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

Refer to NMFS No:
WCRO-2020-01678

July 22, 2020

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

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for King County's Coal Creek Trunk Maintenance Hole 25B Protection Project, King County, Washington (COE Number: NWS-2020-605-WRD, HUC: 171100120400 – Lake Washington)

Dear Ms. Walker:

Thank you for your letter of June 24, 2020, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for U.S. Army Corps of Engineers' (COE) authorization of King County's Coal Creek Trunk Maintenance Hole 25B Protection Project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016). The enclosed document contains the biological opinion (Opinion) prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this Opinion, the NMFS concludes that the proposed action would adversely affect but is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon, and documents our conclusion that the proposed action is not likely to adversely affect PS steelhead. This Opinion does not consider designated critical habitat for either species because the action area has been excluded from designation as critical habitat for any species under our jurisdiction.

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

Section 3 of this document includes our analysis of the action's likely effects on EFH pursuant to Section 305(b) of the MSA. Based on that analysis, the NMFS concluded that the action would adversely affect designated EFH for Pacific Coast Salmon. Therefore, we have provided 1 conservation recommendations that can be taken by the COE to avoid, minimize, or otherwise offset potential adverse effects on EFH.

Section 305(b) (4) (B) of the MSA requires Federal agencies to provide a detailed written response to NMFS within 30 days after receiving this recommendation. If the response is inconsistent with the EFH conservation recommendations, the COE must explain why the recommendations will not be followed, including the scientific justification for any disagreements over the effects of the action and recommendations. In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we request that in your statutory reply to the EFH portion of this consultation you clearly identify the number of conservation recommendations accepted.

Please contact Donald Hubner in the North Puget Sound Branch of the Oregon/Washington Coastal Office at (206) 526-4359, or by electronic mail at Donald.Hubner@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

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

cc: Rory Lee, COE
Grace Smith, King County

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

King County's Coal Creek Trunk Maintenance Hole 25B Protection Project
King County, Washington
(COE Number: NWS-2020-605-WRD, HUC: 171100120400 – Lake Washington)

NMFS Consultation Number: WCRO-2020-01678

Action Agency: U.S. Army Corps of Engineers

Affected Species and NMFS' Determinations:

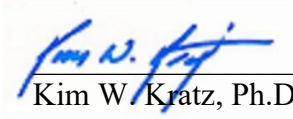
ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species?	Is Action Likely To Jeopardize the Species?	Is Action Likely to Adversely Affect Critical Habitat?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Chinook salmon (Oncorhynchus tshawytscha) Puget Sound (PS)	Threatened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

Consultation Conducted By: National Marine Fisheries Service
West Coast Region

Issued By:



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

Date: July 22, 2020

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LIST OF ABREIVIATIONS

BE – Biological Evaluation
BMP – Best Management Practices
CFR – Code of Federal Regulations
COE – Corps of Engineers, U.S. Army
DQA – Data Quality Act
EF – Essential Feature
EFH – Essential Fish Habitat
ESA – Endangered Species Act
ESU – Evolutionarily Significant Unit
FR – Federal Register
FMP – Fishery Management Plan
HAPC – Habitat Area of Particular Concern
HUC – Hydrologic Unit Code
ITS – Incidental Take Statement
mg/L – Milligrams per Liter
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
PAH – Polycyclic Aromatic Hydrocarbons
PCB – Polychlorinated Biphenyl
PFMC – Pacific Fishery Management Council
PS – Puget Sound
PSTRT – Puget Sound Technical Recovery Team
RL – Received Level
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SEL – Sound Exposure Level
SL – Source Level
VSP – Viable Salmonid Population
WDFW – Washington State Department of Fish and Wildlife
WDOE – Washington State Department of Ecology

1. INTRODUCTION

This Introduction section provides information relevant to the other sections of this document and is incorporated by reference into Sections 2 and 3, below.

1.1 Background

The National Marine Fisheries Service (NMFS) prepared the biological opinion (opinion) and incidental take statement (ITS) portions of this document in accordance with section 7(b) of the Endangered Species Act (ESA) of 1973 (16 USC 1531 et seq.), and implementing regulations at 50 CFR 402, as amended.

We also completed an essential fish habitat (EFH) consultation on the proposed action, in accordance with section 305(b)(2) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 et seq.) and implementing regulations at 50 CFR 600.

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (DQA) (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. A complete record of this consultation is on file at the Oregon Washington Coastal Office.

1.2 Consultation History

On April 7, 2020 the NMFS received and email from King County requesting technical assistance for the proposed action. Subsequently, multiple emails and phone calls were exchanged between the NMFS, the COE and King County. On June 18, 2020, King County shared their permit application documents with the NMFS. The NMFS provided comments on June 23, 2020. On June 24, 2020, the NMFS received the COE's request for formal consultation (COE 2020a), with King County's biological evaluation (BE) and Joint Aquatic Resources Permit Application (JARPA) form enclosed (King County 2020a & b). Formal consultation for the proposed action was initiated on that date. On June 29, 2020, the NMFS received an email from King County that provided additional project information, and revised their effect determination for PS steelhead from LAA to NLAA (King County 2020c). On July 5, 2020, the COE similarly revised their effect determination PS steelhead to NLAA for (COE 2020b).

