



UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
1201 NE Lloyd Boulevard, Suite 1100
PORTLAND, OR 97232-1274

Refer to NMFS No:
WCRO-2021-01424

May 23, 2022

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

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Parkside Apartments HOA's Sewer Line Protection and Skirting Removal project in Kirkland, Washington (USACE No. NWS-2021-387, HUC: 171100120400 – Lake Washington)

Dear Mr. Printz:

Thank you for your letter of June 10, 2021, 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 the U.S Army Corps of Engineers' (USACE) authorization of Watermark Estate Management Services LLC's Shoreline Maintenance Project in Lake Washington. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

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.

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. 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 also documents our conclusion that the proposed action may affect, but is not likely to adversely affect PS steelhead, southern resident (SR) killer whales, and designated critical habitat for SR killer whales.

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 USACE 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.

WCRO-2021-01424



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 freshwater EFH for Pacific Coast Salmon. Therefore, we have provided 1 conservation recommendation that can be taken by the USACE to avoid, minimize, or otherwise offset potential adverse effects on EFH. We also concluded that the action would not adversely affect EFH for Pacific Coast groundfish and coastal pelagic species. Therefore, consultation under the MSA is not required for EFH for Pacific Coast groundfish and coastal pelagic species.

Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to the NMFS within 30 days after receiving this recommendation. If the response is inconsistent with the EFH conservation recommendations, the USACE 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, 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 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: Daniel Krenz, USACE
Colleen Anderson, USACE

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

Parkside Apartments HOA's Sewer Line Protection and Skirting Removal Project
in Lake Washington, King County, Washington
(USACE Number: NWS-2021-387)

NMFS Consultation Number: WCRO-2021-01424

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

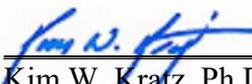
ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Chinook salmon (<i>Oncorhynchus tshawytscha</i>) Puget Sound (PS)	Threatened	Yes	No	Yes	No
Steelhead (<i>O. mykiss</i>) PS	Threatened	No	No	N/A	N/A
Killer whales (<i>Orcinus orca</i>) Southern resident (SR)	Endangered	No	No	No	No

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

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

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:



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

Date: May 23, 2022

TABLE OF CONTENTS

1. Introduction	1
1.1 Background.....	1
1.2 Consultation History.....	1
1.3 Proposed Federal Action.....	2
2. Endangered Species Act Biological Opinion And Incidental Take Statement	5
2.1 Analytical Approach.....	6
2.2 Range-wide Status of the Species and Critical Habitat.....	7
2.3 Action Area.....	15
2.4 Environmental Baseline.....	15
2.5 Effects of the Action.....	18
2.5.1 Effects on Listed Species.....	19
2.5.2 Effects on Critical Habitat.....	25
2.6 Cumulative Effects.....	26
2.7 Integration and Synthesis.....	27
2.7.1 ESA Listed Species.....	27
2.7.2 Critical Habitat.....	28
2.8 Conclusion.....	29
2.9 Incidental Take Statement.....	30
2.9.1 Amount or Extent of Take.....	30
2.9.2 Effect of the Take.....	31
2.9.3 Reasonable and Prudent Measures.....	31
2.9.4 Terms and Conditions.....	32
2.10 Conservation Recommendations.....	32
2.11 Reinitiation of Consultation.....	32
2.12 “Not Likely to Adversely Affect” Determinations.....	33
2.12.1 Effects on Listed Species.....	33
2.12.2 Effects on Critical Habitat.....	34
3. Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response	35
3.1 Essential Fish Habitat Affected By the Project	36
3.2 Adverse Effects on Essential Fish Habitat.....	36
3.3 Essential Fish Habitat Conservation Recommendations.....	37
3.4 Statutory Response Requirement.....	38
3.5 Supplemental Consultation.....	38
4. Data Quality Act Documentation and Pre-Dissemination Review	38
5. References	40

LIST OF ABBREVIATIONS

BE – Biological Evaluation
BMP – Best Management Practices
CFR – Code of Federal Regulations
dB – Decibel (common unit of measure for sound intensity)
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
HPA – Hydraulic Project Approval
ITS – Incidental Take Statement
JARPA – Joint Aquatic Resources Permit Application
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
PBF – Physical or Biological Feature
PCE – Primary Constituent Element
PFMC – Pacific Fishery Management Council
PS – Puget Sound
PSTRT – Puget Sound Technical Recovery Team
PSSTRT – Puget Sound Steelhead Technical Recovery Team
RL – Received Level
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SAV – Submerged Aquatic Vegetation
SEL – Sound Exposure Level
SL – Source Level
SR – Southern Resident (Killer Whales)
USACE – U.S. Army Corps of Engineers
VSP – Viable Salmonid Population
WCR – West Coast Region (NMFS)
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 U.S.C. 1531 et seq.), as amended, and implementing regulations at 50 CFR part 402.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR part 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 June 10, 2021, the NMFS received a letter from the U.S. Army Corps of Engineers (USACE) requesting informal consultation for the proposed action (USACE 2021). The request enclosed the applicant's Biological Evaluation (BE; SUHRCO 2021), project drawings (Waterfront 2021a), and a Project Description & Construction Sequence document (Waterfront 2021b).

The NMFS requested additional information on September 10, 2021. On September 13, the applicant's agent sent an email (Waterfront 2021c) that included the applicant's Joint Aquatic Resources Permit Application (JARPA) Form (Waterfront 2021d), Permit Drawings for planned deck work (Amento 2021), and the Hydraulic Project Approval (HPA) for the project (WDFW 2021). On September 16, 2021, the USACE sent an email to confirm the scope of the project components to be covered under their permit. The NMFS considers that formal consultation for this action was initiated on September 16, 2021. On May 9, 2022, the applicant's agent provided revised drawings in response to the NMFS's request for confirmation of the draft description of the proposed action (Waterfront 2022a; 2022b).

This opinion is based on the information in the emails and documents identified above; 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 (see 50 CFR 402.02). Under MSA, federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded or undertaken by a federal agency (50 CFR 600.910).

The USACE proposes to authorize the Parkside Apartments HOA (the applicants) to conduct in- and above-water work on the Parkside Apartments pier on the eastern shore of Lake Washington, at 5535 Lake Washington Blvd NE, Kirkland, Washington (Figure 1).

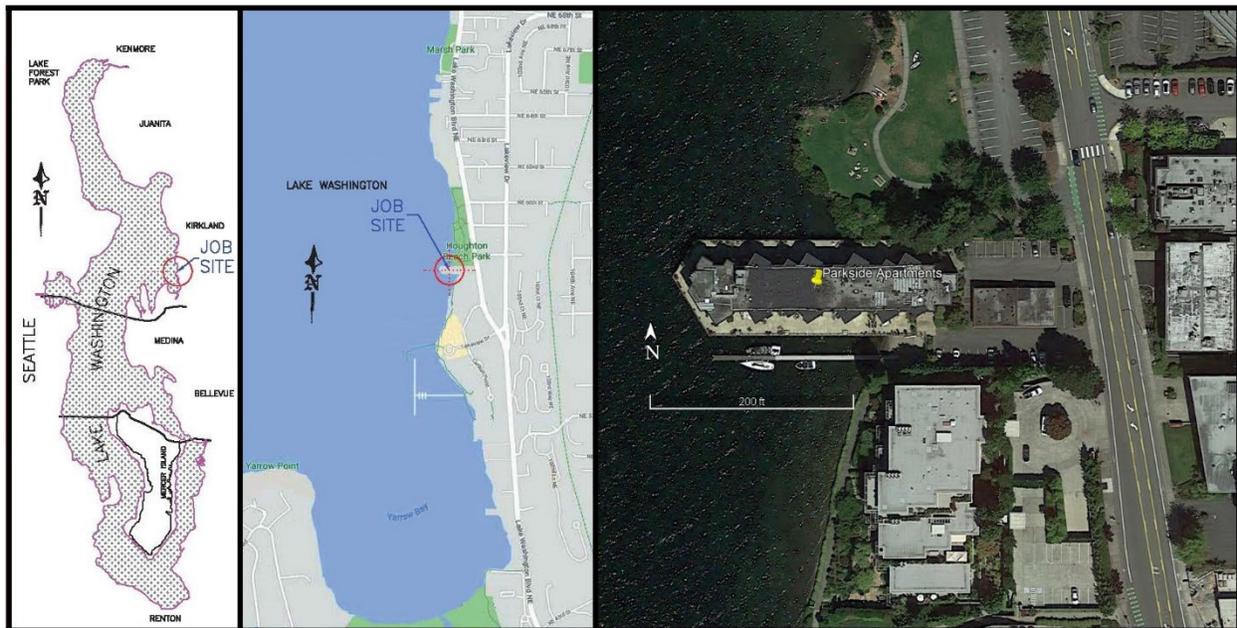


Figure 1. Maps and a Google Earth photograph of the Parkside Apartments HOA project site. The maps show the project site relative to the City of Seattle and Lake Washington. The photograph shows the applicant’s pier-supported condominium complex extending over Lake Washington (Maps were adapted from Page 1 of 7 in Waterfront 2021a).

The project is expected to last 22 weeks, with all in-water work being completed between July 16 and March 15 in-water work window for the area. All work would be done in compliance with all protective measures, best management practices (BMPs), and provisions identified in the applicant’s BE, JARPA, and HPA.

The project would consist of two phases. Phase 1 would consist of the removal of about 470 linear feet (lf) of skirting and 550 lf of fascia and guard rails from around the perimeter of the applicant’s pier (the pier), and the installation of a protective fence around a sewer line that is suspended under the pier. Phase 2 would consist of above-water work to repair and waterproof the pier’s concrete decking, to install new guard rails, to replace a set of beach stairs, and to install aluminum security screens under the beach-end of the pier. The aluminum security

screens would extend from the pier's lower deck edge to about 2 inches above the beach, and from the landward end of the pier to the OHWM, but not over the water (Figure 2).

