fuca Tributaries Winter Run	Low
	Elwha River Summer Run and Winter Run	Low

In 2015, the PSSTRT concluded that the DPS is at “very low” viability; with most of the 32 DIPs and all three MPGs at “low” viability based on widespread diminished abundance, productivity, diversity, and spatial structure when compared with available historical evidence (Hard *et al*. 2015). Based on the PSSTRT viability criteria, the DPS would be considered viable when all three component MPG are considered viable. A given MPG would be considered viable when: 1) 40%or more of its component DIP are viable; 2) mean DIP viability within the MPG exceeds the threshold for viability; and 3) 40% or more of the historic life history strategies (i.e., summer runs and winter runs) within the MPG are viable. For a given DIP to be considered viable, its probability of persistence must exceed 85%, as calculated by Hard et al. (2015), based on abundance, productivity, diversity, and spatial structure within the DIP.

General Life History: Steelhead are anadromous fish that require well-oxygenated water that is typically less than 63º F (17º C). PS steelhead exhibit two major life history strategies. Ocean-maturing, or winter-run fish typically enter freshwater from November to April at an advanced stage of maturation, and then spawn from February through June. Stream-maturing, or summer-run fish typically enter freshwater from May to October at an early stage of maturation, migrate to headwater areas, and hold for several months prior to spawning in the following spring. After hatching, juveniles rear in freshwater from one to three years prior to migrating to marine habitats (two years is typical). Smoltification and seaward migration typically occurs from April to mid-May. Smolt lengths vary between watersheds, but typically range from 4.3 to 9.2 inches (109 to 235 mm) (Myers et al. 2015). Juvenile steelhead are generally independent of shallow nearshore areas soon after entering marine water (Bax et al. 1978, Brennan et al. 2004, Schreiner et al. 1977), and are not commonly caught in beach seine surveys. Recent acoustic tagging studies (Moore et al. 2010) have shown that smolts migrate from rivers to the Strait of Juan de Fuca from one to three weeks. PS steelhead feed in the ocean waters for one to three years (two years is again typical), before returning to their natal streams to spawn. Unlike Chinook salmon, most female steelhead, and some males, return to marine waters following spawning (Myers et al. 2015).

Spatial Structure and Diversity: The PS steelhead DPS includes all naturally spawned anadromous steelhead populations in streams in the river basins of the Strait of Juan de Fuca, Puget Sound, and Hood Canal, Washington, bounded to the west by the Elwha River (inclusive) and to the north by the Nooksack River and Dakota Creek (inclusive). The DPS also includes six hatchery stocks that are considered no more than moderately diverged from their associated natural-origin counterparts (USDC 2014). PS steelhead are the anadromous form of *O. mykiss* that occur below natural barriers to migration in northwestern Washington State (NWFSC 2015). Non-anadromous ‘‘resident’’ *O. mykiss* (a.k.a. rainbow trout) occur within the range of PS steelhead but are not part of the DPS due to marked differences in physical, physiological, ecological, and behavioral characteristics (Hard et al. 2015). As stated above, the DPS consists of 32 DIPs that are distributed among three geographically-based MPG. An individual DIP may consist of winter-run only, summer-run only, or a combination of both life history types. Winter-run is the predominant life history type in the DPS (Hard et al. 2015).

Abundance and Productivity: Available data on total abundance since the late 1970s and early 1980s indicate that abundance trends have fluctuated between positive and negative for individual DIPs. However, low productivity persists throughout the 32 DIPs, with most showing downward trends, and a few showing sharply downward trends (Hard et al. 2015, NWFSC 2015). Since the mid-1980s, trends in natural spawning abundance have also been temporally variable for most DIP but remain predominantly negative, and well below replacement for at least 8 of the DIP (NWFSC 2015). Smoothed abundance trends since 2009 show modest increases for 13 DIPs. However, those trends are similar to variability seen across the DPS, where brief periods of increase are followed by decades of decline. Further, several of the upward trends are not statistically different from neutral, and most populations remain small. Nine of the evaluated DIPs had geometric mean abundances of fewer than 250 adults, and 12 had fewer than 500 adults (NWFSC 2015). Over the time series examined, the over-all abundance trends, especially for natural spawners, remain predominantly negative or flat across the DPS, and general steelhead abundance across the DPS remains well below the level needed to sustain natural production into the future (NWFSC 2015). The PSSTRT recently concluded that the PS steelhead DPS is currently not viable (Hard et al. 2015). The DPS's current abundance and productivity are considered to be well below the targets needed to achieve delisting and recovery. Growth rates are currently declining at 3 to 10% annually for all but a few DIPs, and the extinction risk for most populations is estimated to be moderate to high. The most recent 5-year status review concluded that the DPS should remain listed as threatened (NMFS 2017a).

Limiting Factors: Factors limiting recovery for PS steelhead include:

- The continued destruction and modification of steelhead habitat
- Widespread declines in adult abundance (total run size), despite significant reductions in harvest in recent years
- Threats to diversity posed by use of two hatchery steelhead stocks (Chambers Creek and Skamania)
- Declining diversity in the DPS, including the uncertain but weak status of summer run fish
- A reduction in spatial structure
- Reduced habitat quality through changes in river hydrology, temperature profile, downstream gravel recruitment, and reduced movement of large woody debris
- In the lower reaches of many rivers and their tributaries in Puget Sound where urban development has occurred, increased flood frequency and peak flows during storms and reduced groundwater-driven summer flows, with resultant gravel scour, bank erosion, and sediment deposition
- Dikes, hardening of banks with riprap, and channelization, which have reduced river braiding and sinuosity, increasing the likelihood of gravel scour and dislocation of rearing juveniles

PS Steelhead within the Action Area: The PS steelhead populations that occur in the action area consist of winter-runs from the Cedar River and North Lake Washington / Lake Sammamish populations. Both populations are among the smallest within the DPS (NWFSC 2015; WDFW 2020b). WDFW reports that the total PS steelhead abundance in the Cedar River basin has fluctuated between 0 and 900 individuals between 1984 and 2018, with a strong negative trend. Since 2000, the total annual abundance has remained under 50 fish. NWFSC (2015) suggests that the returns may have been above 1,000 individuals during the 1980s, but agrees with the steep decline to less than 100 fish since 2000. It is unclear what proportion of the returns are natural-origin spawners, if any, and a total of only 4 adults are thought to have returned in 2018 (WDFW 2020d). The Sammamish River population is even smaller. WDFW reports that the total abundance for PS steelhead in the North Lake Washington / Lake Sammamish basin fluctuated between 0 and 916 individuals between 1984 and the last survey in 1999, with a strong negative trend. Abundance never exceeded 45 fish after 1992, and was only 4 in 1999 (WDFW 2020d). NWFSC (2015) disagrees with WDFW in that returns may have been above 1,500 individuals during the mid-1980s, but NWFSC agrees with the steep decline to virtually no steelhead in the basin since 2000.