This Opinion is based on the information in King County's BE and additional information; recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon; published and unpublished scientific information on the biology and ecology of those species; and relevant scientific and gray literature (see Literature Cited).

1.3 Proposed Federal Action

Under the ESA, "Action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (50 CFR 402.02), whereas the EFH

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

The COE proposes to authorize King County Department of Natural Resources and Parks Wastewater Treatment Division (the County) to install temporary streambank stabilization (revetment) to protect maintenance hole 25B (MH-25B) from ongoing scour along the left bank of Coal Creek in the City of Bellevue, Washington (Figure 1). The County intends to remove the revetment within 10 years as part of the Coal Creek Trunk Upgrade Project that is currently under development, and would remove MH-25B from the creek. If the Coal Creek Trunk Upgrade Project is unexpectedly delayed beyond this time frame, the County commits to replace the revetment with softer structures (such as large woody material) through a separate permitted project (King County 2020c).

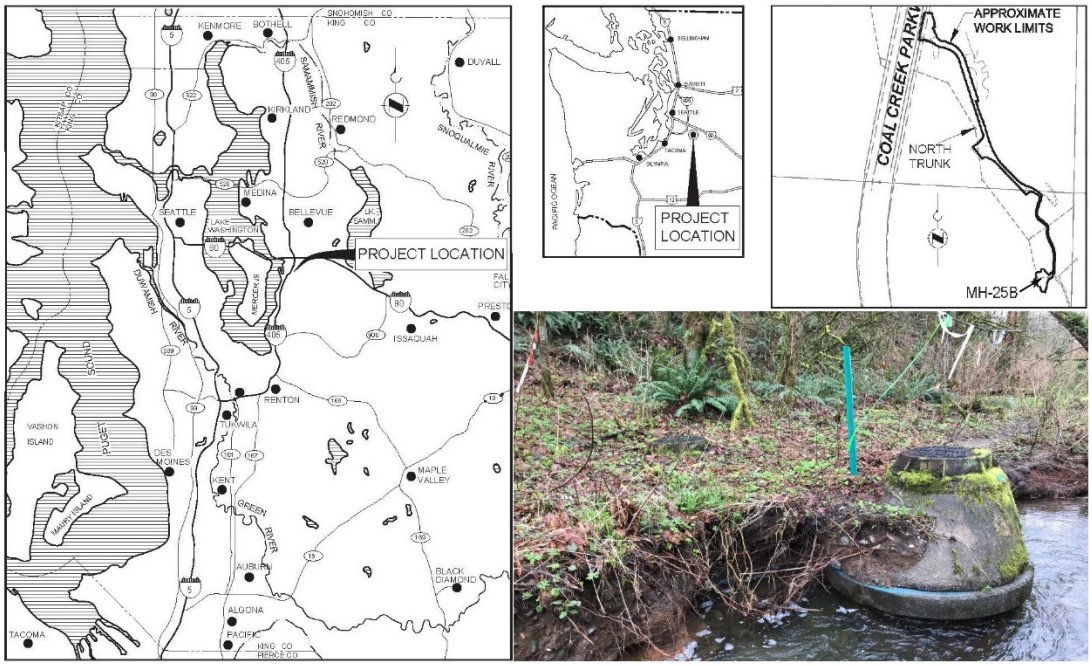

Figure 1. The project location in Bellevue, Washington (Adapted from King County 2020a sheets 1 & 2 of 8 and a photograph shared during technical assistance).

The County's contractor would conduct about 2 weeks of in- and near-water work that would end no later than August 30, 2020. They would stage equipment and supplies in portions of the Upper West Coal Creek Trail (Trail) parking lot and on an existing gravel ramp. Motorized equipment would be limited to mini excavators and track loaders less than 4 feet wide. They would access the project site by following a 4-foot wide compacted trail that extends south from the parking lot along the east side of the creek, but must then move off trail and across the creek to access the construction site, which is located on the west bank. The shortest off-trail route would be selected to access the construction site, and in the off-trail areas, the motorized equipment would travel over protective mats that would be installed over the soil and partially in the stream channel. Additionally, all construction work would be done in compliance with the protective measures and best management practices (BMPs) identified in the County's BE for this project, as well as in the provisions of the Washington State Department of Fish and Wildlife (WDFW) Hydraulic Project Approval (HPA) permit for the project (WDFW 2020a).

Off-trail site access would require the contractor to clear up to 1,838 square feet of wetland and stream buffer vegetation between the trail and the creek, and around MH-25B (Figure 2). Upon completion of the project, the protective mats would be removed and all cleared areas would be revegetated with native plantings to match or exceed existing conditions. The project would also temporarily disturb about 1,084 square feet of the Coal Creek streambed to access the left bank with a small excavator and with personnel on foot. No in-stream fill or excavation would occur to provide access to the work site.