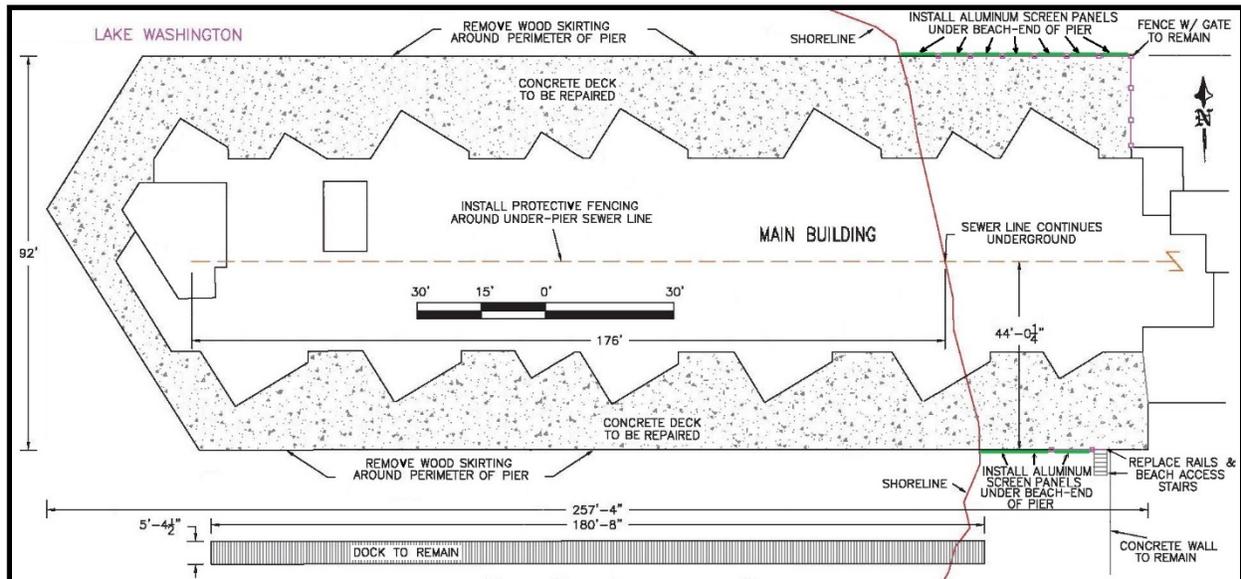


Figure 2. Overhead drawing of the Parkside Apartments HOA pier showing the major project components (Adapted from Sheet 3 of 7 in Waterfront 2021a).

All Phase 2 work would be conducted from land and or from the deck of the pier, and would include best management practices to prevent detectable in-water effects from the work. Further, the work would do nothing to measurably increase the functional life of the pier. Consequently, it is extremely unlikely that any Phase 2 work would cause detectable effects on listed species or critical habitats under our jurisdiction. Therefore, this opinion focuses on Phase 1 work.

Phase 1 work would be conducted mostly from a work barge and small boats or work skiffs, but some work would also be done from the upper deck of the pier. The applicant's contractors would position a construction spud barge and a utility barge at the project site. Workers would disconnect and or cut-away all of the skirting, railing, railing supports and fascia board around the perimeter of the pier (Figure 3). The debris would be placed in large debris containers aboard the utility barge for transportation to approved upland disposal facilities.



Figure 3. Three photographs of the wood skirting and guard rails that surround the perimeter of the Parkside Apartments HOA pier (Adapted Photos 1, 3, & 4 in SUHRCO 2021).

The contractors would then install a protective fence around the sewer pipe that is suspended under the pier (Figures 2 and 4). Working under the pier from small workboats or small floating platforms, the workers would attach prefabricated fence panels to existing concrete beams to create a narrow U-shaped fence around the under-pier sewer pipe.



Figure 4. Two photographs of the sewer pipe line that is suspended under the Parkside Apartments HOA pier (Adapted Photos 9 & 10 in SUHRCO 2021).

The fence would be about 5.5 feet tall, and extend about 3.85 feet below the ordinary high water mark (OHWM). It would be about 6 to 8 feet wide and extend about 174 feet waterward of the shoreline. The fence would consist of panels of epoxy-coated wire mesh fencing with 6-inch by 8-inch openings (a.k.a. hog-wire) that would be framed with epoxy-coated 1 5/8-inch by 1 5/8-inch, C-shaped steel channel (a.k.a. B22 unistrut) (Figure 5).

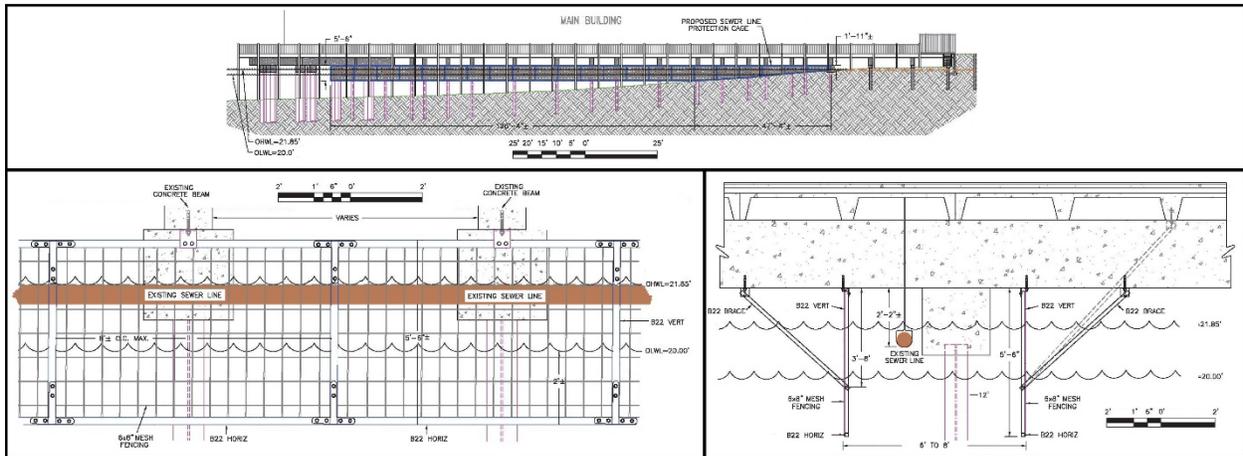


Figure 5. Drawing of the planned sewer line protective fencing (Adapted from Sheets 6 & 7 of 7 in Waterfront 2021a, and Sheet 6 of 11 in Waterfront. 2022b).

Other activities that could be caused by the proposed action

The NMFS considered whether or not the proposed action would cause any other activities that could affect listed resources. Neither the applicant nor the USACE identified any such activities. Because the action wouldn't extend the functional life of the structure or cause any changes in its use, the NMFS believes that the proposed action would cause no other activities that could affect listed resources.

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 to adversely modify or destroy their designated critical habitat. Per the requirements of the ESA, Federal action agencies consult with the NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, the 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 the NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

The USACE determined that the proposed action is not likely to adversely affect PS Chinook salmon, PS steelhead, and designated critical habitat for PS Chinook salmon, and would have no effect on Southern Resident (SR) killer whales and designated critical habitat for SR killer whales and PS steelhead. However, the NMFS has concluded that the proposed action is likely to adversely affect PS Chinook salmon and their designated critical habitat. Consequently, we have proceeded with formal consultation for the proposed action. Our concurrence with the USACE's determination that the proposed action is not likely to adversely affect PS steelhead is described in the "Not Likely to Adversely Affect" Determinations section (2.12) of this opinion. Additionally, because of the trophic relationship between PS Chinook salmon and SR killer whales, the NMFS analyzed the action's potential effects on SR killer whales and their designated critical habitat in Section 2.12 (Table 1).

Table 1. ESA-listed species and critical habitat 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 (<i>Oncorhynchus tshawytscha</i>) Puget Sound	Threatened	LAA	LAA	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	Status	Species	Critical Habitat	Listed / CH Designated
steelhead (<i>O. mykiss</i>) Puget Sound	Threatened	NLAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)
killer whales (<i>Orcinus orca</i>) Southern resident (SR)	Endangered	NLAA	NLAA	11/18/05 (70 FR 57565) / 11/29/06 (71 FR 69054)

LAA = likely to adversely affect NLAA = not likely to adversely affect
 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 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion also relies on the regulatory definition of “destruction or adverse modification,” which “means a direct or indirect alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species” (50 CFR 402.02).

The designations of critical habitat for PS Chinook salmon and SR killer whales use the term primary constituent element (PCE). The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR 424.12) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a “destruction or adverse modification” analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE the specific critical habitats.

The ESA Section 7 implementing regulations define effects of the action using the term “consequences” (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision 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 critical 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 Range-wide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to 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” for the jeopardy analysis. 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 PBFs that are essential for the conservation of the species.

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 63° F (17° C), but some tolerance to higher temperatures is documented with acclimation. Adult Chinook salmon spawn in freshwater streams, depositing fertilized eggs in gravel “nests” called redds. The eggs incubate for three to five months before juveniles hatch and emerge from the gravel. Juveniles spend from three months to two years in freshwater before migrating to the ocean to feed and mature. Chinook salmon spend from one to six years in the ocean before returning to their natal freshwater streams where they spawn and then die.

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

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

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

Spatial Structure and Diversity: The PS Sound Chinook salmon ESU includes all naturally spawning populations of Chinook salmon from rivers and streams flowing into Puget Sound including the Straits of Juan De Fuca from the Elwha River, eastward, including rivers and streams flowing into Hood Canal, South Sound, North Sound and the Strait of Georgia in Washington. The ESU also includes the progeny of numerous artificial propagation programs (NWFSC 2015). The PSTRT identified 22 extant populations, grouped into five major geographic regions, based on consideration of historical distribution, geographic isolation,

dispersal rates, genetic data, life history information, population dynamics, and environmental and ecological diversity. The PSTRT distributed the 22 populations among five major biogeographical regions, or major population groups (MPGs), that are based on similarities in hydrographic, biogeographic, and geologic characteristics (Table 2).

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

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	

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

extinction. The other four MPGs are considered to be at high risk of extinction due to low abundance and productivity (NWFSC 2015). The most recent 5-year status review concluded that the ESU should remain listed as threatened (NMFS 2017).

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

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

PS Chinook Salmon within the Action Area: The PS Chinook salmon 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 2022a). 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 2022b). Between 1965 and 2021, 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 62% of a combined total return of 963 fish in 2021 (WDFW 2022b).

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 2021, with the average trend being relatively flat (NWFSC 2015; WDFW 2022b). Natural-origin spawners make up a small proportion of the total population, accounting for about 9% of the 2,186 total return in 2021.

All returning adults and out-migrating juveniles of these two populations, as well as individuals that spawn in the numerous smaller streams across the basin, must pass the action area to complete their life cycles. Adult Chinook salmon pass through Chittenden Locks (aka Ballard Locks) 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 and Lake Sammamish between January and July, primarily in the littoral zone (Tabor et al. 2006). Outmigration through the ship canal and past the action area to the locks occurs between late-May and early-July, with the peak in June (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 3.

Major tributary river basins in the Puget Sound basin include the Nooksack, Samish, Skagit, Sauk, Stillaguamish, Snohomish, Lake Washington, Cedar, Sammamish, Green, Duwamish, Puyallup, White, Carbon, Nisqually, Deschutes, Skokomish, Duckabush, Dosewallips, Big Quilcene, Elwha, and Dungeness rivers and Soos Creek. Critical habitat throughout the Puget Sound basin has been degraded by numerous activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of large wood from the waterways, intense urbanization, agriculture, alteration of floodplain and stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion,

dredging, armoring of shorelines, marina and port development, road and railroad construction and maintenance, logging, and mining. Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common limiting factors of critical habitat throughout the basin.

Land use practices have likely accelerated the frequency of landslides delivering sediment to streams. Fine sediment from unpaved roads also contributes to stream sedimentation. Unpaved roads are widespread on forested lands in the Puget Sound basin, and to a lesser extent, in rural residential areas. Historical logging removed most of the riparian trees near stream channels. Subsequent agricultural and urban conversion permanently altered riparian vegetation in the river valleys, leaving either no trees, or a thin band of trees. The riparian zones along many agricultural areas are now dominated by alder, invasive canary grass and blackberries, and provide substantially reduced stream shade and large wood recruitment (SSPS 2007).