All returning adults and out-migrating juveniles of these two populations must pass the action area to complete their life cycles. Adult steelhead pass through Chittenden Locks (aka Ballard Locks) and the Lake Washington Ship Canal between January and May, and may remain within Lake Washington through June (City of Seattle 2008). The timing of steelhead spawning in the basin is uncertain, but occurs well upstream of the action area. Juvenile steelhead enter Lake Washington in April, and typically migrate through the ship canal and past the action area to the locks between April and May (City of Seattle 2008).

Critical Habitat

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

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

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

Table 4. 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).

<u>Critical Habitat within the Action Area:</u> All of Portage Bay has been designated as freshwater critical habitat for PS Chinook salmon. The critical habitat within the action area primarily

supports the Freshwater Migration PBF for juvenile and adult PS Chinook (NOAA 2020; WDFW 2020b).

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 sites are located toward the western edge of Portage Bay, on the south side of the Lake Washington Ship Canal (Figure 1). As described in Sections 2.5, water quality impacts within about 300 feet of each project site would be the stressor with the greatest range of effects for fish. The action 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.

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 sites are located toward the western edge of Portage Bay, on the south side of the Lake Washington Ship Canal (Figure 1). The geography and ecosystems in and adjacent to the action area have been dramatically altered by human activity since European settles first arrived in the 1800s. Historically, a small stream flowed from Lake Union to Shilshole Bay, with no surface water connection between Lake Union and Lake Washington. The waters of Lake Washington flowed south to the Duwamish River via the now absent Black River. The Lake Washington Ship Canal was created by dredging and excavation that began in the 1880s to provide a navigable passage between Lake Washington and the marine waters of Shilshole Bay. The canal is 8.6 miles long, about 150 to 260 feet wide in the cuts, and widens at Portage Bay, Lake Union, and Salmon Bay.

The canal was completed in 1916 when little was known about the environmental needs of the ESA-listed salmonids that now depend on it. Instead of slopes that gently rise to the surface, as typically occurs along the banks of natural streams, the canal closely resembles an elongated box culvert along most of its length, and about 96% of the canal's banks are armored (City of Seattle 2008). The averages depth in the navigational channel is about 30 feet, with typical depths along the edges of 10 to 20 feet. Additionally, the Hiram M. Chittenden Locks (aka Ballard Locks) were constructed near the west end of the canal to maintain navigable water levels in the canal and lakes. This permanently converted Salmon Bay from an estuary to freshwater. Water flow through canal is tightly controlled, and is typically very slow. Further, the canal supports high levels of commercial and recreational vessel traffic.

The vast majority of the canal's shoreline from Lake Washington to Shilshole Bay is lined by shipyards, industrial properties, large marinas, houseboats, and residential piers. Unbroken urban development extends north and south immediately landward of both shorelines. With the exception of the southern end of Portage Bay, and along the armored banks of the Fremont and Mountlake Cuts, very little riparian vegetation exists along the banks of the canal.

Water quality within the canal is influenced by the inflow of freshwater from Lake Washington, by point and non-point discharges all along the waterway, and by a saltwater lens that intrudes through the Ballard Locks, underlays the outflowing freshwater, and occasionally extends into Lake Union. Industrial, commercial, and residential development has impacted water quality in the canal since before the canal was completed in 1916. Lumber and plywood mills, machine shops, metal foundries, fuel and oil facilities, concrete and asphalt companies, and power plants were quickly developed along the shoreline of the waterway, along with numerous shipyards, marinas, commercial docks, and houseboats. Virtually all of the early industrial, commercial, and residential facilities discharged untreated wastes directly to the waterway, some of which persisted into the 1940s and beyond. Tomlinson (1977) cites a 1943 Washington State Pollution Commission report that indicated that the Seattle Gas Plant (now Gasworks Park) discharged oily wastes so routinely that the water surface was covered and fish kills occurred in its vicinity. The report also identified raw sewage discharge into the waterway from most of the residences, commercial establishments, and all of the houseboats that lined the shoreline. Stormwater drainage has also contributed to pollutant loading. Most of the direct discharge of raw sewage was stopped and the gas plant ceased operation during the 1960s.

The City of Seattle (1987) reported water quality problems in the canal that included saltwater intrusion, low dissolved oxygen, and elevated fecal coliform, as well as sediments that were contaminated with Polycyclic Aromatic Hydrocarbons (PAHs), Polychlorinated Biphenyls (PCBs), cadmium, chromium, lead, mercury, nickel, and zinc, particularly in the area off the former Seattle Gas Plant. Today, the overall water quality in the ship canal has improved substantially. However, Portage Bay is included on Washington State Department of Ecology's (WDOE) 303(d) list impaired waterbodies for elevated water temperatures and fecal coliform bacteria (Category 5). Other listings include chloride (Category 2), as well as chromium, selenium, and total phosphorus (Category 1) (WDOE 2020).

The artificial shorelines and widespread presence of overwater structures along the length of the canal provide habitat conditions that favor fish species that prey on juvenile salmonids, especially the non-native smallmouth bass. Other predators in the canal include the native northern pikeminnow and the non-native largemouth bass (Celedonia et al. 2008a and b; Tabor et al. 2004 and 2010). Tabor et al. (2004) estimated that about 3,400 smallmouth bass and 2,500 largemouth bass, large enough to consume salmon smolt (> 130 mm fork length), were in the ship canal. They also estimated that smallmouth bass consumed about 48,000 salmon smolts annually, while largemouth bass consumed about 4,200 smolts. Of those, over half were Chinook salmon smolts. Predation appeared to be highest in June, and near Portage Bay, when smolts made up approximately 50% of the diet for smallmouth bass, and about 45% for northern pikeminnow. Returning adult salmon and steelhead are often exposed to excessive predation by pinniped marine mammals (seals and sea lions) that feed on the fish that accumulate downstream of the fish ladder.