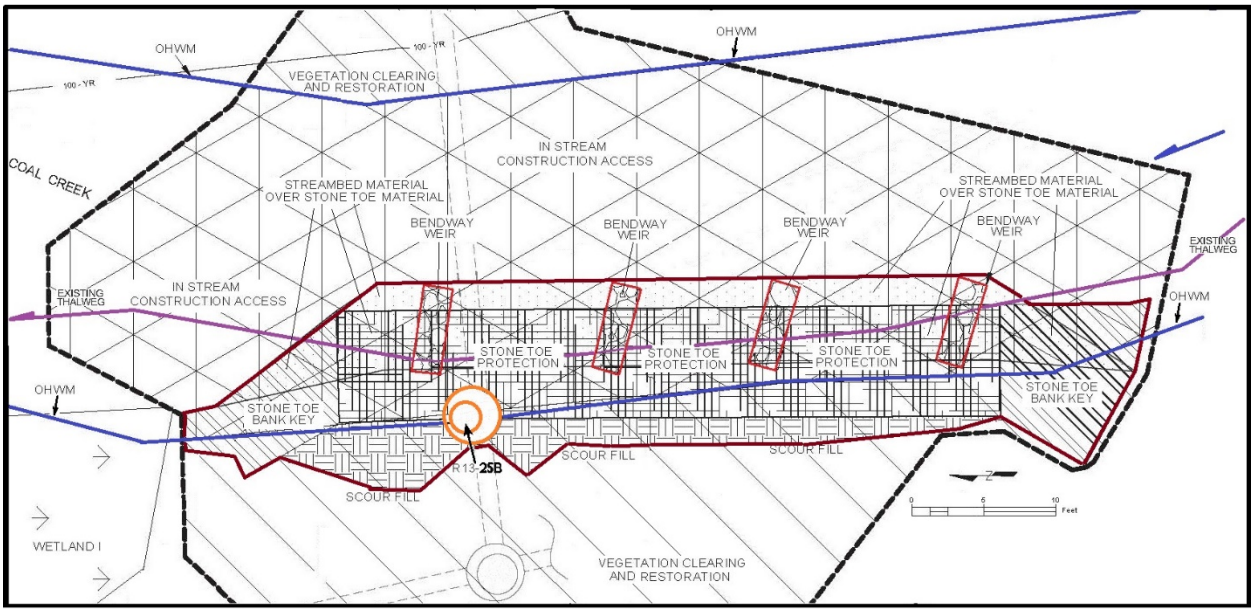

Figure 2. Plan drawing of the streambank protection in Coal Creek. The stream thalweg is shown in purple (Adapted from King County 2020a, App. C Sheet 6 & 7 of 8).

Prior to construction the contractor would install a temporary stream bypass to divert stream flow away from and past the revetment site. The final design would be approved by qualified fisheries biologists from WDFW and the County, and all bypass structures would be removed by the end of construction. Installation of the bypass, and fish salvage would be performed under the direction of a qualified fisheries biologist, and in compliance with the Fish Exclusion Protocols from the US Fish and Wildlife Service and from the Washington State Department of Transportation (USFWS 2012; WSDOT 2016).

In general, the bypass would consist of a 24-inch diameter pipe about 120 feet long that would be buried in the gravel bar that extends along the streambed east of the thalweg. A sandbag dam would be installed upstream of the pipe to direct water away from the thalweg and into the pipe. A second sandbag dam would installed across the thalweg just downstream of the construction area to prevent water and fish from entering from downstream, and a flow diffuser would be installed at the downstream end of the bypass pipe to prevent scour.

Prior to installation of the bypass, the contractors would install two barrier nets across the creek. One would be slightly upstream of the intake end of the pipe and the other would be downstream of the discharge end. Fish salvage would be conducted between the nets immediately prior to construction of the bypass.

The contractors would then use a mini-excavator to dig a trench that would be up to about 120 feet long and 3 feet wide along most of its length. The trench would likely be wider at the upstream end to accommodate installation of the sandbag dam and flow from the thalweg to the pipe. They would install a bypass pipe and a sandbag dam to divert the stream flow from the thalweg and into the pipe. They would then backfill the trench with excavated streambed material. Unused excavated material would be temporarily stored on the gravel bar, then used to backfill the trench after the bypass pipe is removed at the end of the project.

The contractors would remove the fish exclusion nets from the creek soon after bypass construction is complete. Fisheries biologists would continue to monitor the work area, and salvage stranded fish as needed as the water level drops in the bypassed area. If pumps are needed to further reduce the work area water level, they would be installed and operated in compliance with the Fish Exclusion Protocols previously identified.

At MH-25B, the contactors would use a mix of mini-excavator/loader operations and human labor to shape the streambank and streambed, and to install a mix of clean soil and streambed sediment to refill the scoured area behind the MH. They would then install rip rap to construct stone toe bed and bank key, and stone toe protection along about 80 feet of the left bank. They would also install four 6- by 2- by 2-foot bendway weirs that would consist of two-man sized boulders. About half the length of each weir would be embedded within the stone toe. They would also install a layer of clean streambed gravel and cobbles about 1-foot thick over the surface of all rip rap components (Figures 2 & 3).