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

Physical or Biological Features		Life History Event
Site Type	Site Attribute	
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 large wood.

The loss of side-channels, oxbow lakes, and backwater habitats has resulted in a significant loss of juvenile salmonid rearing and refuge habitat. When the water level of Lake Washington was lowered 9 feet in the 1910s, thousands of acres of wetlands along the shoreline of Lake Washington, Lake Sammamish and the Sammamish River corridor were drained and converted to agricultural and urban uses. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows. The interchange of surface and groundwater in complex stream and wetland systems helps to moderate stream temperatures. 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 large wood to downstream areas (SSPS 2007). These actions tend to promote downstream channel incision and simplification (Kondolf 1997), limiting fish habitat. Water withdrawals reduce available fish habitat and alter sediment transport. Hydropower projects often change flow rates, stranding and killing fish, and reducing aquatic invertebrate (food source) productivity (Hunter 1992).

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

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

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

Critical Habitat within the Action Area: The critical habitat in Lake Washington provides the Freshwater Migration PBF for PS Chinook (NOAA 2022; WDFW 2022a).

2.3 Action Area

“Action area” means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02).

The project site is located along the just north of Yarrow Bay on the eastern shore of Lake Washington in Kirkland, Washington (Figure 1). As described in Section 2.5, construction-related water contamination would be the stressor with the greatest range of effects on fish. Detectable effects would be limited to the waters and substrates within about 300 feet around the project site. However, trophic connectivity between PS Chinook salmon and the SR killer whales that feed on them extends the action area to the marine waters of Puget Sound. The described area overlaps with the geographic ranges of the ESA-listed species and the boundaries of designated critical habitats identified in Table 1. The action area also overlaps with areas that have been designated, under the MSA, as EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species.

2.4 Environmental Baseline

The “environmental baseline” refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR 402.02).

Environmental conditions at the project sites and the surrounding area: The project site is located just north of Yarrow Bay on the eastern shore of Lake Washington in Kirkland, Washington (Figure 1). Although the action area includes the marine waters of Puget Sound, all detectable effects of the action would be limited to Lake Washington within about 300 feet of the

project site (Sections 2.5 & 2.12). Therefore this section focuses on habitat conditions in Lake Washington, and does not discuss Puget Sound habitat conditions.

Lake Washington is a long, narrow, freshwater lake with steeply sloping sides. It is about 22 miles long, north to south, has an average width of 1.5 miles, and covers about 21,500 acres. The lake has an average depth of about 100 feet, and is just over 200 feet deep at its deepest (City of Seattle 2010). The Lake Washington watershed covers about 300,000 acres (472 square miles), and its major influent streams are the Cedar and Sammamish Rivers. The Cedar River enters at the southern end of the lake and contributes about 57 percent of the lake's water. The Sammamish River enters at the north end of the lake, and contributes about 27 percent of the lake's water (King County 2016). Numerous creeks, including Coal, Forbes, Juanita, May, McAleer, Ravenna, and Thornton Creeks also flow directly into Lake Washington.

The geography and ecosystems in and adjacent to the action area have been dramatically altered by human activity since European settlers first arrived in the 1800s. Historically, the Cedar River did not enter the lake, and Lake Washington's waters flowed south to the Duwamish River via the now absent Black River. In the 1880s, dredging and excavation was started to create a navigable passage between Lake Washington and the marine waters of Shilshole Bay. In 1911, engineers rerouted the Cedar River into Lake Washington to create an industrial waterway and to prevent flooding in Renton. In 1916, the Lake Washington Ship Canal was opened, which lowered water levels in the lake by about nine feet, and stopped flows through the Black River.

The majority of the lake's watershed is now highly developed and urban in nature with 63 percent of the area considered fully developed (King County 2016). The City of Seattle borders most of the west side of the lake. The cities of Bellevue and Kirkland are along the eastern shoreline, with the Cities of Kenmore and Renton on the north and south ends, respectively. Water quality in the lake has been impacted by point and nonpoint pollution sources including past sewage discharges. Ongoing sources include stormwater discharges and subsurface runoff containing pollutants from roadways, failing septic systems, underground petroleum storage tanks, and fertilizers and pesticides from commercial and residential sites. It has also been impacted by upstream forestry and agricultural practices. Cleanup efforts since the 1960s and 1970s, including diversion of wastewater away from the lake, have improved conditions, such that water quality in the lake is generally considered good (City of Seattle 2010).

Urban development has converted most of the original lake shoreline from a mix of thick riparian forests, shrub-scrub, and emergent wetlands to residential gardens and lawns, with only small scattered patches of natural riparian growth remaining (Toft 2001). Additionally, as of the year 2000, over 70 percent of the lake's shoreline had been armored by bulkheads and rip rap, and over 2,700 docks had been installed around the lake (Toft 2001). It is almost certain that those numbers have increased since then.

The armored shorelines around most of Lake Washington, have converted the gently sloping gravel shorelines with very shallow waters that are favored by juvenile salmon, into artificially steep substrates with relatively deep water. Numerous piers and docks create harsh over-water shadows that limit aquatic productivity and hinder shoreline migration of juvenile salmon. Additionally, the artificial shorelines and overwater structures provide habitat conditions that

favor fish species that prey on juvenile salmonids, especially the non-native smallmouth bass. Other predators in the lake include the native northern pikeminnow and the non-native largemouth bass (Celedonia et al. 2008a and b; Tabor et al. 2010).

The project site is outside of any areas documented by the Washington State Department of Ecology (WDOE) as having water and or sediment contamination issues, but about 800 feet west of the project location, the lake is listed as Category 2 for Ammonia-N and Category 1 for bacteria and Total Phosphorus (WDOE 2022).

The adjacent shoreline to the south of the project site has a rock bulkhead topped with English ivy. The south boundary of the project site has western red cedar and redwood trees, followed by about 30 feet of a sandy cobble beach cove with a 180-foot long by 5.5-foot wide mooring pier, then the applicant's 257-foot long by 92-foot wide pile-supported overwater condominium pier, with a paved parking lot at the inland end of the condominium building. Houghton Beach Park, with about 30 feet of shoreline that is densely vegetated with bamboo and lodgepole pine trees is immediately north of the pier. The lakebed slopes gently from the shore to about 10 feet deep relative to the OHWM at the offshore end of the pier. The substrate is composed of cobble and sand, and submerged aquatic vegetation is assumed to consist mostly of patches of invasive Eurasian milfoil.

The past and ongoing anthropogenic impacts described above have reduced the project area's ability to support migrating PS Chinook salmon and PS steelhead. However, the project area continues to provide migratory habitat for adults and juveniles of both species, and the area has 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. Based on average linear increase per decade, during the last century, average air temperatures in the Pacific Northwest have increased by 1 to 1.4° F (0.6 to 0.8° C), and up to 2° F (1.1° C) in some seasons (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 5.6° 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 3.5-5.3°C increases in Columbia Basin streams and a peak temperature of 26°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 (see 50 CFR 402.02). 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 the factors set forth in 50 CFR 402.17(a) and (b).

The USACE proposes to authorize the applicant to perform up to 22 weeks of in- and over-water work between July 16 and March 15 to remove skirting, fascia, and guard rails from around the perimeter of the applicant's pier (the pier), to install a protective fence around a suspended under-pier sewer line, and to conduct above water work to repair the pier's concrete decking, to install new guard rails, to replace a set of beach stairs, and to install aluminum security screens under the beach-end of the pier. As described in the proposed action section of this opinion, the applicant's contractor would operate barge-mounted heavy equipment, as well as divers and above-water workers with handheld power tools to complete the work.

The proposed work would cause direct effects on the fish and habitat resources that are present during the in-water work through exposure to construction-related noise, water contamination, and propeller wash. The proposed removal of pier skirting and installation of a sewer line protective fence is also likely to cause indirect effects on fish through pier-related impacts.

The action's in-water work window avoids the peak emigration season for juvenile PS Chinook salmon, but the portion of the window between January 1 and March 15 overlaps with the early part of juvenile PS Chinook salmon presence in Lake Washington. The July 16 through to mid-October portion of the window overlaps with the immigration season for returning adult PS Chinook salmon. Therefore, both juvenile and adult PS Chinook salmon may be exposed to construction-related direct effects of the action.

2.5.1 Effects on Listed Species

Construction-related Noise

Construction-related noise is likely to adversely affect juvenile PS Chinook salmon, but cause minor effects in adults. The normal behaviors of juvenile Chinook salmon in the freshwater emigration phase of their life cycle include a strong tendency toward shoreline obligation, which means that they are biologically compelled to follow and stay close to streambanks and shorelines. They are therefore likely to pass through and forage within the project area. Conversely, adult PS Chinook salmon are shoreline independent and likely to remain in deeper offshore waters as they migrate past the site.

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

below 1,500 Hz, with peak sensitivity between about 200 and 300 Hz (Hastings and Popper 2005; Picciulin et al. 2010; Scholik and Yan 2002; Xie et al. 2008).

The NMFS uses two metrics to estimate the onset of injury for fish exposed to high intensity impulsive sounds (Stadler and Woodbury 2009). The metrics are based on exposure to peak sound level and sound exposure level (SEL). Both are expressed in decibels (dB). The metrics are: 1) exposure to 206 dB_{peak}; and 2) exposure to 187 dB SEL_{cum} for fish 2 grams or larger, or 183 dB SEL_{cum} for fish under 2 grams. Further, any received level (RL) below 150 dB_{SEL} is considered “Effective Quiet”. The distance from a source where the RL drops to 150 dB_{SEL} is considered the maximum distance from that source where fishes can potentially experience TTS or PTS from the noise, regardless of accumulation of the sound energy (Stadler and Woodbury 2009). When the range to the 150 dB_{SEL} isopleth exceeds the range to the applicable SEL_{CUM} isopleth, the distance to the 150 dB_{SEL} isopleth is typically considered the range at which detectable behavioral effects would begin, with the applicable SEL_{CUM} isopleth identifying the distance within which sound energy accumulation would intensify effects. However, when the range to the 150 dB_{SEL} isopleth is less than the range to the applicable SEL_{CUM} isopleth, only the 150 dB_{SEL} isopleth would apply because no accumulation effects are expected for noise levels below 150 dB_{SEL}. This assessment considers the range to the 150 dB_{SEL} isopleths as the maximum ranges for detectable acoustic effects from exposure to construction-related noise.

The discussion in Stadler and Woodbury (2009) indicate that these thresholds likely overestimate the potential effects of exposure to impulsive sounds. Further, Stadler and Woodbury’s assessment did not consider non-impulsive sound, which is believed to be less injurious to fish than impulsive sound. Therefore, application of the criteria to non-impulsive sounds is also likely to overestimate the potential effects in fish. However, these criteria represent the best available information. Therefore, to avoid underestimating potential effects, this assessment applies these criteria to the non-impulsive sounds that are expected during this action’s construction to gain a conservative idea of the potential effects that fish may experience due to exposure to project-related sounds.