The two project sites are located within about 400 feet of each other near the west end of a half mile stretch of the canal's southern bank where low hundreds of similar floating homes are moored together in a nearly continuous group that extend between 100 and 400 feet from shore (Figure 1). The shoreline at the project sites consists of concrete or rock bulkheads. The aquatic substrate consists of silty sands and muds at depths of about 7 to 14 feet under the floats. Submerged aquatic vegetation (SAV) is mostly limited to with low amounts of milfoil.

The past and ongoing anthropogenic impacts described above have reduced the action area's ability to support PS Chinook salmon and PS steelhead. However, the action area continues to provide migratory habitat for adults and juveniles of both species, and the area has also been designated as critical habitat for PS Chinook salmon.

Climate Change: Climate change has affected the environmental baseline of aquatic habitats across the region and within the action area. However, the effects of climate change have not been homogeneous across the region, nor are they likely to be in the future. During the last century, average air temperatures in the Pacific Northwest have increased by 1 to 1.4° F (0.6 to 0.8º C), and up to 2° F (1.1º C) in some seasons (based on average linear increase per decade; Abatzoglou et al. 2014; Kunkel et al. 2013). Recent temperatures in all but two years since 1998 ranked above the 20th century average (Mote et al. 2013). Warming is likely to continue during the next century as average temperatures are projected to increase another 3 to 10° F (1.7 to 5.6º C), with the largest increases predicted to occur in the summer (Mote et al. 2014).

Decreases in summer precipitation of as much as 30% by the end of the century are consistently predicted across climate models (Mote et al. 2014). Precipitation is more likely to occur during October through March, less during summer months, and more winter precipitation will be rain than snow (ISAB 2007; Mote et al. 2013 and 2014). Earlier snowmelt will cause lower stream flows in late spring, summer, and fall, and water temperatures will be warmer (ISAB 2007; Mote et al. 2014). Models consistently predict increases in the frequency of severe winter precipitation events (i.e., 20-year and 50-year events), in the western United States (Dominguez et al. 2012). The largest increases in winter flood frequency and magnitude are predicted in mixed rain-snow watersheds (Mote et al. 2014).

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

Higher temperatures will reduce the quality of available salmonid habitat for most freshwater life stages (ISAB 2007). Reduced flows will make it more difficult for migrating fish to pass physical and thermal obstructions, limiting their access to available habitat (Isaak et al. 2012; Mantua et al. 2010). Temperature increases shift timing of key life cycle events for salmonids and species forming the base of their aquatic food webs (Crozier et al. 2011; Tillmann and Siemann 2011; Winder and Schindler 2004). Higher stream temperatures will also cause decreases in dissolved oxygen and may also cause earlier onset of stratification and reduced mixing between layers in lakes and reservoirs, which can also result in reduced oxygen (Meyer et al. 1999; Raymondi et al. 2013; Winder and Schindler 2004). Higher temperatures are likely to cause several species to become more susceptible to parasites, disease, and higher predation rates (Crozier et al. 2008; Raymondi et al. 2013; Wainwright and Weitkamp 2013).

As more basins become rain-dominated and prone to more severe winter storms, higher winter stream flows may increase the risk that winter or spring floods in sensitive watersheds will damage spawning redds and wash away incubating eggs (Goode et al. 2013). Earlier peak stream flows will also alter migration timing for salmon smolts, and may flush some young salmon and steelhead from rivers to estuaries before they are physically mature, increasing stress and reducing smolt survival (Lawson et al. 2004; McMahon and Hartman 1989).

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

2.5 Effects of the Action

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

As described in Section 1.3, the COE would authorize two applicants to replace floating homes in Portage Bay. The Wanzer project would require about 1 week of in-water work between November 1 and April 15 to completely remove and replace an existing 1,543-square foot float and home with a pre-constructed 1,505-square foot float with a new house that would be the same size as the existing house that would be towed into place and moored to 2 new 12-inch steel piles. That project would include 2 days of vibratory pile extraction and installation. The Kelly project would require up to 6 months of in-water work between October 15 and April 15 to demolish an existing home, repair the existing 1,616-square foot float, and construct a new with a roof area that would be about the same size as the float, but would not exceed the raft’s footprint.

Returning adult PS Chinook salmon typically pass through the action area mid-June through September, and out-migrating juveniles typically pass through the action area between late-May and early-July. Returning adult PS steelhead typically pass through the action area January through May, and out-migrating juveniles typically pass through the action area between April and May. The lack of overlap between the work window and their migration timing supports the understanding that it would be extremely unlikely that any PS Chinook salmon or adult PS steelhead would be exposed to work-related stressors. Similarly, the minimal overlap of the work window with the migration season for juvenile PS steelhead combined with that species' rarity in the watershed supports the understanding that it would also be extremely unlikely that any juvenile PS steelhead would be exposed to work-related stressors.

However, the COE-authorized repairs would have the additional effect of extending the useful lives of the two houseboats for several decades beyond that of the existing structures. Over that time, the houseboats would cause effects on juvenile PS Chinook salmon, juvenile PS steelhead, and on the PBFs of PS Chinook salmon critical habitat through exposure to structure-related stormwater and altered lighting.

2.5.1 Effects on Listed Species

Construction-related Noise

Exposure to construction-related noise for both projects would cause no more than minor effects in PS Chinook salmon and PS steelhead. Based on the best available information, as described in a recent acoustic assessment of vibratory installation of 12-inch steel pipe piles (NMFS 2017b), and in other sources (Blackwell and Greene 2006; CalTrans 2015; FHWA 2017; Richardson et al. 1995) all peak sound levels would be below the threshold for injury, and sound levels above the 150 dB_{SEL} threshold for effective quite (Stadler and Woodbury 2009) would be only briefly present within about 72 feet around pile driving at the Wanzer project site, and episodically around tugboat operations. All other in-water construction-related noise would likely be under the 150 dB_{SEL} threshold.

It is extremely unlikely that any individuals of either species would be present during the in-water work window. Therefore exposure to construction-related noise is extremely unlikely. Further, any fish that may be exposed to construction-related noise would experience no more than very brief low-level behavioral effects, which individually, or in combination would not affect the fitness or meaningfully affect the normal behaviors of the exposed individuals.