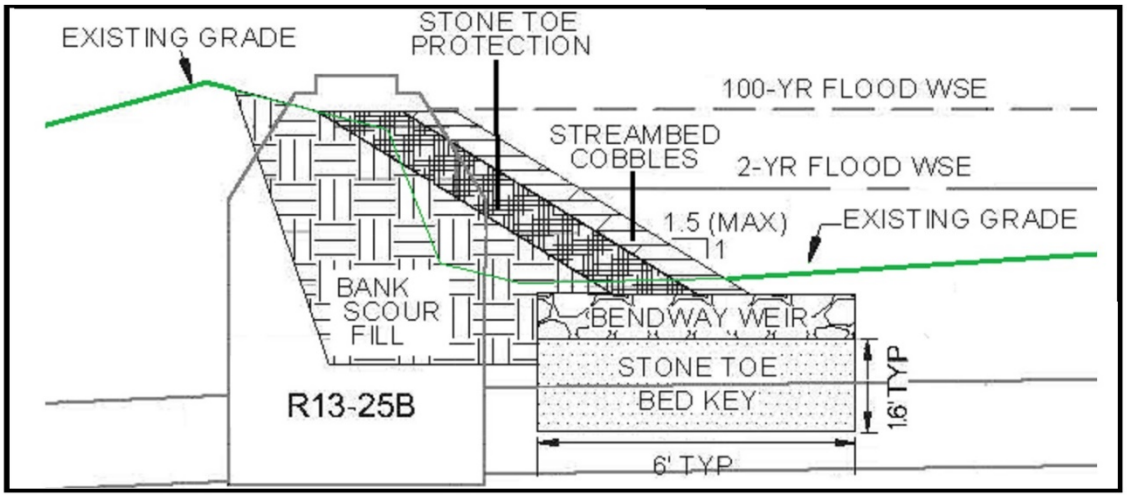

Figure 3. Profile drawing of the streambank protection in Coal Creek. (Adapted from King County 2020a, App. C Sheet 7 of 8).

Over the life of the revetment, the County commits to conduct post-construction monitoring of the structure annually and after any storms larger than the 2-year event. During the soonest in-water work window, the County would replace lost streambed material as needed to cover any exposed rip rap.

The NMFS also considered whether or not the proposed action would cause any other activities that could affect listed resources. Based on the nature of the project, the NMFS expects that the

only additional activities likely to be caused by the proposed action would be those taken to remove the temporary revetment and to restore the area as part of the Coal Creek Trunk Upgrade Project or as compliance with the County's commitment to limit the structure's life to no more than 10 years, both of which would require permitting that would trigger additional ESA consultation. Therefore, this consultation focuses only on the effects that are likely to be caused by the construction described above, and by the presence of the revetment for up to 10 years.

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

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

The COE determined that the proposed action is likely to adversely affect PS Chinook salmon, is not likely to adversely affect PS steelhead, and would have no effect on designated critical habitat because the action area has been excluded from that designation for both species (Table 1). Because the proposed action is likely to adversely affect PS Chinook salmon, the NMFS has proceeded with formal consultation. Our concurrence with the COE's determination that their action is not likely to adversely affect PS steelhead is documented in the "Not Likely to Adversely Affect" Determinations section (2.12).

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

ESA-listed species and critical habitat likely to be adversely affected (LAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound	Threatened	LAA	N/A	06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630)
ESA-listed species and critical habitat not likely to be adversely affected (NLAA)				
Species	**Status**	**Species**	**Critical Habitat**	**Listed / CH Designated**
steelhead (*O. mykiss*) Puget Sound	Threatened	NLAA	N/A	05/11/07 (72 FR 26722) / 02/24/16 (81 FR 9252)

LAA = likely to adversely affect NLAA = not likely to adversely affect
N/A = not applicable. The action area is outside designated critical habitat.

2.1 Analytical Approach

This biological opinion includes a jeopardy analysis that 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.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition does not change the scope of our analysis and in this opinion we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species:

- Evaluate the range-wide status of the species expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species.
- Evaluate the effects of the proposed action on species and their habitat using an exposure-response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species, 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.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

2.2 Rangewide Status of the Species

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02.

The summary that follows describes the status of the ESA-listed species that occurs within the action area and is considered in this opinion. More detailed information on the biology, habitat, and conservation status and trend of this listed species 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 (Table 2) are functioning in a manner that is sufficient to support an ESU-wide recovery scenario; Production of Chinook salmon from tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations occurs in a manner consistent with ESU recovery; and
- Populations that do not meet all the Viable Salmon Population (VSP) parameters are sustained to provide ecological functions and preserve options for ESU recovery.

Table 2. Extant PS Chinook salmon populations in each biogeographic region (Ruckelshaus *et al*. 2002, NWFSC 2015).

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

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).