Elevated in-water noise at levels capable of causing detectable effects in exposed fish would be caused by episodic tugboat operations and the use of above water power tools such as saws, drills, and pneumatic wrenches. The estimated in-water source levels (SL, sound level at 1 meter from the source) used in this assessment are based on the best available information, as described in recent acoustic assessments for similar projects (NMFS 2018), and in other sources (Blackwell and Greene 2006; FHWA 2001; McKenna et al. 2012; NoiseMeters 2020; Picciulin et al. 2010; Richardson et al. 1995). The best available information supports the understanding that all of the SLs would be below the 206 dB_{peak} threshold for the onset of instantaneous injury in fish, and that the loudest in-water sound levels would be caused by tugboat operations. To be protective of fish, this assessment focuses on tugboat noise levels, but assumes that in-water noise levels up to 170 dB_{SEL} would be present at the project site all day, every day during the planned 22 days of work (Table 5).

In the absence of location-specific transmission loss data, variations of the equation $RL = SL - \# \text{Log}(R)$ is often used to estimate the received sound level at a given range from a source (RL = received level (dB); SL = source level (dB, 1 m from the source); # = spreading loss coefficient;

and R = range in meters (m). Numerous acoustic measurements in shallow water environments support the use of a value close to 15 for projects like this one (CalTrans 2015). This value is considered the practical spreading loss coefficient, and was used for all sound attenuation calculations in this assessment. Application of the practical spreading loss equation to the expected SEL SL suggests that noise levels above the 150 dB_{SEL} threshold would extend out to about 72 feet (22 m) from a typical tugboat, which was used as a surrogate for this assessment (Table 4).

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

Source	Acoustic Signature	Source Level	Threshold Range
Tugboat Propulsion	< 1 kHz Combination	185 dB _{peak}	206 @ N/A
		170 dB _{SEL}	150 @ 22 m

Juvenile Chinook salmon that are within the 150 dB_{SEL} isopleth are likely to experience behavioral disturbances, such as acoustic masking, startle responses, altered swimming patterns, avoidance, and increased risk of predation. Further, the intensity of these effects would increase with increased proximity to the source and or duration of exposure. Response to this exposure would be non-lethal in most cases, but some individuals may experience stress and fitness effects that could reduce their long-term survival, and individuals that are eaten by predators would be killed.

The number of juvenile PS Chinook salmon that would be impacted by this stressor, and the intensity of any effects that an exposed individual may experience are unquantifiable with any degree of certainty. However, the best available information about the sizes of the affected populations, the timing of the work relative to the peak emigration season, and the numerous emigration routes taken by juvenile Chinook salmon in the lake supports the understanding that the subset of the annual juvenile Chinook salmon cohort that would migrate through the affected area during construction would be very small.

Further, the typically episodic and short-duration of tugboat operations, combined with the knowledge that construction-related power tool use would have limited connectivity with the water suggests that the intensity and duration of exposure to construction related noise would be low for any individual fish that passes through the project area. Therefore, the number of PS Chinook salmon that would be exposed to construction-related noise would represent an extremely small subset of their cohort, and the numbers of exposed fish that would be meaningfully affected would be too low to cause detectable population-level effects.

Construction-related Water Contamination

Exposure to construction-related water contamination is likely to adversely affect juvenile PS Chinook salmon, but cause minor effects in adults. The proposed tugboat operations would temporarily affect water quality through increased turbidity. Construction may also temporarily introduce toxic materials from equipment-related spills and discharges. The NMFS estimates that

all detectable water quality impacts would be limited to the extent of the project-related turbidity, which is expected to be limited to the area within 300 feet around the project site.

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

Water quality is considered adversely affected by suspended sediments when turbidity is increased by 20 NTU for a period of 4 hours or more (Berg and Northcote 1985; Robertson et al. 2006). The effects of turbidity on fish are somewhat species and size dependent. In general, severity typically increases with sediment concentration and duration of exposure, and decreases with the increasing size of the fish. Bjornn and Reiser (1991) report that adult and larger juvenile salmonids appear to be little affected by the high concentrations of suspended sediments that may be mobilized during storm and snowmelt runoff episodes. However, empirical data from numerous studies report the onset of minor physiological stress in juvenile and adult salmon after one hour of continuous exposure to suspended sediment concentration levels between about 1,100 and 3,000 mg/L, or to three hours of exposure to 400 mg/L, and seven hours of exposure to concentration levels as low as 55 mg/L (Newcombe and Jensen 1996). The authors reported that serious non-lethal effects such as major physiological stress and reduced growth were reported after seven hours of continuous exposure to 400 mg/L and 24 hours of continuous exposures to concentration levels as low as about 150 mg/L.

Tugboat propeller wash would episodically 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 turbidity caused by large tugboats operating in Navy harbors (ESTCP 2016). At about 13 minutes, the plume extended about 550 yards (500 m) and had a TSS concentration of about 80 mg/L. The plume persisted for hours and extended far from the event, but the TSS concentration fell to 30 mg/L within 1 hour and to 15 mg/L within 3 hours. At its highest concentration, the plume was below the concentrations required to elicit physiological responses reported by Newcombe and Jensen (1996). The exact extent of turbidity plumes from tugboat operations for this project are unknown, but given the small size of tugboats used in Lake Washington, it is extremely unlikely that turbidity would rise to the levels described above. Project-related tugboat trips would be infrequent, and would likely last a low number of hours while they reposition work barges. Therefore, the resulting propeller wash turbidity plumes would be low in number and episodic. The intensity and duration of the resulting turbidity plumes are uncertain. However, based on the information above, and on numerous consultations for similar projects in the region, sediment mobilization from tugboat propeller wash would

likely consist of relatively low-concentration plumes that could extend up to about 300 feet from the site, and last a low number of hours hour after the disturbance ends.

Based on the best available information, construction-related turbidity concentrations would be too low and short-lived to cause more than very brief, non-injurious behavioral effects such as avoidance of the plume, mild gill flaring (coughing), and slightly reduced feeding rates in any juvenile PS Chinook salmon that may be exposed to it.

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

The project has limited in-water work, and includes BMPs specifically intended to reduce the risk and intensity of discharges and spills during construction. In the unlikely event of a construction-related spill or discharge, the event would likely be very small, quickly contained and cleaned. This supports the expectation that the in-water presence of spill and discharge-related contaminants would be infrequent, at low concentrations, and very short-lived. It is most likely that any fish that may be exposed to construction-related toxic discharges would experience more than behavioral effects such as temporary avoidance of the project area.

In summary, exposure to construction-related turbidity and toxic discharges is likely to cause brief, non-injurious avoidance of the affected water and other mild behavioral effects. However, those effects may reduce the fitness for a small number of individual fish.

The number of juvenile PS Chinook salmon that would be impacted by this stressor, and the intensity of any effects that an exposed individual may experience are unquantifiable with any degree of certainty. However, for the same reasons expressed for Construction-related Noise, the PS Chinook salmon that may be exposed to construction-related water contamination would represent an extremely small subset of their cohort, and the number of exposed fish that would be meaningfully affected would be too low to cause detectable population-level effects.

Construction-related Propeller Wash

Exposure to construction-related propeller wash would adversely affect juvenile PS Chinook salmon, but cause minor effects in adults. Work-related tugboat operations would cause propeller wash within the project area. Spinning boat propellers kill fish and small aquatic organisms (Killgore et al. 2011; VIMS 2011). Spinning propellers also generate fast-moving turbulent water

(propeller wash) that can displace and disorient small fish, as well as dislodge benthic aquatic organisms and submerged aquatic vegetation (SAV), particularly in shallow water and or at high power settings (propeller scour).

The juvenile Chinook salmon that would be within the project area are likely to remain close to the surface where they may be exposed to spinning propellers and powerful propeller wash. Additionally, juvenile Chinook salmon tend to stay as close to shore as possible. Conversely, adults would tend to swim offshore and below the surface, and they would be able to swim against most propeller wash they might be exposed to, without experiencing any measurable effect on their fitness or normal behaviors.

Juveniles that are struck or very nearly missed by the spinning propellers of boats in the inlet would be injured or killed by the exposure. At greater distances, the boats' propeller wash may displace and disorient fish. Depending on the direction and strength of the thrust plume, displacement could increase energetic costs, reduce feeding success, and may increase the vulnerability to predators for individuals that tumble stunned and or disoriented in the wash.

The number of juvenile PS Chinook salmon that may be impacted by this stressor is unquantifiable with any degree of certainty. However, for the same reasons expressed for Construction-related Noise, the PS Chinook salmon that may be exposed to construction-related propeller wash would represent an extremely small subset of their cohort, and the number of exposed fish that would be meaningfully affected would be too low to cause detectable population-level effects.

Construction-related propeller scour may also reduce SAV and diminish the density and diversity of the benthic community at the project site. However, the disturbances would be brief, the affected areas would likely consist of a tiny portion of the SAV- and invertebrate-supporting substrate in the immediate area, and the disturbed SAV and invertebrates would likely recover very quickly after work is complete. Therefore, the effects of propeller scour would be too small to cause any detectable effects on the fitness and normal behaviors of juvenile Chinook salmon in the action area.

Pier-related Impacts

Pier-related impacts would cause minor effects in PS Chinook salmon. The proposed project includes no repair or replacement of piles or other structural elements that would meaningfully increase the life of the applicant's pier, but it would remove the existing skirting from the over-water perimeter of the pier, and it would install a new in-water protective fence around an under-pier sewer pipe that is located along the centerline of the pier.

The removal of the pier's skirting is likely to slightly decrease daytime under-pier shading, especially along the south side of the pier. The increased illumination would cause no adverse effects on migrating juvenile Chinook salmon, and may instead slightly reduce the intensity of altered migratory behavior that the over-water shading of the existing skirted pier is currently causing for juvenile Chinook salmon. Additionally, the increased illumination may slightly increase aquatic productivity in the area that is exposed to increased illumination.

The in-water protective fence around the under-pier sewer pipe could inhibit migration for juvenile Chinook salmon that swim under the pier. However, at its closest, the fence would be about 30 feet in from the edge of the offshore end of the pier, and about 40 feet in from the edge along its sides, and its 6-inch by 8-inch openings would make it highly permeable to the small juvenile Chinook salmon that may encounter it.

Given the proposed fence's design and location along the centerline of an existing 90-foot wide pier that is supported by about 77 in-water piles, it is extremely unlikely that the fence would measurably increase altered migratory behavior or exposure to predators for juvenile Chinook salmon that encounter the applicant's pier.

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 BMPs, is likely to adversely affect designated critical habitat for PS Chinook salmon as described below.