Construction-related Degraded Water Quality

Exposure to construction-related degraded quality for both projects would cause no more than minor effects in PS Chinook salmon and PS steelhead.

Turbidity: Sediment disturbance would be limited to the removal of a timber pile and some dock posts, and the installation of 2 steel piles at the Wanzer project site, and barge spuds and tugboat propeller wash at both sites. The intensity of turbidity is typically measured in Nephlometric Turbidity Units (NTU) that describe the opacity caused by the suspended sediments, or by the concentration of TSS as measured in milligrams per liter (mg/L). A strong positive correlation exists between NTU values and TSS concentrations. Depending on the particle sizes, NTU values roughly equal the same number of mg/L for TSS (i.e. 10 NTU = ~ 10 mg/L TSS, and 1,000 NTU = ~ 1,000 mg/L TSS) (Campbell Scientific Inc. 2008; Ellison et al. 2010). Therefore, the two units of measure are easily compared.

The effects on fish exposed to suspended sediments 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. At concentration levels of about 700 to 1,100 mg/l, minor physiological stress is reported in juvenile salmon only after about three hours of continuous exposure (Newcombe and Jensen 1996). Water quality is considered adversely affected by suspended sediments when turbidity is increased by 20 NTU for a period of 4 hours or more (Berg and Northcote 1985; Robertson et al. 2006).

Vibratory removal of hollow 30-inch steel piles in Lake Washington mobilized sediments that adhered to the piles as they were pulled up through the water column (Bloch 2010). 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.

It is extremely unlikely that the extraction of the timber pile and dock posts would mobilize sediments beyond that reported by Bloch, because the timber pile and posts have much smaller surface areas for sediments to adhere to, and the posts would not be deeply embedded. Lifting barge spuds would also mobilize sediments, but likely less than that of pile removal because the spuds would not be deeply embedded.

Tugboat propeller wash may 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).

Project-related tugboat operations would most likely include the infrequent use of relatively small tugboats and barges. The individual events would most likely last a low number of hours when the tugboats reposition floats and work-related barges. Therefore, the resulting turbidity plumes would be few in number, episodic, and consist of TSS concentrations well below those described above for the Navy harbors. 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 low-concentration plumes that would extend less than 300 feet from the sites, and last no more than a low number of hours after the disturbance ends.

Based on the best available information, work-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 and mild gill flaring in any PS Chinook salmon or PS steelhead that may be exposed to them. None of these potential responses, individually, or in combination would affect the fitness or meaningfully affect the normal behaviors of exposed fish.

<u>Dissolved Oxygen:</u> Mobilization of anaerobic sediments can decrease dissolved oxygen levels (Hicks et al., 1991; Morton 1976). The impact on dissolved oxygen 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 dissolved oxygen can affect salmonid swimming performance (Bjornn and Reiser 1991), as well as cause avoidance of water with low dissolved oxygen levels (Hicks 1999). However, the very small amount of sediments that would be infrequently mobilized support the understanding that any dissolved oxygen reductions would be too small and too short-lived to cause detectable effects in exposed fish.

<u>Toxic Materials:</u> Toxic materials may enter the water through work-related spills and discharges, and possibly by the mobilization of bottom sediments if they are contaminated. 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 PAHs, which are known to be injurious to fish. Other contaminants can include metals, pesticides, 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).

Both projects include best management practices (BMPs) intended to reduce the risk and intensity of discharges and spills. In the unlikely event of a work-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, 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 legacy contaminants that may include PAHs, heavy metals, and other pollutants. As described above, the amount of sediment that would be mobilized by construction activities would be small, and any pollutants that may be mobilized with sediments 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. The NMFS estimates that all detectable work-related water quality impacts would limited to the extent of project-related turbidity plumes, which wouldn't exceed 300 feet and last no more than a low number of hours after the cessation of work. The in-water concentrations of any work-related waterborne contaminants would be too low, and exposure too brief to cause more than brief and minor behavioral effects such as temporary avoidance of the work area.

It is extremely unlikely that any individuals of either species would be present during the in-water work window. Therefore exposure to construction-related water quality impacts is extremely unlikely. Further, based on the best available information, as described above, any fish that may be exposed to those impacts would experience no more than very brief low-level behavioral effects, which individually, or in combination would not affect the fitness or meaningfully affect the normal behaviors of the exposed individuals.

Structure-related Stormwater

Structure-related stormwater is likely to adversely affect PS Chinook salmon and PS steelhead through direct exposure to pollutants in the water column and through indirect exposure to pollutants through the trophic web.

The untreated stormwater from both renovated houseboats would discharge directly into Portage Bay for decades to come. Numerous contaminants that are known to be harmful to fish and other aquatic resources can accumulate on building rooftops from common roofing materials and from rooftop structures, and that those contaminants are transported to nearby waterbodies via stormwater runoff (WDOE 2008, 2014). To reduce the potential for toxic stormwater runoff from the project sites, neither of the renovated floating homes would include the use of treated wood or uncoated metals on exterior surfaces. The Wanzer roof would consist of a mix of concrete pavers and vegetated areas over an undescribed membrane, and the exterior walls would consist of cement fiber siding. The Kelly roof would consist of coated corrugated metal, and the exterior walls would consist of painted wood siding. The NMFS knows of no specific information to describe the toxicity of any of these roofing and siding materials, and although we expect that their toxicity may be relatively low, we assume that they would contribute at least some contaminants to Portage Bay through stormwater runoff. Pollutants also accumulate on rooftops and other surfaces through atmospheric deposition (Lye 2009), and common household cleaners, fertilizers, herbicides, insecticides, and pet wastes are other sources of contamination that are likely to accumulate on the float decks and to enter Portage Bay with stormwater runoff.

As described above, fish can uptake contaminants directly through their gills, and through dietary exposure. Depending on the pollutant, its concentration, and/or the duration of exposure, direct exposure to runoff-borne pollutants can cause effects in exposed fish that range from mild avoidance behaviors, to reduced growth, altered immune function, and immediate mortality. Beitinger and Freeman (1983) report that fish possess acute chemical discrimination abilities and that very low levels of some water-borne contaminants can trigger strong avoidance behaviors. Exposure to PAHs can cause reduced growth, increased susceptibility to infection, and increased mortality in juvenile salmonids (Meador et al. 2006; Varanasi et al. 1993). Dietary exposure to the polybrominated diphenyl ethers (PBDEs) that are common in flame retardant materials can reduce immunity and increase disease susceptibility in juvenile Chinook salmon (Arkoosh et al. 2018). Zinc can bind to fish gills and cause suffocation (WDOE 2008).