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

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

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

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

Abundance and Productivity: Available data on total abundance since 1980 indicate that abundance trends have fluctuated between positive and negative for individual populations, but productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit watershed. Available data now show that

most populations have declined in abundance over the past 7 to 10 years. Further, escapement levels for all populations remain well below the PSTRT planning ranges for recovery, and most populations are consistently below the spawner-recruit levels identified by the PSTRT as consistent with recovery (NWFSC 2015). The current information on abundance, productivity, spatial structure and diversity suggest that the Whidbey Basin MPG is at relatively low risk of extinction. The other four MPGs are considered to be at high risk of extinction due to low abundance and productivity (NWFSC 2015). The most recent 5-year status review concluded that the ESU should remain listed as threatened (NMFS 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 in Coal Creek are not a defined population, and they likely consist of returning fall-run Chinook salmon that originated in Coal Creek and stray fall-run adults from the Cedar River population and from the North Lake Washington / Sammamish River population (Bellevue 2018; NWFSC 2015; WDFW 2020b). Both stream- and ocean-type Chinook salmon are present in these populations, but the majority are ocean-type fish.

Low numbers of adult Chinook salmon use Coal Creek as spawning habitat. Between 2008 and 2017, WDFW surveyors annually documented between 0 and 19 live adult Chinook salmon, and 0 to 7 redds in Coal Creek. The Cedar River population is relatively small, with a total annual abundance fluctuating at close to 1,000 fish (NWFSC 2015; WDFW 2020c). Between 1965 and 2019, the total abundance for PS Chinook salmon in the basin has fluctuated between about 133 and 2,451 individuals, with the average trend being slightly negative. The 2015 status review reported that the 2010 through 2014 5-year geometric mean for natural-origin spawner abundance had shown a positive change since the 2010 status review, with natural-origin spawners accounting for about 82% of the population. WDFW data suggest that natural-origin spawners accounted for about 71% of a combined total return of 855 fish in 2019 (WDFW 2020c). The North Lake Washington / Sammamish River population is also small, with a total abundance that has fluctuated between about 33 and 2,223 individuals from 1983 through 2019. Natural-origin spawners make up a small proportion of the total population, accounting for about 30% of the 365 total return in 2019, and the trend is rather flat to slightly negative (NWFSC 2015; WDFW 2020c).

Returning adults begin entering Coal Creek in early September. Spawning occurs primarily during October and early November, typically downstream of Coal Creek Parkway SE, but spawning in or slightly upstream of the action area was observed in 2017 (Bellevue 2018).

Ocean-type juveniles briefly rear in the creek before entering Lake Washington in their migration to the ocean. Juvenile Chinook salmon typically start out-migrating from the creek in December and January. They are found in Lake Washington between January and July (Tabor et al. 2006). Some stream-type fish may occur in the creek year-round, but only in very low numbers. Fish presence surveys conducted with electrofishing in Coal Creek during the summer of 2015 yielded numerous fish species, including juvenile coho salmon, but no juvenile Chinook salmon (Bellevue 2015).

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 County's proposed revetment would be located along the left bank of Coal Creek in the City of Bellevue, Washington (Figures 1 & 4). As described in the Effects of the Action Section (2.5), construction related effects would be limited to the in-water area within about 50 feet upstream, and 300 feet downstream of the project site. However, hydrological impacts may extend to the bends in the creek nearest to the revetment. Those bends are located about 250 feet upstream and 300 feet downstream of the project site. Therefore, the NMFS estimates that the action area for this consultation would be limited to the waters and substrates of Coal Creek within about 250 feet upstream, and 300 feet downstream of the of the proposed revetment.