1. Freshwater spawning sites: None in the action area.
2. Freshwater rearing sites: None in the action area.
3. Freshwater migration corridors free of obstruction and excessive predation:
 - a. Obstruction and excessive predation – The proposed action would cause no effect on this attribute.
 - b. Water quantity – The proposed action would cause no effect on this attribute.
 - c. Water quality – The proposed action would cause minor short-term adverse effects on this attribute. Tugboat operations would cause episodic plumes of increased turbidity. Tugboat operations and construction work would also cause episodic low-level inputs of contaminants at the site. Detectable water quality impacts would be limited to the area within 300 feet around the project site, and would persist no more than a low number of hours after work stops. The action would cause no measurable changes in water temperature or salinity.
 - d. Natural Cover – The proposed action would cause long-term minor beneficial effects on this attribute. The proposed skirting removal would slightly increase under-pier illumination, which may slightly increase SAV growth in the area that is exposed to increased illumination.
4. Estuarine areas free of obstruction and excessive predation: None in the action area.

5. Nearshore marine areas free of obstruction and excessive predation: None in the action area.
6. Offshore marine areas: None in the action area.

2.6 Cumulative Effects

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

Some continuing non-Federal activities are reasonably certain to contribute to climate effects within the action area. However, it is difficult if not impossible to distinguish between the action area’s future environmental conditions caused by global climate change that are properly part of the environmental baseline vs. cumulative effects. Therefore, all relevant future climate-related environmental conditions in the action area are described in the discussion of environmental baseline (Section 2.4).

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

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

The intensity of these influences depends on many social and economic factors, and therefore is difficult to predict. Further, the adoption of more environmentally acceptable practices and standards may gradually reduce some negative environmental impacts over time. Interest in restoration activities has increased as environmental awareness rises among the public. State, tribal, and local governments have developed plans and initiatives to benefit ESA-listed PS Chinook salmon and PS steelhead within many of 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 assessing the risk that the proposed action poses to species and critical habitat. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

As described in more detail above in 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 PBF of designated critical habitats. The exact effects of climate change are both uncertain, and unlikely to be spatially homogeneous. However, climate change is reasonably likely to cause reduced instream flows in some systems, and may impact water quality through elevated in-stream water temperatures and reduced dissolved oxygen, as well as by causing more frequent and more intense flooding events.

Climate change may also impact coastal waters through elevated surface water temperature, increased and variable acidity, increasing storm frequency and magnitude, and rising sea levels. The adaptive ability of listed-species is uncertain, but is likely reduced due to reductions in population size, habitat quantity and diversity, and loss of behavioral and genetic variation.

The proposed action will cause direct and indirect effects on the ESA-listed species and critical habitats considered in the opinion well into the foreseeable future. However, the action's effects on water quality, substrate, and the biological environment are expected to be of such a small scale that no detectable effects on ESA-listed species or critical habitat through synergistic interactions with the impacts of climate change are expected.

2.7.1 ESA Listed Species

PS Chinook salmon 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. PS Chinook salmon 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, the effects on viability parameters for this species are also likely to be negative. In this context we consider how the proposed action's impacts on individuals would affect the listed species at the population and ESU scales.

PS Chinook salmon

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

The PS Chinook salmon most likely to occur at the project site would be fall-run Chinook salmon from the Cedar River and the North Lake Washington/Sammamish River populations, and part of the South Puget Sound MPG. Both populations are considered at high risk of extinction due to low abundance and productivity.

The project site is located along the just north of Yarrow Bay on the eastern shore of Lake Washington in Kirkland, Washington (Figure 1), which serves primarily as a freshwater migration route to and from marine waters for adult and juvenile PS Chinook salmon from both affected populations. The environmental baseline at and adjacent to the project site has been degraded by the effects of nearby intense bankside development and maritime activities, and by nearby and upstream industry, urbanization, agriculture, forestry, water diversion, and road building and maintenance.

The proposed action would cause short-term construction-related impacts that are likely to cause a range of effects that both individually and collectively would cause altered behaviors, reduced fitness, and possible mortality for a very low number of juvenile PS Chinook salmon, and only minor effects in adults. Based on the best available information, the scale of the direct and indirect effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause detectable effects on any of the characteristics of a viable salmon population (abundance, productivity, distribution, or genetic diversity) for the affected PS Chinook salmon populations. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

2.7.2 Critical Habitat

Critical habitat was designated for PS Chinook salmon to ensure that specific areas with PBFs that are essential to the conservation of that listed species are appropriately managed or protected. The critical habitat for PS Chinook salmon will be affected over time by cumulative effects, some positive – as restoration efforts 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 trends are negative, the effects on the PBFs of critical habitat for PS Chinook salmon are also likely to be negative. In this context we consider how the proposed action's impacts on the attributes of the action area's PBFs would affect the designated critical habitat's ability to support the conservation of PS Chinook salmon as a whole.

Past and ongoing land and water use practices have degraded salmonid critical habitat throughout the Puget Sound basin. Hydropower and water management activities have reduced

or eliminated access to significant portions of historic spawning habitat. Timber harvests, agriculture, industry, urbanization, and shoreline development have adversely altered floodplain and stream morphology in many watersheds, diminished the availability and quality of estuarine and nearshore marine habitats, and reduced water quality across the region.

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

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

The project site is located just north of Yarrow Bay on the eastern shore of Lake Washington in Kirkland, Washington (Figure 1). The PBF for PS Chinook salmon critical habitat at and adjacent to the project site is limited to freshwater migration corridors free of obstruction and excessive predation. The attributes of that PBF that would be affected by the action are obstruction and excessive predation, water quality, and natural cover. The project site is located along a heavily impacted lake shoreline, and all three of these attributes currently function at reduced levels as compared to undisturbed freshwater migratory corridors. The proposed project would cause a mix of adverse and beneficial effects on critical habitat attributes at the project site. The proposed work would cause minor ephemeral impacts on water quality. Conversely, the proposed removal of pier-skirting would slightly increase aquatic productivity at the 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 the freshwater migration corridors PBF in the action area. Therefore, this 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, nor is it likely to destroy or adversely modify designated critical habitat for PS Chinook salmon.

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). “Harass” is further defined by interim guidance as to “create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns which include, but are not limited to, breeding, feeding, or sheltering.” “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 biological opinion, the NMFS determined that incidental take is reasonably certain to occur as follows:

Harm of PS Chinook salmon from exposure to:

- Construction-related noise,
- Construction-related water contamination, and
- Construction-related propeller wash.

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

The timing and duration of in-water work is an appropriate surrogate for the extent of take of juvenile PS Chinook salmon from exposure to construction-related noise, water contamination, and propeller wash because the planned work window was selected to reduce the potential for juvenile salmonid presence at the project site. Therefore, working outside of the planned work window and or working for longer than planned would increase the number of fish likely to be exposed to these construction-related impacts.

The design and location of the proposed sewer line protective fence is applicable for this action because the current design is not expected to detectable affect juvenile PS Chinook salmon in the project area, whereas alternative designs could increase the potential that PS Chinook salmon would be exposed to stressors that they otherwise would not be exposed to.

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

- In-water work to be completed between July 16 and March 15; and
- The post-construction design and location of the sewer line protective fence 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 any of these take surrogates exceed the proposal, it could still meaningfully trigger reinitiation because the USACE 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 biological opinion, the NMFS determined that the amount or extent of anticipated take, coupled with other effects of the proposed action, is not likely to result in jeopardy to the species or destruction or adverse modification of critical habitat.

2.9.3 Reasonable and Prudent Measures

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

The USACE shall 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

In order to be exempt from the prohibitions of section 9 of the ESA, the Federal action agency must comply (or must ensure that any applicant complies) with the following terms and conditions. The USACE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. The following terms and conditions implement reasonable and prudent measure 1:
 - a. The USACE shall require the applicant to develop and implement plans to collect and report details about the take of listed fish. That plan shall:
 - i. Require the applicant and or their contractor to maintain and submit records to verify that all take indicators are monitored and reported. Minimally, the records should include:
 1. Documentation of the timing of in-water work to ensure that all work is accomplished between July 16 and March 15; and
 2. Documentation of the design and location of the sewer line protective fence to confirm that it complies with the characteristics described in this opinion.
 - ii. Require the applicant to establish procedures for the submission of the construction records and other materials to the appropriate USACE office, and to submit an electronic post-construction report to the NMFS within six months of project completion. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2021-01424 in the subject line.

2.10 Conservation Recommendations

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

1. The USACE should require the applicant to limit all in-water work to the period between July 16 and December 31 to reduce the likelihood of exposing juvenile Chinook salmon to the direct effects of construction.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S. Army Corps of Engineers’ authorization of the Parkside Apartments HOA’s Sewer Line Protection and Skirting Removal Project in Lake Washington, Kirkland, Washington.

Under 50 CFR 402.16(a): “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: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If 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 written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action.”

2.12 “Not Likely to Adversely Affect” Determinations

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

As described in Section 1.2 and below, the NMFS has concluded that the proposed action is not likely to adversely affect PS steelhead, SR killer whales, and designated critical habitat for SR killer whales. Detailed information about the biology, habitat, and conservation status and trends of PS steelhead and SR killer whales can be found in the listing regulations and critical habitat designations published in the Federal Register, as well as in the recovery plans and other sources at: <https://www.fisheries.noaa.gov/species-directory/threatened-endangered>, and are incorporated here by reference.

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

2.12.1 Effects on Listed Species

PS steelhead

PS steelhead are very rare in the Lake Washington watershed. Fewer than 10 adults from the North Lake Washington and Lake Sammamish population returned to the watershed between 1994 and 1999 when the last WDFW survey was done. Similarly, 50 adults from the Cedar River population have returned to the watershed since 2000, with 10 or less returning since 2007 (WDFW 2022c). Given the timing, short duration, and very small spatial scale of the in-water work that would be done for this project, combined with very low numbers of PS steelhead that may be in the watershed, it is extremely unlikely that any individuals from either population would be exposed to any of the stressors identified in Section 2.5. Therefore, the proposed action is not likely to adversely affect PS steelhead.

SR killer whales

The proposed action will have no direct effects on SR killer whales or their critical habitat because all construction and its impacts would take place in freshwater, and SR killer whales and their designated critical habitat are limited to marine waters.

However, the project may indirectly affect SR killer whales through the trophic web by affecting the quantity and quality of prey available to SR killer whales. We therefore analyze that potential here but conclude that the effects on SR killer whales will be insignificant for at least two reasons.

First, as described in Section 2.5, the action would annually affect an extremely low number of juvenile Chinook salmon. The project's detectable effects on fish would be limited to an area no more than 300 feet around the project site, where small subsets of each year's juvenile PS Chinook salmon cohorts from the Cedar River and North Lake Washington populations could be briefly exposed to project-related impacts during the final portion their freshwater migration lifestage, and only very small subsets of the individuals that pass through the area are likely to be detectably affected by the exposure.

The exact Chinook salmon smolt to adult ratios are not known. However, even under natural conditions, individual juvenile Chinook salmon have a very low probability of surviving to adulthood (Bradford 1995). We note that human-caused habitat degradation and other factors such as hatcheries and harvest exacerbate natural causes of low survival such as natural variability in stream and ocean conditions, predator-prey interactions, and natural climate variability (Adams 1980, Quinones et al., 2014). However, based on the best available information, the annual numbers of project-affected juveniles would be too low to influence any VSP parameters for either population, or to cause any detectable reduction in adult Chinook salmon availability to SR killer whales in marine waters.