The identities and concentrations of the contaminants that would enter Portage Bay in the stormwater from the two project sites are unknown and likely to be highly variable depending on the timing and intensity of individual storm events. The concentrations would be positively correlated with the length of time between precipitation events. The highest concentrations would likely occur near the start of heavy downpour events that occur after a long dry spell that allows pollutants to build-up on roofs and other impervious surfaces, such as in early- to mid-fall. Lower concentrations would occur later in a given storm and/or later in the season when precipitation events are more frequent because the build-up of pollutants would be lower. Similarly, the distance from the houseboat where the contaminants would dilute to levels too low to cause detectable direct and/or indirect effects is also unknown and expected to be highly variable. Given the relatively small volume of stormwater from each of the two houseboats compared to the large volume of water flowing through the action area, it is extremely unlikely that action-attributable pollutant concentrations at levels high enough to cause detectable effects in salmonids would extend beyond 300 feet downstream from either houseboat.

Although the individual stormwater discharges from the two renovated houseboats would be relatively small, those discharges would repeatedly occur over the decades-long lives of those structures. Action-related stormwater contaminants that settle to the bottom would accumulate in the action area and be biologically available for years (Romberg 2005). Amphipods and copepods uptake contaminants from contaminated sediments and pass them to juvenile Chinook salmon and other fish through the food web (Landrum et al. 1984; Landrum and Scavia 1983; Neff 1982). Varanasi et al. (1993) found high levels of PAHs in the stomach contents of juvenile Chinook salmon in the contaminated Duwamish Waterway. 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. Although the authors did not specifically address steelhead, they are likely to be similarly affected by contaminated forage.

In summary, some subset of the juvenile Chinook salmon and steelhead that annually out-migrate through the ship canal are likely to pass through the action area. Individuals that swim through the action area during and shortly after a storm event are likely to be directly exposed to action-related contaminated stormwater. Additionally, at least some of those migrating juveniles are likely to feed on the invertebrate resources during their transit through the action area, some of which may be contaminated by stormwater contaminants that have settled to the bottom.

The annual numbers of PS Chinook salmon and PS steelhead that may be directly and/or indirectly exposed to stormwater contaminants from the renovated houseboats is unquantifiable with any degree of certainty, as is the intensity of any effects that an exposed individual may experience. However, the small affected area suggests that the probability of exposure would be very low for any individual fish. Therefore, the annual numbers of PS Chinook salmon and PS steelhead that may be exposed to project-attributable stormwater effects would represent extremely small subsets of their respective cohorts, and the numbers of exposed fish would be too low to cause detectable population-level effects.

Structure-related Altered Lighting

Structure-related altered lighting is likely to adversely affect PS Chinook salmon and PS steelhead. The renovated houseboats would maintain unnatural lighting conditions at the project sites. The houseboats would create unnaturally harsh shade during the day and artificial illumination at night.

Shade: The two renovated houseboats would be totally opaque, with overwater footprints of about 1,589 and 1,636 square feet for the Wanzer and Kelly projects, respectively. In addition to reducing aquatic productivity, the shadows are likely to alter migration and increase exposure and vulnerability to predators for juvenile salmonids. The intensity of these effects are likely to vary based on the brightness and angle of the sun, being most intense on sunny days, and less pronounced to possibly inconsequential on cloudy days.

Juvenile salmon feed on planktonic organisms such as amphipods, copepods, and euphausiids, as well as the larvae of many benthic species and fish (NMFS 2006). Shade limits primary production and can reduce the diversity of the aquatic communities under over-water structures (Nightingale and Simenstad 2001; Simenstad et al. 1999). Because the floats cast hard shadows over water and substrate that would otherwise be supportive of SAV and benthic invertebrates, those structures reduce the quantity and diversity of cover and prey organisms for juvenile salmonids. However, the small size of the affected area combined with the mixing that is caused by the normal water movements in the action area, suggests that any action-attributable reduction in the availability of planktonic prey would cause no detectable effects on juvenile salmonids in the action area.

Shade affects juvenile salmon migration. Numerous studies demonstrate that juvenile salmonids, in both freshwater and marine habitats, are more likely to avoid the shadow of an overwater structure than to pass through it (Celedonia et al. 2008a and b; Kemp et al. 2005; Moore et al. 2013; Munsch et al. 2014; Nightingale and Simenstad 2001; Ono et al. 2010; Southard et al. 2006). Swimming around overwater structures increases the migratory distance, which has been positively correlated with increased mortality in juvenile Chinook salmon (Anderson et al. 2005). If situated alone along a stretch of undisturbed shoreline, the shadows from the applicants' floats would alter the migratory behavior of juvenile salmon by delaying their passage under the structures, or by inducing them to swim around them. However, because the applicants' houseboats are but two of many long-standing similar structures that line this artificial waterway, the shadow caused by the flaots would not alter the behavior of juvenile salmonids per se. Instead, their shadows, in combination with the shadows of the adjacent structures, would act to effectively force juvenile Chinook salmon to migrate in the open and relatively deep waters near the middle of the canal, which is well documented (Celedonia et al. 2008a and b; Tabor et al. 2000 and 2010) and contrary to normal migratory behavior for juvenile Chinook salmon at this life stage. Off-bank migration places juvenile Chinook salmon in relatively deep water where foraging is likely to have higher energetic costs than in shallow shoreline waters (Heerhartz and Toft 2015). Therefore, the juvenile Chinook salmon that swim around the shadows are likely to experience some degree of reduced fitness due to increased energetic costs.

Float shade is likely to increase juvenile salmonid exposure and vulnerability to predators. Shade and deep water both favor freshwater predatory species, such as smallmouth bass and northern pikeminnow that are known to prey heavily on juvenile salmonids (Celedonia et al. 2008a; Tabor et al. 2010). The applicants' floats would each cast over 1,500 square feet of shade that would extend between 65 and 80 feet from the shoreline where the water depth is about 14 feet. The shadow would not increase the population of predatory fish in the action area, but it is likely to concentrate predatory fish within it.