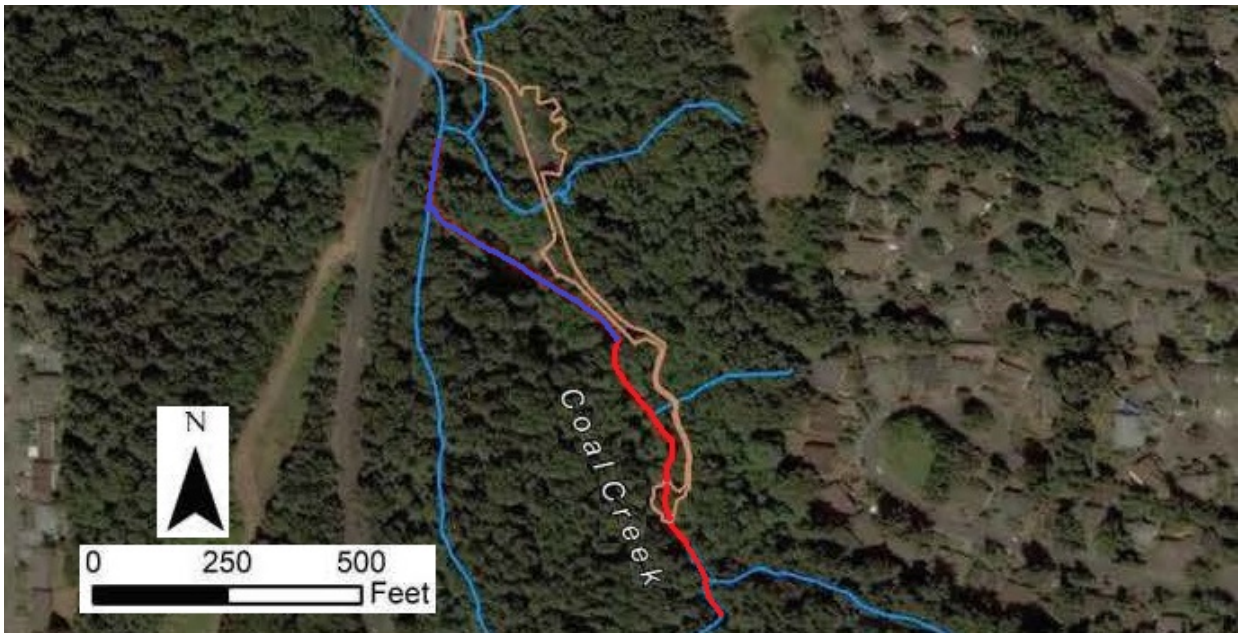

Figure 4. Google Earth photograph of Coal Creek with the aquatic action area shown in red, and the outline of the project area, including upland access and staging outlined in light brown (Adapted from King County 2020a, Figure 1).

The described area overlaps with the geographic ranges of the ESA-listed species identified in Table 1. The action area also overlaps with an area that has been designated, under the MSA, as EFH for Pacific Coast salmon.

2.4 Environmental Baseline

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

Environmental conditions at the project site and the surrounding area: The County's proposed construction site is on the left bank of Coal Creek in the City of Bellevue, Washington (Figure 1). The Coal Creek basin includes about 18.4 miles of open channel and drains about 3,978 acres. Coal Creek originates in Cougar Mountain Park and flows 7 miles to the East Channel of Lake Washington (Bellevue 2020).

The geography and ecosystems within the Lake Washington watershed, including the Coal Creek basin have been dramatically altered by human activity since Euro-American settlement began in the 1800s. Heavy timber harvests from the 1870s through the early twentieth century removed almost all of the area's forests. Development since then has converted most of the lowland areas to urban, agricultural, and industrial uses, and forestry and agricultural practices continue to impact the upper portions of the watershed (WRIA 8). Today, tree canopy accounts for about 59 percent of the land cover within the Coal Creek basin. Impervious surfaces account for about 21 percent. Tree canopy cover within the 100-foot stream buffer is 86 percent. Open space or parks accounts for about 41 percent of the land use within the basin. The remaining 59 percent consists of a mix of residences, roads, commercial and government offices, industrial facilities, and other miscellaneous users (Bellevue 2020). The creek reach within action area is located within the Coal Creek Natural Area, which includes wooded areas, open space, and trails. Sediment removal ponds and several access roads are also located within the natural area.

Urban land use within the basin has caused Coal Creek's hydrologic regime to become flashy, with increased peak flows, stream bank erosion, and streambed sedimentation (Kerwin 2001 in King County 2020a). The City of Bellevue has installed two sediment retention ponds in the creek to combat this issue, one of which is immediately adjacent to the action area. The sediment retention ponds collect larger sediments. However, the finer particles remain suspended and are carried downstream. The creek is also on Washington State Department of Ecology's (WDOE) 303(d) list for impaired dissolved oxygen and degraded benthic biologic integrity (Category 5). Other listings include mercury, temperature, and pH (Category 2), as well as selenium, copper, zinc, ammonia-N, arsenic, and bacteria (Category 1) (WDOE 2020).

The past and ongoing anthropogenic impacts described above have reduced Coal Creek's ability to support PS Chinook salmon. However, barriers to fish passage are limited a few man-made partial barriers, and the creek and its associated tributaries, including within the action area, are

all fish bearing or potentially fish bearing streams. In addition to Chinook salmon, coho and sockeye salmon, cutthroat trout, sculpin, lamprey, and largescale suckers have all been recently documented within the action area (Bellevue 2015; 2018). In addition to these species, steelhead have been previously documented in the creek (King County 2020a). Further, the action area continues to provide spawning, rearing and migratory habitat for PS Chinook salmon and other salmonid species.

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

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

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

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

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

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

2.5 Effects of the Action

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

As described in Section 1.3, the COE proposes to authorize King County to perform about 2 weeks of in-water work to install a temporary revetment to protect MH-25B along the left bank of Coal Creek (Figures 1 - 4). The work would include the in-creek and bank side use of mini excavators and track loaders between July 1 and August 30, 2020.

As described in Section 2.2, PS Chinook salmon inhabit the action area. The proposed timing of the work avoids the typical migration and spawning seasons for adult PS Chinook salmon, as well as the typical incubation, rearing, and out-migration seasons for eggs and juveniles. However, very low numbers of juvenile stream-type Chinook salmon that remain in the system year-round could be present. Therefore, the planned construction may cause direct effects on juvenile PS Chinook salmon through exposure to through fish salvage activities, construction-related noise, and water quality impacts. Construction may also cause indirect effects on adults and juveniles through impacts on riparian vegetation, and the new revetment would cause effects on adults and juveniles through structure-related impacts on hydrological and biological processes in the creek.

2.5.1 Effects on Listed Species

Fish Salvage

Exposure to fish salvage is likely to adversely affect juvenile PS Chinook salmon. Fish that are between the bypass barrier nets that would be installed upstream and downstream of the construction area would be exposed to removal by nets and to electrofishing if they are not readily spotted and removed.