Second, as described in Sections 1.3, 2.2, and 2.5, the only PS Chinook populations that would be affected by the project would be the two Lake Washington populations that migrate through the Lake Washington ship canal, and both populations are small. Adult returns in 2019 for the Cedar River and North Lake Washington populations were 963 and 2,186 individuals, respectively (WDFW 2022b). Consequently, the two populations, combined, make up a very small portion of the adult Chinook that are available to SR killer whales in marine waters. Therefore, based on the best available information, the proposed action is not likely to adversely affect SR killer whales.

2.12.2 Effects on Critical Habitat

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

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

1. Water quality to support growth and development

The proposed action would cause no detectable effects on marine water quality.

2. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth

The proposed action would cause long-term undetectable effects on prey availability and quality. Action-related impacts would annually injure or kill extremely low numbers of individual juvenile Chinook salmon (primary prey), during the final portion their freshwater migration lifestage. However, the numbers of affected juvenile Chinook salmon would be too small to cause detectable effects on the numbers of available adult Chinook salmon in marine waters. Therefore, it would cause no detectable reduction in prey availability and quality.

3. Passage conditions to allow for migration, resting, and foraging

The proposed action would cause no detectable effects on passage conditions.

For the reasons expressed immediately above, the NMFS has concluded that the proposed action is not likely to adversely affect ESA-listed SR killer whales and their designated critical habitat.

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

Section 305(b) of the MSA directs Federal agencies to consult with the NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”, and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires the NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)].

This analysis is based, in part, on the EFH assessment provided by the USACE and the descriptions of EFH contained in the fishery management plan for Pacific Coast salmon

developed by the Pacific Fishery Management Council and approved by the Secretary of Commerce (PFMC 2014).

3.1 Essential Fish Habitat Affected By the Project

The project site is located just north of Yarrow Bay on the eastern shore of Lake Washington in Kirkland, Washington (Figure 1). The waters and substrate of Lake Washington 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. Due to trophic links between PS Chinook salmon and SR killer whales, the project's action area also overlaps with marine waters that have been designated, under the MSA, as EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species. However, the action would cause no detectable effects on any components of marine EFH. Therefore, the action's effects on EFH would be limited to impacts on freshwater EFH for Pacific Coast Salmon, and it would not adversely affect marine EFH for Pacific Coast Salmon, or EFH for Pacific Coast groundfish and coastal pelagic species.

Freshwater EFH for Pacific salmon is identified and described in Appendix A to the Pacific Coast salmon fishery management plan, 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., large woody debris, 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 project 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 for Pacific Coast Salmon. Based on the analysis of effects presented in Section 2.5 the proposed action will cause minor short- and long-term adverse effects on EFH for Pacific Coast Salmon as summarized below.

1. Water quality: The proposed action would cause minor short-term adverse effects on this attribute. Tugboat operations would cause episodic plumes of increased turbidity. Tugboat operations and construction work would also cause episodic low-level inputs of contaminants at the site. Detectable water quality impacts would be limited to the area within 300 feet

around the project site, and would persist no more than a low number of hours after work stops. The action would cause no measurable changes in water temperature or salinity.

2. Water quantity, depth, and velocity: No changes expected. The proposed sewer line protective fence would extend about 5 feet below the OHWM of the lake. However, based on its very open design and its position among 77 pier-supporting piles, it is extremely unlikely that the fence would cause any detectable effect on the water flow velocity under the pier. Maintenance dredging would maintain artificially deepened water within the small boat moorage inlet that would persist for many years after the end of the project. The project includes no components that could change water quantity or depth.
3. Riparian-stream-marine energy exchanges: No changes expected.
4. Channel gradient and stability: No changes expected.
5. Prey availability: The proposed action would cause minor long-term beneficial effects on this attribute. The proposed skirting removal would slightly increase under-pier illumination, which would slightly increase aquatic productivity and prey availability at the project site.
6. Cover and habitat complexity: The proposed action would cause minor long-term beneficial effects on this attribute. The proposed skirting removal would slightly increase under-pier illumination, which would slightly increase aquatic productivity and SAV availability at the project site.
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

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

To reduce adverse impacts on water quality, the USACE should:

1. Require the applicant to limit all in- and overwater work to the period between July 16 and December 31 to reduce the likelihood of exposing juvenile Chinook salmon to the direct effects of construction.

Fully implementing this EFH conservation recommendation would protect, by avoiding or minimizing the adverse effects described in section 3.2 above, for Pacific Coast salmon.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the USACE must provide a detailed written response 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 the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with 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 USACE must reinitiate EFH consultation with the 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 the 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 USACE. Other interested users could include the applicant, WDFW, the governments and citizens of King County and the City of Kirkland, and Native American tribes. Individual copies of this opinion were provided to the USACE. 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 the 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.

5. REFERENCES

- Abatzoglou, J.T., Rupp, D.E. and Mote, P.W. 2014. Seasonal climate variability and change in the Pacific Northwest of the United States. *Journal of Climate* 27(5): 2125-2142.
- Adams, P.B. 1980. Life History Patterns in Marine Fishes and Their Consequences for Fisheries Management. *Fishery Bulletin*: VOL. 78, NO.1, 1980. 12 pp.
- Amento Group (Amento). 2021. [Permit Drawings] – Parkside Condominiums – Deck Remediation Scope of Repair. Amento Group, 710 2nd Ave. Ste. 400, Seattle, WA, 98104. April 2, 2021. 14 pp. Sent as an attachment to Waterfront 2021c.
- Beitinger, T.L. and L. Freeman. 1983. Behavioral avoidance and selection responses of fishes to chemicals. In: Gunther F.A., Gunther J.D. (eds) *Residue Reviews*. Residue Reviews, vol 90. Springer, New York, NY.
- Berg, L. and T.G. Northcote. 1985. Changes in Territorial, Gill-Flaring, and Feeding Behavior in Juvenile Coho Salmon (*Oncorhynchus kisutch*) Following Short-Term Pulses of Suspended Sediment. *Canadian Journal of Fisheries and Aquatic Sciences* 42: 1410-1417.
- Bjornn, T. C., and D. W. Reiser. 1991. Habitat requirements of salmonids in streams. *American Fisheries Society Special Publication* 19:83-139.
- Blackwell, S.B. and C.R. Greene Jr. 2006. Sounds from an oil production island in the Beaufort Sea in summer: characteristics and contribution of vessels. *J. Acoust. Soc. Am.* 119(1): 182-196.
- Bradford, M.J. 1995. Comparative review of Pacific salmon survival rates. *Canadian Journal of Fisheries and Aquatic Sciences*. 52: f 327-1338 (1995).
- Brette, F., B. Machado, C. Cros, J.P. Incardona, N.L. Scholz, and B.A. Block. 2014. Crude Oil Impairs Cardiac Excitation-Contraction Coupling in Fish. *Science* Vol 343. February 14, 2014. 10.1126/science.1242747. 5 pp.
- CalTrans. 2015. Technical Guidance for Assessment and Mitigation of the Hydroacoustic Effects of Pile Driving on Fish. Including Appendix 1 - Compendium of Pile Driving Sound Data. Division of Environmental Analysis California Department of Transportation, 1120 N Street Sacramento, CA 95814. November 2015. 532 pp.
- Campbell Scientific, Inc. 2008. Comparison of Suspended Solids Concentration (SSC) and Turbidity. Application Note Code: 2Q-AA. April 2008. 5 pp.
- Celedonia, M.T., R.A. Tabor, S. Sanders, S. Damm, D.W. Lantz, T.M. Lee, Z. Li, J.-M. Pratt, B.E. Price, and L. Seyda. 2008a. Movement and Habitat Use of Chinook Salmon Smolts, Northern Pikeminnow, and Smallmouth Bass Near the SR 520 Bridge – 2007 Acoustic Tracking Study. U.S. Fish and Wildlife Service, Lacey, WA. October 2008. 139 pp.
- Celedonia, M.T., R.A. Tabor, S. Sanders, D.W. Lantz, and J. Grettenberger. 2008b. Movement and Habitat Use of Chinook Salmon Smolts and Two Predatory Fishes in Lake Washington and the Lake Washington Ship Canal. 2004–2005 Acoustic Tracking Studies. U.S. Fish and Wildlife Service, Lacey, WA. December 2008. 129 pp.
- City of Seattle. 2008. Synthesis of Salmon Research and Monitoring – Investigations Conducted in the Western Lake Washington Basin. Seattle Public Utilities and US Army Corps of Engineers, Seattle Division. December 31, 2008. 143 pp.
- City of Seattle. 2010. Shoreline Characterization Report. Seattle Public Utilities and US Army Corps of Engineers, Seattle Division. January 2010. 221 pp.
- Codarini, A., L.E. Wysocki, F. Ladich, and M. Picciulin. 2009. Effects of ambient and boat noise on hearing and communication in three fish species living in a marine protected area (Miramare, Italy). *Marine Pollution Bulletin* 58 (2009) 1880–1887.