Therefore, juvenile Chinook salmon and steelhead would be more likely to encounter predatory fish at the project sites than they would in the absence of the floats. The depth of the water at the project sites further increases the risk of predation because the increased water volume allows predators to attack from below and from the sides instead of from just one side as would be the case in shallow water along the shore. This has been shown in the marine environment where juvenile salmonid consumption by piscivorous predators increased fivefold when juvenile pink salmon were forced to leave the shallow nearshore (Willette 2001). In summary, juvenile Chinook salmon and steelhead are more likely to be exposed to predators near the applicants' floats than away from them, and those individuals would be more vulnerable to attack than they would be in the absence of the shadows. Individuals that fail to escape a predatory attack would be killed. Individuals that do escape would experience reduced fitness due to increased energetic costs and stress-related effects that may reduce their overall likelihood of survival. The likelihood that any individual juvenile Chinook salmon or steelhead would be injured or killed due to increased exposure to predators at the two sites is expected to be very low, and that likelihood would vary greatly over time due to the complexities of predator/prey dynamics as well as variations in environmental conditions at the sites. However, over the lives of the renovated houseboats, it is extremely likely that at least some individuals would be killed due to the increased risk of predation that would be caused by the floats' shadows.

Artificial Lighting: No project work would occur outside of daylight hours, and no nighttime construction lighting would be used for either project. However, both renovated houseboats would have exterior lighting systems that would cause artificial illumination of the nearby water.

Artificial lighting attracts fish (positive phototaxis) and often shifts nocturnal behaviors toward more daylight-like behaviors. It may also affect light-mediated behaviors such as migration timing. Tabor and Piaskowski (2002) report that juvenile Chinook salmon in lacustrine environments typically feed and migrate during the day, and are inactive at night, residing at the bottom in shallow waters. They tend to move off the bottom and become increasingly active at dawn when light levels reach 0.8 to 2.1 lumens per square meter. Tabor et al. (2017) found that subyearling salmon (Chinook, coho, and sockeye) exhibit strong nocturnal phototaxic behavior when exposed to levels of 5.0 to 50.0 lumens per square meter, with phototaxis positively correlated with light intensity. Celedonia and Tabor (2015) found that juvenile Chinook salmon in the Lake Washington Ship Canal were attracted to artificially lit areas at 0.5 to 2.5 lumens per square meter. The authors also reported that attraction to artificial lights may delay the onset of morning migration by up to 25 minutes for some juvenile Chinook salmon migrating through the Lake Washington Ship Canal.

The new Wanzer house would have 10 80-lumen and 8 1,100-lumen LED exterior lights installed on the main deck level, as well as a single shielded 330-lumen incandescent porch light on the upper level. The applicant reports that all fixtures would be located and oriented to avoid direct illumination of the water. The new Kelly house would have 1 shielded exterior 40-watt light installed over each of the 2 main level doors. The applicant reports that both lights would be aimed to avoid direct illumination of the water's surface. The high level of shoreline development and the high density of houseboats, vessels, and piers in the area support the understanding that nighttime artificial illumination of the water is already relatively high in the action area. However, the described intensities of the planned exterior lights for both projects suggest that it is very likely that within low tens of feet, their indirect nighttime illumination of the water would exceed the 0.5-lumen threshold for the onset of phototaxis, and also add to the nighttime illumination of the water in the area.

It is very unlikely that adult Chinook salmon and steelhead would be exposed to the applicants' artificial lighting because they would most likely remain near the center of the ship canal. However, juvenile Chinook salmon are nearshore oriented and are very likely to be exposed to structure-related artificial lighting. Some juvenile steelhead may also be exposed. The juvenile salmonids that are exposed to the renovated houseboats' nighttime illumination would likely experience some level of nocturnal phototaxis, and may experience other altered behaviors, such as delayed resumption of migration in the morning. Over the lives of both renovated houseboats, it is likely that a small subset of the exposed individuals would experience reduced fitness and/or altered behaviors that could reduce their overall likelihood of survival.

In summary, structure-related shade and artificial lighting would cause a combination of altered behaviors and increased risk of predation that would reduce fitness or cause mortality for some juvenile PS Chinook salmon and juvenile PS steelhead that pass the sites. The annual numbers of either species that would be impacted by this stressor is unquantifiable with any degree of certainty, and the numbers are likely to vary greatly over time. However, the available information suggests that the probability of exposure would be very low for any individual fish, and only a subset of the exposed individuals would be measurably affected. Therefore, for both species, the proportion of any year's cohort that would be killed or experience measurably reduced fitness due to structure-related altered lighting would be too low to cause any 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 Primary 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.

Puget Sound Chinook Salmon Critical Habitat: The proposed action, including full application of the planned conservation measures and best management practices, is likely to adversely affect designated critical habitat for PS Chinook salmon. The expected effects would be limited to the impacts on the PBF of freshwater migration corridors free of obstruction and excessive predation as described below.

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

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

3. Freshwater migration corridors:
    a. Free of obstruction and excessive predation – The proposed action would cause long-term minor adverse and beneficial effects on this attribute. The proposed action would cause no measurable change in the quality and function of this attribute, but instead would act to maintain reduced functional levels compared to undisturbed areas. As described in detail under structure-related altered lighting, extending the life of the two houseboats would maintain long-standing shade and nighttime artificial light at both project sites, which individually and in combination with adjacent structures act to greatly limit access to shoreline areas for migrating juvenile Chinook salmon, and to support the presence and success of predatory species that feed on those juveniles. The permanent removal of a float and 4 floating logs at the Wanzer site would act to slightly reduce the current level of intensity of these effects at that site.
    b. Water quantity – The proposed project would cause no effect on this attribute.
    c. Water quality – The proposed action will cause long-term minor 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. As described in detail under structure-related stormwater, extending the life of the two houseboats would maintain long-standing overwater impervious surfaces that would collect pollutants that would be delivered to the waterway with their untreated stormwater discharges. The area of affect would likely be limited to the area within 300 feet downstream of each of the renovated houseboats.
    d. Natural Cover – The proposed action would cause long-term minor adverse and beneficial effects on this attribute. Extending the lives of the two houseboats would maintain previously altered habitat conditions at the sites that limit the growth of submerged aquatic vegetation at both project sites, which in combination with adjacent structures act to greatly limit the availability of natural cover in the action area. The permanent removal of a float and 4 floating logs at the Wanzer site would act to slightly reduce the current level of intensity of these effects at that site.