Handling and transfer processes can cause physical trauma and physiological stress responses in exposed fish (Moberg 2000; Shreck 2000). Contact with nets can cause scale and skin damage, and overcrowding of small fish in traps can cause stress and injury. The primary contributing factors to stress and mortality from handling are: (1) Difference in water temperatures between the creek and the holding buckets; (2) dissolved oxygen levels; (3) the amount of time that fish are held out of the water; and (4) physical trauma. Stress from handling increases rapidly if water temperature exceeds 18ºC (64ºF), or if dissolved oxygen is below saturation.

Electrofishing and capture can cause stress, physical trauma, and mortality in exposed fish. Dalbey et al. (1996), Emery (1984), and Snyder (2003) describe responses that range from muscular contractions to mortality from exposure to electrofishing. Depending on the pulse train used, and the intensity and duration of exposure, muscular contractions may cause a lactic acid load and oxygen debt in muscle tissues (Emery 1984), it can cause internal hemorrhage and spinal fractures in 12 to 54% of the exposed fish, and acute mortality in about 2% (Dalbey et al. 1996). Severe interruption of motor function can stop respiration, and combinations of lactic acid load and oxygen debt may be irreversible, causing delayed mortality in apparently healthy fish. Obvious physical injuries often lead to reduced long-term growth and survival, whereas uninjured to slightly injured fish showed long-term growth and survival rates similar to unexposed fish of similar age (Dalbey et al. 1996).

Based on the timing and location of the work, very few juvenile Chinook salmon are expected to be present within the action area during the proposed work period (Bellevue 2015). However, because low numbers of juveniles are known to remain in the watershed year-round, the County and the NMFS believe that some juveniles could be present during the proposed construction.

We lack sufficient site-specific information to accurately estimate the numbers of individuals that could be exposed to fish salvage. Therefore, the County and the NMFS have based their estimate on the information presented in a 2013 biological opinion completed for restoration activities in the Pacific Northwest Region (NMFS 2013). Based on the best available information for the region, that opinion estimated that projects that included fish salvage captured an average of 132 ESA-listed salmon and steelhead per project, and that up to 5% of the captured fish are seriously injured or killed by the activity.

The PS Chinook salmon populations within the Lake Washington watershed are very small. Also, the July 1 to August 30, 2020 in-water work window for the project is well outside of the expected presence of adults and ocean-type juveniles in the creek. Therefore, it is extremely likely that the estimated regional average far exceeds any reasonable expectations for the number

of juvenile Chinook salmon that may be captured during this project's fish salvage activities. Based on the available information, and on the need to avoid underestimating the potential take for this activity, the County and the NMFS estimate that the total number of captured juvenile Chinook salmon would not exceed 10 individuals (King County 2020c), and that no more than 1 of those individuals would be seriously injured or killed. The remaining fish would likely experience sub-lethal effects that are unlikely to affect their fitness or survival. Because the fish that may be injured or killed by this stressor would comprise such a small subset of its cohort, its potential loss would cause no detectable population-level effects.

Construction-related Noise

Exposure to construction-related noise is likely to adversely affect juvenile PS Chinook salmon. Elevated in-water noise at levels capable of causing detectable effects in exposed fish would be caused by the in-water excavation and installation of rip rap.

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

The NMFS uses two metrics to estimate the onset of injury for fish exposed to high intensity impulsive sounds. The metrics are based on exposure to peak sound level and sound exposure level (SEL), respectively. Both are expressed in decibels (dB). The metrics are: 1) exposure to 206 dB_{peak}; and 2) exposure to 187 dB SEL_{cum} for fish 2 grams or larger, or 183 dB SEL_{cum} for fish under 2 grams. Any received level (RL) below 150 dB_{SEL} is considered "Effective Quiet". The distance from a source where the RL drops to 150 dB_{SEL} is considered the maximum distance from that source where fishes can be affected by the noise, regardless of accumulation of the sound energy (Stadler and Woodbury 2009). Therefore, when there is a difference between the ranges to the isopleths for effective quiet and SEL_{cum}, the shorter range shall apply. The discussion in Stadler and Woodbury (2009) makes it clear that the thresholds likely overestimate the potential effects of exposure to impulsive sounds.

The estimated in-water source levels (SL, sound level at 1 meter from the source) used in this assessment are based on the best available information, as described in a recent consultation for a similar project (NMFS 2018), and in other sources (Dickerson et al. 2001; Reine et al. 2012 & 2014; Richardson et al. 1995). The best available information supports the understanding that the

loudest construction related noise source would be excavation and installation of rock rip rap that could cause in-water noise levels up to about 194 dB_{peak} (below the 206 dB_{peak} threshold for the onset of instantaneous injury in fish) and 169 dB_{SEL}.

It is impossible to estimate the number of impulsive events that may occur from a workday's worth of excavation and rip rap installation, but the number is likely to be enormous. Therefore, the SEL_{cum} threshold would likely exceed that of effective quiet. If not, the use of effective quiet would over-estimate the area of effect. Therefore, use of effective quiet would be conservative to estimate the range of acoustic effects for this project.