- Crozier, L.G., Hendry, A.P., Lawson, P.W., Quinn, T.P., Mantua, N.J., Battin, J., Shaw, R.G. and Huey, R.B., 2008. Potential responses to climate change in organisms with complex life histories: evolution and plasticity in Pacific salmon. *Evolutionary Applications* 1(2): 252-270.
- Crozier, L. G., M. D. Scheuerell, and E. W. Zabel. 2011. Using Time Series Analysis to Characterize Evolutionary and Plastic Responses to Environmental Change: A Case Study of a Shift Toward Earlier Migration Date in Sockeye Salmon. *The American Naturalist* 178 (6): 755-773.
- Dominguez, F., E. Rivera, D. P. Lettenmaier, and C. L. Castro. 2012. Changes in Winter Precipitation Extremes for the Western United States under a Warmer Climate as Simulated by Regional Climate Models. *Geophysical Research Letters* 39(5).
- Doney, S. C., M. Ruckelshaus, J. E. Duffy, J. P. Barry, F. Chan, C. A. English, H. M. Galindo, J. M. Grebmeier, A. B. Hollowed, N. Knowlton, J. Polovina, N. N. Rabalais, W. J. Sydeman, and L. D. Talley. 2012. Climate Change Impacts on Marine Ecosystems. *Annual Review of Marine Science* 4: 11-37.
- Ellison, C.A., R.L. Kiesling, and J.D. Fallon. 2010. Correlating Streamflow, Turbidity, and Suspended-Sediment Concentration in Minnesota's Wild Rice River. 2nd Joint Federal Interagency Conference, Las Vegas, NV, June 27 - July 1, 2010. 10 pp.
- Environmental Security Technology Certification Program (ESTCP). 2016. Evaluation of Resuspension from Propeller Wash in DoD Harbors. ER-201031. SPAWARSYSCEN Pacific, 53560 Hull Street, San Diego, CA 92152-5001. May 2016. 53 pp.
- Federal Highway Administration (FHWA). 2017. On-line Construction Noise Handbook – Section 9.0 Construction Equipment Noise Levels and Ranges. Updated: August 24, 2017. Accessed may 14, 2022 at: https://www.fhwa.dot.gov/environment/noise/construction_noise/handbook/handbook09.cfm
- Feist, B.E., E.R. Buhle, P. Arnold, J.W. Davis, and N.L. Scholz. 2011. Landscape ecotoxicology of coho salmon spawner mortality in urban streams. *Plos One* 6(8):e23424.
- Forest Ecosystem Management Assessment Team (FEMAT). 1993. Forest ecosystem management: An ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. 1993-793-071. U.S. Gov. Printing Office.
- Gobel, P., C. Dierkes, & W.C. Coldewey. 2007. Storm water runoff concentration matrix for urban areas. *Journal of Contaminant Hydrology*, 91, 26–42.
- Goode, J.R., Buffington, J.M., Tonina, D., Isaak, D.J., Thurow, R.F., Wenger, S., Nagel, D., Luce, C., Tetzlaff, D. and Soulsby, C., 2013. Potential effects of climate change on streambed scour and risks to salmonid survival in snow-dominated mountain basins. *Hydrological Processes* 27(5): 750-765.
- Graham, A.L., and S.J. Cooke. 2008. The effects of noise disturbance from various recreational boating activities common to inland waters on the cardiac physiology of a freshwater fish, the largemouth bass (*Micropterus salmoides*). *Aquatic Conservation: Marine and Freshwater Ecosystems*. 18:1315-1324.
- Hastings, M.C., and A. N. Popper. 2005. Effects of sound on fish. Final Report # CA05-0537 – Project P476 Noise Thresholds for Endangered Fish. For: California Department of Transportation, Sacramento, CA. January 28, 2005, August 23, 2005 (Revised Appendix B). 85 pp.
- Hood Canal Coordinating Council (HCCC). 2005. Hood Canal & Eastern Strait of Juan de Fuca summer chum salmon recovery plan. Version November 15, 2005. 339 pp.
- Hunter, M.A. 1992. Hydropower flow fluctuations and salmonids: A review of the biological effects, mechanical causes, and options for mitigation. Washington Department of Fisheries. Technical Report No. 119. Olympia, Washington.

- Incardona, J.P., T.K. Collier, and N.L. Scholz. 2004. Defects in cardiac function precede morphological abnormalities in fish embryos exposed to polycyclic aromatic hydrocarbons. *Toxicology and Applied Pharmacology* 196:191-205.
- Incardona, J.P., M.G. Carls, H. Teraoka, C.A. Sloan, T.K. Collier, and N.L. Scholz. 2005. Aryl hydrocarbon receptor-independent toxicity of weathered crude oil during fish development. *Environmental Health Perspectives* 113:1755-1762.
- Incardona, J.P., H.L. Day, T.K. Collier, and N.L. Scholz. 2006. Developmental toxicity of 4-ring polycyclic aromatic hydrocarbons in zebrafish is differentially dependent on AH receptor isoforms and hepatic cytochrome P450 1A metabolism. *Toxicology and Applied Pharmacology* 217:308-321.
- Independent Scientific Advisory Board (ISAB, editor). 2007. Climate change impacts on Columbia River Basin fish and wildlife. In: *Climate Change Report, ISAB 2007-2*. Independent Scientific Advisory Board, Northwest Power and Conservation Council. Portland, Oregon.
- Isaak, D.J., Wollrab, S., Horan, D. and Chandler, G., 2012. Climate change effects on stream and river temperatures across the northwest US from 1980–2009 and implications for salmonid fishes. *Climatic Change* 113(2): 499-524.
- Karrow, N., H.J. Boermans, D.G. Dixon, A. Hontella, K.R. Soloman, J.J. White, and N.C. Bols. 1999. Characterizing the immunotoxicity of creosote to rainbow trout (*Oncorhynchus mykiss*): a microcosm study. *Aquatic Toxicology*. 45 (1999) 223–239.
- Killgore, K.J, L.E. Miranda, C.E. Murphy, D.M. Wolff, J.J. Hoover, T.M. Keevin, S.T. Maynard, and M.A. Cornish. 2011. Fish Entrainment Rates through Towboat Propellers in the Upper Mississippi and Illinois Rivers. *Transactions of the American Fisheries Society*, 140:3, 570-581, DOI: 10.1080/00028487.2011.581977.
- King County. 2016. The Lake Washington Story. King County website. Article Last Updated February 26, 2016. Accessed on June 10, 2019, at: <https://www.kingcounty.gov/services/environment/water-and-land/lakes/lakes-of-king-county/lake-washington/lake-washington-story.aspx>.
- Kondolf, G.M. 1997. Hungry water: Effects of dams and gravel mining on river channels. *Environmental Management* 21(4):533-551.
- Kunkel, K. E., L. E. Stevens, S. E. Stevens, L. Sun, E. Janssen, D. Wuebbles, K. T. Redmond, and J. G. Dobson. 2013. Regional Climate Trends and Scenarios for the U.S. National Climate Assessment: Part 6. *Climate of the Northwest U.S. NOAA Technical Report NESDIS 142-6*. 83 pp. National Oceanic and Atmospheric Administration, National Environmental Satellite, Data, and Information Service, Washington, D.C.
- Lawson, P. W., Logerwell, E. A., Mantua, N. J., Francis, R. C., & Agostini, V. N. 2004. Environmental factors influencing freshwater survival and smolt production in Pacific Northwest coho salmon (*Oncorhynchus kisutch*). *Canadian Journal of Fisheries and Aquatic Sciences* 61(3): 360-373.
- Lee, R. and G. Dobbs. 1972. Uptake, Metabolism and Discharge of Polycyclic Aromatic Hydrocarbons by Marine Fish. *Marine Biology*. 17, 201-208.
- Mantua, N., I. Tohver, and A. Hamlet. 2009. Impacts of Climate Change on Key Aspects of Freshwater Salmon Habitat in Washington State. *In The Washington Climate Change Impacts Assessment: Evaluating Washington's Future in a Changing Climate*, edited by Mantua, N., I. Tohver, and A. Hamlet. 2010. Climate change impacts on streamflow extremes and summertime stream temperature and their possible consequences for freshwater salmon habitat in Washington State. *Climatic Change* 102(1): 187-223.

- McCain, B., D.C. Malins, M.M. Krahn, D.W. Brown, W.D. Gronlund, L.K. Moore, and S-L. Chan. 1990. Uptake of Aromatic and Chlorinated Hydrocarbons by Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) in an Urban Estuary. *Arch. Environ. Contam. Toxicol.* 19, 10-16 (1990).
- McElhany, P., M.H. Ruckelshaus, M.J. Ford, T.C. Wainwright, and E.P. Bjorkstedt. 2000. Viable Salmonid Populations and the Recovery of Evolutionarily Significant Units. U.S. Dept. Commer., NOAA Tech. Memo. NMFS-NWFSC-42. June 2000. 156 pp.
- McIntyre, J.K., D.H. Baldwin, D.A. Beauchamp, and N.L. Scholz. 2012. Low-level copper exposures increase visibility and vulnerability of juvenile coho salmon to cutthroat trout predators. *Ecological Applications*, 22(5), 2012, pp. 1460–1471.
- McKenna, M.F., D. Ross, S.M. Wiggins, and J.A. Hildebrand. 2012. Underwater radiated noise from modern commercial ships. *J. Acoust. Soc. Am.* 131(1): 92-103.
- McMahon, T.E., and G.F. Hartman. 1989. Influence of cover complexity and current velocity on winter habitat use by juvenile coho salmon (*Oncorhynchus kisutch*). *Canadian Journal of Fisheries and Aquatic Sciences* 46: 1551–1557.
- Meadore, J.P., F.C. Sommers, G.M. Ylitalo, and C.A. Sloan. 2006. Altered growth and related physiological responses in juvenile Chinook salmon (*Oncorhynchus tshawytscha*) from dietary exposure to polycyclic aromatic hydrocarbons (PAHs). *Canadian Journal of Fisheries and Aquatic Sciences*. 63: 2364-2376.
- Meyer, J.L., M.J. Sale, P.J. Mulholland, and N.L. Poff. 1999. Impacts of climate change on aquatic ecosystem functioning and health. *JAWRA Journal of the American Water Resources Association* 35(6): 1373-1386.
- Mote, P.W., J.T. Abatzglou, and K.E. Kunkel. 2013. Climate: Variability and Change in the Past and the Future. In *Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities*, edited by M.M. Dalton, P.W. Mote, and A.K. Snover, 41-58. Island Press, Washington, DC.
- Mote, P.W., A. K. Snover, S. Capalbo, S.D. Eigenbrode, P. Glick, J. Littell, R.R. Raymond, and W.S. Reeder. 2014. Ch. 21: Northwest. In *Climate Change Impacts in the United States: The Third National Climate Assessment*, J. M. Melillo, T.C. Richmond, and G.W. Yohe, Eds., U.S. Global Change Research Program, 487-513.
- Mueller, G. 1980. Effects of Recreational River Traffic on Nest Defense by Longear Sunfish. *Transactions of the American Fisheries Society*. 109:248-251.
- National Marine Fisheries Service (NMFS). 2006. Final Supplement to the Shared Strategy's Puget Sound Salmon Recovery Plan. Prepared by NMFS Northwest Region. November 17, 2006. 47 pp.
- NMFS. 2017. 2016 5-Year Review: Summary and Evaluation of Puget Sound Chinook Salmon, Hood Canal Summer-run Chum Salmon, and Puget Sound Steelhead. NMFS West Coast Region, Portland, Oregon. April 6, 2017. 98 pp.
- NMFS. 2018. Memorandum to the Record Re: WCR-2017-7601 WA Parks Pier Replacement, Cornet Bay, Whidbey Island, Washington – Acoustic Assessment for Planned Pile Extraction and Driving, and for Recreational Boat Use at the Pier. March 26, 2018. 15 pp.
- NOAA. 2022. Environmental Response Management Application – Pacific Northwest. On-line mapping application. Accessed on April 8, 2022 at: <https://erma.noaa.gov/northwest/erma.html#/layers=1+44000&x=122.20290&y=47.68411&z=12&view=881&panel=layer>
- Neff, J.M. 1982. Accumulation and release of polycyclic aromatic hydrocarbons from water, food, and sediment by marine animals. Pages 282-320 in N.L. Richards and B.L. Jackson (eds.). *Symposium: carcinogenic polynuclear aromatic hydrocarbons in the marine environment*. U.S. Environ. Protection Agency Rep. 600/9-82-013.