4. Estuarine areas – None in the action area.

5. Nearshore marine areas – None in the action area.

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

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

2.6 Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

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

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

The NMFS is unaware of any specific future non-federal activities that are reasonably certain to affect the action area. However, the NMFS is reasonably certain that future non-federal actions such as the previously mentioned shoreline and upstream 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 the 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 the action area. However, the implementation of plans, initiatives, and specific restoration projects are often subject to political, legislative, and fiscal challenges that increase the uncertainty of their success.

2.7 Integration and Synthesis

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

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

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

2.7.1 ESA-listed Species

The species considered in this Opinion have been 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. Each 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. The action area provides habitat for freshwater life histories of PS Chinook salmon and PS steelhead.

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 that occur in the action area would be fall-run Chinook salmon from the Cedar River and/or the North Lake Washington/Sammamish River populations. Abundance in both populations is relatively low, with a total annual abundances fluctuating between less than 100 and about 2,500 individuals since 1965, and slightly negative average abundance trends.

The project sites are located near the western edge of Portage Bay in the Lake Washington Ship Canal, where the environmental baseline has been degraded by the effects of intense shoreline development. The baseline has also been degraded by nearby and upstream industry, urbanization, agriculture, forestry, water diversion, and road building and maintenance.

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 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.

<u>PS Steelhead</u>

The PS steelhead DPS is currently considered “not viable”, and the extinction risk for most DIPs is estimated to be moderate to high. Long-term abundance trends have been predominantly negative or flat across the DPS, especially for natural spawners. Ten or fewer adult natural-spawner Cedar River and North Lake Washington / Lake Sammamish PS steelhead are estimated to remain.

The project sites are located near the western edge of Portage Bay in the Lake Washington Ship Canal, where the environmental baseline has been degraded by the effects of intense shoreline development. The baseline has also been degraded by nearby and upstream industry, urbanization, agriculture, forestry, water diversion, and road building and maintenance.

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 extremely low.

Based on the best available information, the scale of the 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 steelhead populations. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

2.7.2 Critical Habitat

Puget Sound 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.

Future non-federal actions 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 PBF for PS salmonid critical habitat in the action area is limited to freshwater migration corridors that are free of obstruction and excessive predation. The site attributes of that PBF that would be affected by the action are freedom from obstruction and excessive predation, water quality, and natural cover. As described above, the proposed action would cause long-term minor adverse effects, as well as long-term minor beneficial effects on the site attributes of those PBFs that in combination would act to maintain greatly reduced functionality levels as compared to undisturbed freshwater migratory corridors. 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 its 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.

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

2.9 Incidental Take Statement

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

2.9.1 Amount or Extent of Take

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

Harm of PS Chinook salmon from exposure to:
- structure-related stormwater and
- structure-related altered lighting.

Harm of PS steelhead from exposure to:
- structure-related stormwater and
- structure-related altered lighting.

The NMFS cannot predict with meaningful accuracy the number of PS Chinook salmon and PS steelhead 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 in-water work, the surface area of the floats and roofs, the heights of the houses, the materials used for the exterior surfaces, and the design of the exterior lights are the best available surrogates for the extent of take of juvenile PS Chinook salmon and PS steelhead.

The timing and duration of in-water work is applicable because the proposed in-water work windows avoid the expected presence of PS Chinook salmon and PS steelhead in the action area. Therefore, working outside of the proposed work windows would increase the potential that PS Chinook salmon and PS steelhead would be exposed to work-related stressors that they otherwise would not be exposed to.

The surface area of the renovated houseboats (floats and roofs), and the materials used for their exterior surfaces are the best available surrogates for the extent of take of PS Chinook salmon and PS steelhead from exposure to structure-related stormwater. The surface areas of the renovated houseboats is an appropriate surrogate because the amount of contaminants from roofing materials or from atmospheric and other deposition would both increase as the surface area of the roofs and floats increase. The materials used for the exterior surfaces is an appropriate surrogate because the toxicity of the stormwater and prey would increase as the toxicity of the exterior materials increases. Therefore, as the surface area of the renovated houseboats increases, or as the toxicity of their exterior surface materials increases, the intensity of effect would increase on the juvenile PS Chinook salmon and PS steelhead that are exposed to the resulting water-borne contaminants and contaminated prey, despite the low density and random distribution of these species in the action area.

The surface area of the floats and roofs, the heights of the houses, and the number, intensity, and design of the houseboats' exterior lights are the best available surrogates for the extent of take of juvenile PS Chinook salmon and PS steelhead from exposure to structure-related altered lighting. The surface area and heights of the structures are appropriate surrogates because the size of the shaded area is positively correlated with those features. As the size of the shadow increases, the greater the migratory disturbance, and the greater the likelihood of exposure to piscivorous fish predators that hide in the shadow. The number, intensity, and design of the houseboats' exterior lights are appropriate surrogates because any increase in the number or intensity of the lights would increase the size and intensity of the artificially illuminated area. Similarly, if the orientation of the lights or their shielding are altered in manner that results in direct illumination of the water, the size and intensity of the artificially illuminated area would increase. As the size and intensity of the artificially illuminated area increases, the likelihood of exposure as well as the intensity of phototaxis and other light altered behaviors would increase. Therefore, as the surface area of the renovated houseboats increases, or as the size and intensity of the artificially illuminated area increases, the intensity of effect would increase on the juvenile PS Chinook salmon and PS steelhead that are exposed to the altered lighting, despite the low density and random distribution of these species in the action area.