- Neo, Y.Y., J. Seitz, R.A. Kastelein, H.V. Winter, C. Cate, H. Slabbekoorn. 2014. Temporal structure of sound affects behavioural recovery from noise impact in European seabass. *Biological Conservation* 178 (2014) 65-73.
- Newcombe, C.P. and J.O. Jensen. 1996. Channel suspended sediment and fisheries: a synthesis for quantitative assessment of risk and impact. *North American Journal of Fisheries Management*, 16:693-727.
- NoiseMeters Inc. 2020. Frequency Weightings - A-Weighted, C-Weighted or Z-Weighted? Undated FAQ Help Page. 3 pp. Accessed May 14, 2022 at: <https://www.noisemeters.com/help/faq/frequency-weighting>
- Northwest Fisheries Science Center (NWFSC). 2015. Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest. December 21, 2015. 356 pp.
- Pacific Fishery Management Council (PFMC). 2014. Appendix A to the Pacific Coast salmon fishery management plan, as modified by amendment 18 to the pacific coast salmon plan: identification and description of essential fish habitat, adverse impacts, and recommended conservation measures for salmon. PFMC, Portland, OR. September 2014. 196 p. + appendices.
- Picciulin, M., L. Sebastianutto, A. Codarin, A. Farina, and E.A. Ferrero. 2010. In situ behavioural responses to boat noise exposure of *Gobius cruentatus* (Gmelin, 1789; fam. Gobiidae) and *Chromis chromis* (Linnaeus, 1758; fam. Pomacentridae) living in a Marine Protected Area. *Journal of Experimental Marine Biology and Ecology* 386 (2010) 125–132.
- Quinones, R.M., Holyoak, M., Johnson, M.L., Moyle, P.B. 2014. Potential Factors Affecting Survival Differ by Run-Timing and Location: Linear Mixed-Effects Models of Pacific Salmonids (*Oncorhynchus* spp.) in the Klamath River, California. *PLOS ONE* www.plosone.org 1 May 2014 | Volume 9 | Issue 5 | e98392. 12 pp.
- Raymondi, R.R., J.E. Cuhaciyan, P. Glick, S.M. Capalbo, L.L. Houston, S.L. Shafer, and O. Grah. 2013. Water Resources: Implications of Changes in Temperature and Precipitation. *In* *Climate Change in the Northwest: Implications for Our Landscapes, Waters, and Communities*, edited by M.M. Dalton, P.W. Mote, and A.K. Snover, 41-58. Island Press, Washington, DC.
- Richardson, W. J., C. R. Greene, C. I. Malme Jr., and D. H. Thomson. 1995. *Marine Mammals and Noise*. Academic Press, 525 B Street, Ste. 1900, San Diego, California 92101-4495.
- Robertson, M.J., D.A. Scruton, R.S. Gregory, and K.D. Clarke. 2006. Effect of suspended sediment on freshwater fish and fish habitat. *Canadian Technical Report of Fisheries and Aquatic Sciences* 2644, 37 pp.
- Ruckelshaus, M., K. Currens, W. Graeber, R. Fuerstenberg, K. Rawson, N. Sands, and J. Scott. 2002. Planning ranges and preliminary guidelines for the delisting and recovery of the Puget Sound Chinook salmon evolutionarily significant unit. Puget Sound Technical Recovery Team. April 30, 2002. 19 pp.
- Sandahl, J.F., D. Baldwin, J.J. Jenkins, and N.L. Scholz. 2007. A Sensory System at the Interface between Urban Stormwater Runoff and Salmon Survival. *Environmental Science and Technology*. 2007, 41, 2998-3004.
- Scholik, A.R., and H.Y. Yan. 2002. Effects of boat engine noise on the auditory sensitivity of the fathead minnow, *Pimephales promelas*. *Environmental Biology of Fishes*. 63:203-209.
- Sebastianutto, L., M. Picciulin, M. Costantini, and E.A. Ferrero. 2011. How boat noise affects an ecologically crucial behavior: the case of territoriality in *Gobius cruentatus* (Gobiidae). *Environmental Biology of Fishes*. 92:207-215.

- Shared Strategy for Puget Sound (SSPS). 2007. Puget Sound Salmon Recovery Plan – Volume 1. Shared Strategy for Puget Sound, 1411 4th Ave., Ste. 1015, Seattle, WA 98101. Adopted by NMFS January 19, 2007. 503 pp.
- Simpson, S.D., A.N. Radford, S.L. Nedelec, M.C.O. Ferrari, D.P. Chivers, M.I. McCormick, and M.G. Meekan. 2016. Anthropogenic noise increases fish mortality by predation. *Nature Communications* 7:10544 DOI: 10.1038/ncomms10544 www.nature.com/naturecommunications February 5, 2016. 7 pp.
- Spence, B.C., G.A. Lomnický, R.M. Hughes, and R.P. Novitzki. 1996. An ecosystem approach to salmonid conservation. ManTech Environmental Research Services, Inc. Corvallis, Oregon. National Marine Fisheries Service, Portland, Oregon.
- Spromberg, J.A, D.H. Baldwin, S.E. Damm, J.K. McIntyre, M. Huff, C.A. Sloan, B.F. Anulacion, J.W. Davis, and N.L. Scholz. 2015. Coho salmon spawner mortality in western US urban watersheds: bioinfiltration prevents lethal storm water impacts. *Journal of Applied Ecology*. DOI: 10.1111/1365-2264.12534.
- Stadler, J.H., and D.P. Woodbury. 2009. Assessing the effects to fishes from pile driving: Application of new hydroacoustic criteria. 8 pp.
- SUHRCO Residential Properties LLC, AMO (SUHRCO). 2021. Biological Evaluation for Informal ESA Consultation for: SUHRCO Residential Properties LLC, AMO (NWS-2021-387) Version: May 2012. April 12, 2021. 47 pp. Sent as an enclosure with USACE 2021a.
- Tabor, R.A., H.A. Gearns, C.M. McCoy III, and S. Camacho. 2006. Nearshore Habitat Use by Juvenile Chinook Salmon in Lentic Systems, 2003 and 2004 Report. U.S. Fish and Wildlife Service, Western Washington Fish and Wildlife Office, Fisheries Division, 510 Desmond Drive SE, Suite 102, Lacey, Washington 98503. March 2006. 108 pp.
- Tabor, R.A., S.T. Sanders, M.T. Caledonia, D.W. Lantz, S. Damm, T.M. Lee, Z. Li, and B.E. Price. 2010. Spring/Summer Habitat Use and Seasonal Movement Patterns of Predatory Fishes in the Lake Washington Ship Canal. Final Report, 2006-2009 to Seattle Public Utilities. U.S. Fish and Wildlife Service, Washington Fish and Wildlife Office, Fisheries Division, 510 Desmond Drive SE, Suite 102, Lacey, Washington 98503. September 2010. 88 pp.
- Tillmann, P. and D. Siemann. 2011. Climate Change Effects and Adaptation Approaches in Marine and Coastal Ecosystems of the North Pacific Landscape Conservation Cooperative Region. National Wildlife Federation.
- Toft, J.D. 2001. Shoreline and Dock Modifications in Lake Washington. Prepared for King County Department of Natural Resources. University of Washington School of Aquatic & Fishery Sciences. SAFS-UW-0106. October 2001. 23 pp.
- U.S. Army Corps of Engineers (USACE). 2021a. Reference: ESA Consultation request – NWS-2021-387 – Sprecher, Kari (King). Letter to request informal consultation under the Endangered Species Act and the Magnuson-Stevens Fishery Conservation and Management Act. June 10, 2021. 3 pp. Included 3 enclosures.
- Varanasi, U., E. Casillas, M.R. Arkoosh, T. Hom, D.A. Misitano, D.W. Brown, S.L. Chan, T.K. Collier, B.B. McCain, and J.E. Stein. 1993. Contaminant Exposure and Associated Biological Effects in Juvenile Chinook Salmon (*Oncorhynchus tshawytscha*) from Urban and Nonurban Estuaries of Puget Sound. NOAA Technical Memorandum NMFS-NWFSC-8. NMFS NFSC Seattle, WA. April 1993. 69 pp.
- Virginia Institute of Marine Science (VIMS). 2011. Propeller turbulence may affect marine food webs, study finds. *ScienceDaily*. April 20, 2011. Accessed May 15, 2018 at: <https://www.sciencedaily.com/releases/2011/04/110419111429.htm>

- Wainwright, T. C., and L. A. Weitkamp. 2013. Effects of climate change on Oregon Coast coho salmon: habitat and life-cycle interactions. *Northwest Science* 87(3): 219-242.
- WDOE. 2022. Washington State Water Quality Atlas. Accessed on May 13, 2022 at: <https://apps.ecology.wa.gov/waterqualityatlas/>
- Washington State Department of Fish and Wildlife (WDFW). 2021. Hydraulic Project Approval Re: Permit Number 2021-4-335+01. Application ID: 23929. Project Name: Parkside Apartments HOA – Skirting Demo and Sewer Protection. May 25, 2021. 5 pp. Sent as an attachment to Waterfront 2021c.
- WDFW. 2022a. SalmonScape. Accessed on April 8, 2022 at: <http://apps.wdfw.wa.gov/salmonscape/map.html>.
- WDFW. 2022b. WDFW Conservation Website – Species – Salmon in Washington – Chinook. Accessed on April 8, 2022 at: <https://fortress.wa.gov/dfw/score/score/species/chinook.jsp?species=Chinook>
- WDFW. 2022c. WDFW Conservation Website – Species – Salmon in Washington – Steelhead. Accessed on April 8, 2022 at: <https://fortress.wa.gov/dfw/score/score/species/steelhead.jsp?species=Steelhead>
- Waterfront Construction Inc. (Waterfront). 2021a. [Permit Drawings, Revised]. Applicant: The Parkside Apartment Condominiums. July 10, 2020. Revised April 20, 2021. 7 pp. Sent as an enclosure with USACE 2021a.
- Waterfront. 2021b. Project Description & Construction Sequence – Parkside Apartments HOA – Skirting Demo and Sewer Protection. April 9, 2021. 3 pp. Sent as an enclosure with USACE 2021a.
- Waterfront. 2021c. RE: Parkside Apartments HOA Skirting Demo and Sewer Protection (NWS-2021-387; WCRO-2021-01424). Electronic mail with 4 attachments, sent to provide requested information. September 13, 2021. 3 pp.
- Waterfront. 2021d. Washington State Joint Aquatic Resources Permit Application (JARPA) Form - Parkside Apartments HOA – Skirting Demo and Sewer Protection. January 21, 2021. 12 pp. Sent as an attachment to Waterfront 2021c.
- Waterfront. 2022a. RE: Parkside Apartments (NWS-2021-387; WCRO-2021-01424). Electronic mail with 4 attachments, sent to provide feedback regarding the draft description of the proposed action. May 9, 2022. 2 pp.
- Waterfront. 2022b. [Permit Drawings, Revised]. Applicant: The Parkside Apartment Condominiums. July 10, 2020. Revised February 10, 2022. 11 pp. Sent as an attachment to Waterfront 2022b.
- Winder, M. and D. E. Schindler. 2004. Climate change uncouples trophic interactions in an aquatic ecosystem. *Ecology* 85: 2100–2106.
- Xie, Y.B., C.G.J. Michielsens, A.P. Gray, F.J. Martens, and J.L. Boffey. 2008. Observations of avoidance reactions of migrating salmon to a mobile survey vessel in a riverine environment. *Canadian Journal of Fisheries and Aquatic Sciences*. 65:2178-2190.