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

- In-water work November 1 through April 15 for the Wanzer project, and October 15 through April 15 for the Kelly project.
- The surface areas and heights of the refurbished houseboats as described in the proposed action section of this biological opinion;
- The materials used for the exterior surfaces of the refurbished houseboats as described in the proposed action section of this biological opinion; and
- The number, intensity, and design of the houseboats' exterior lights 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 either of the houseboats exceed their proposed characteristics, it could still meaningfully trigger reinitiation because the COE 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 PS Chinook salmon and PS steelhead, or destruction or adverse modification of PS Chinook salmon 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. 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, Implement monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded, the COE shall require the applicants to develop and implement plans to collect and report details about the take of listed fish. Those plans shall:
   a. Require the contractors to maintain and submit records to verify that all take indicators are monitored and reported. Minimally, the records should include:
      i. Documentation of the timing and duration of in-water to ensure that it is accomplished between November 1 and April 15 for the Wanzer project, and October 15 through April 15 for the Kelly project;
      ii. Documentation of the final dimensions of the floats to confirm that they do not exceed the dimensions described in this opinion;
      iii. Documentation of the final dimensions of the houses and the materials used for the exterior surfaces to confirm that they do not exceed the dimensions and/or characteristics described in this opinion; and
      iv. Documentation of the exterior lighting systems to confirm that they are consistent with the designs limits described in this opinion.
   b. Require the applicant to establish procedures for the submission of the construction records and other materials to the appropriate COE office; and
   a. Require the COE to submit an electronic post-construction report to NMFS within six months of project completion. Send the reports to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2020-00009 in the subject line for the Wanzer project (NWS-2019-259) and WCRO-2020-00664 for the Kelly project (NWS-2020-73).

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).

The COE should encourage the applicants to:

1. Ensure that the Wanzer houseboat's roofing membrane would leach no toxic chemicals. Minimally, the applicant should avoid the use of petroleum-based sealants or other roofing materials that WDOE has identified as sources of toxic discharge (WDOE 2014);

2. Ensure that Kelly houseboat's metal roof be coated with a material that leaches no toxic chemicals (such as Kynar 500™ plastic resin or similar coating);

3. Ensure to the greatest extent practicable that all paints and coatings used on exterior surfaces would leach no toxic chemicals;

4. Ensure that all exterior metal surfaces on both houseboats be painted or coated;

5. Avoid the use of treated wood; and

6. Avoid the exterior use of toxic household chemicals and pesticides, and avoid the accumulation of wastes on and around the houseboats.

Additionally, the COE should:

7. Coordinate with the NMFS, other resource agencies, and technical experts to address contaminated sediments and water quality issues in the ship canal.

8. Conduct or support continuing research to better understand the distribution, abundance, and habitat use of PS Chinook salmon and PS steelhead in Lake Union and the ship canal.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S Army Corps of Engineers' authorization the Wanzer and Kelly Houseboat Projects in Seattle, Washington (NWS-2019-259 and NWS-2020-73, respectively). 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.

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 contained in the fishery management plan developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce (PFMC 2014).

3.1 Essential Fish Habitat Affected by the Project

The project sites are located toward the western edge of Portage Bay, on the south side of the Lake Washington Ship Canal (Figure 1). The waters and substrates of the action area are designated as freshwater EFH for various life-history stages of Pacific Coast Salmon, which within the Lake Washington watershed include Chinook and coho salmon. Freshwater EFH for Pacific Coast Salmon is identified and described in Appendix A to the Pacific Coast salmon fishery management plan (PFMC 2014), and consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and holding habitat.

Those components of freshwater EFH for Pacific Coast Salmon depend on habitat conditions for spawning, rearing, and migration that include: (1) water quality (e.g., dissolved oxygen, nutrients, temperature, etc.); (2) water quantity, depth, and velocity; (3) riparian-stream-marine energy exchanges; (4) channel gradient and stability; (5) prey availability; (6) cover and habitat complexity (e.g., LWD, pools, aquatic and terrestrial vegetation, etc.); (7) space; (8) habitat connectivity from headwaters to the ocean (e.g., dispersal corridors); (9) groundwater-stream interactions; and (10) substrate composition.

As part of Pacific Coast Salmon EFH, five Habitat Areas of Particular Concern (HAPCs) have been defined: 1) complex channels and floodplain habitats; 2) thermal refugia; 3) spawning habitat; 4) estuaries; and 5) marine and estuarine submerged aquatic vegetation. The action area provides no known HAPC habitat features.

3.2 Adverse Effects on Essential Fish Habitat

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

1. <u>Water quality:</u> – The proposed action would cause some long-term minor adverse effects on water quality. The action would cause no changes in water temperature and salinity, but untreated stormwater from the refurbished houseboats would be long-term sources of low levels of contaminants. Detectable effects would be limited to the area within about 300 feet around the structure.

2. <u>Water quantity, depth, and velocity:</u> – No changes expected.

3. <u>Riparian-stream-marine energy exchanges:</u> – No changes expected.

4. <u>Channel gradient and stability:</u> – No changes expected.

5. <u>Prey availability:</u> – The proposed action would cause long-term minor adverse effects on prey availability. The houseboats’ shadows would maintain reduced and altered benthic

populations in the affected areas, including the planktonic organisms such as amphipods, copepods, and larvae of many benthic species that are important prey resources for juvenile salmonids.

6. Cover and habitat complexity: – The proposed action would cause long-term minor adverse effects on this attribute. The houseboats' shadows would continue to limit SAV growth and diversity within their footprints.

7. Water quantity: – No changes expected.

8. Space: – No changes expected.

9. Habitat connectivity from headwaters to the ocean: – No changes expected.

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

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

12. Substrate composition: – No changes expected.

3.3 Essential Fish Habitat Conservation Recommendations

Full implementation of the following EFH conservation recommendations would protect about 6.5 acres of designated EFH for Pacific Coast salmon by avoiding or minimizing the adverse effects described in Section 3.2 above.

To reduce adverse impacts on water quality, the COE should require the applicants to:

1. Ensure that the Wanzer houseboat's roofing membrane would leach no toxic chemicals. Minimally, the applicant should avoid the use of petroleum-based sealants or other roofing materials that WDOE has identified as sources of toxic discharge (WDOE 2014);

2. Ensure that Kelly houseboat's metal roof be coated with a material that leaches no toxic chemicals (such as Kynar 500™ plastic resin or similar coating);

3. Ensure to the greatest extent practicable that all paints and coatings used on exterior surfaces would leach no toxic chemicals;

4. Ensure that all exterior metal surfaces on both houseboats be painted or coated; and

5. Avoid the use of treated wood.

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 user of this opinion is the COE. Other users could include the project applicants, the WDFW, the government and citizens of the City of Seattle and King County, 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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