In the absence of location-specific transmission loss data, variations of the equation RL = SL – #Log(R) are often used to estimate the received sound level at a given range from a source (RL = received level (dB); SL = source level (dB, 1 m from the source); # = spreading loss coefficient; and R = range in meters (m). Acoustic measurements in shallow water environments support the use of a value close to 15 for projects like this one (CalTrans 2015). This value is considered the practical spreading loss coefficient.

Application of the practical spreading loss equation to the expected SL suggests that noise levels above the 150 dB_{SEL} threshold could extend to about 62 feet (19 m) around the excavation and rock installation work. Individuals that are beyond the 150 dB_{SEL} isopleth would be unaffected by the noise. However, fish within the 150 dB_{SEL} isopleth are likely to hear and respond to the noise.

The juvenile Chinook salmon that are within about 62 feet of the project site are likely to experience behavioral disturbance, such as acoustic masking, startle responses, altered swimming patterns, avoidance, and increased risk of predation. Individuals that remain within 61 feet of work long enough to accumulate sound energy in excess of the 183/187 dB SEL_{cum} may also experience some level of auditory- and non-auditory tissue injury, which could reduce their likelihood of survival. The number of individuals that may be impacted by this stressor is unquantifiable with any degree of certainty. However, based on the timing and short duration of the project, it is expected to extremely low, such that the exposed fish would comprise such a small subset of their cohort that their loss would cause no detectable population-level effects.

Construction-related Water Quality Impacts:

Exposure to construction-related degraded quality would cause minor effects in PS Chinook salmon. Water quality would be temporarily affected by increased turbidity that may also reduce dissolved oxygen (DO) levels. It may also be affected by the introduction of toxic materials.

Turbidity: Installation and removal of the stream bypass would briefly mobilize small amounts of streambed sediments. Revetment construction would loosen a large amount of streambank and streambed sediments, and runoff from the construction area could transport sediments to the creek.

The intensity of turbidity is typically measured in Nephlometric Turbidity Units (NTU), which describes the opacity caused by the suspended sediments. Whereas, total suspended sediments

(TSS) concentrations are typically measured in milligrams per liter (mg/L). A strong positive correlation exists between turbidity and the concentration of TSS (mg/L). Depending on the particle sizes, NTU values roughly equate to the same number of mg/L for TSS concentration (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 can be easily compared.

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

During construction, the work area would be dewatered by the stream bypass and pumps as needed to prevent its exposure to flowing water, and most upland erosion-mobilized sediments would be contained within upland sediment barriers. Upon completion of work, the vast majority of disturbed streambank and streambed fine sediments would be covered by layers of rip rap and streambed gravels and cobbles that would be about two feet thick and greatly diminish its exposure to moving water after the bypass is removed. Further, the County's turbidity monitoring plan requires that turbidity be limited to 5 NTU over background levels of 50 NTU or less, or 10% over background levels of turbidity levels above 50 NTU, with a maximum point of compliance 300 feet downstream for stream flow above 100 cubic feet per second (King County 2020d).

Based on the available information, project-related turbidity in the creek would consist of TSS concentrations well below those described by Berg and Northcote (1985) and Robertson et al. (2006), and would be largely undetectable beyond 300 feet downstream of the project site, and last no more than one or two hours after work stops each day (Bloch 2010). If any PS Chinook salmon be exposed to project-related turbidity, the duration of their exposure would likely be measured in minutes, and the plume concentrations would most likely be too low to cause more than temporary, non-injurious behavioral effects such as avoidance of the plume and mild gill flaring. None of the potential responses, individually, or in combination would affect the fitness of exposed fish nor meaningfully affect their normal behaviors. Further, the timing of the work would prevent exposure of eggs and interstitial juveniles to the effects of sedimentation, and the TSS concentrations would be too low to measurably increase substrate embeddedness that could affect future spawning.

Dissolved Oxygen (DO): Mobilization of anaerobic sediments can decrease dissolved oxygen (DO) levels (Hicks *et al*., 1991; Morton 1976). The impact on DO is a function of the oxygen demand of anaerobic sediments that may be present, the amount of material suspended in the water, the duration of suspension, and the water temperature (Lunz and LaSalle 1986; Lunz *et al*. 1988). Impacts tend to be more severe lower in the water column (LaSalle 1988). Avoidance of water with DO levels below 5.5 mg/l has been observed in salmon (Hicks 1999). Avoidance could drive fish from preferred forage areas or from shelter and thereby increase the risk of

predation. Reduced DO can also affect swimming performance in salmonids (Bjornn and Reiser 1991), which may reduce an affected fish's ability to forage and to escape predation.
As described above, very little of the suspended sediment would be mobilized in the creek. Further, it is very unlikely that the mobilized sediments would be anaerobic, and the well-oxygenated water in the stream flow beyond the bypass would quickly dilute the small volumes of affected water. This suggests that potential DO reductions would be extremely unlikely to cause detectable effects on the fitness or normal behaviors in fish that may be exposed to the affected water.

Toxic Materials: Construction related spills and discharges may introduce toxic materials to the water. PS Chinook salmon and other 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).

Some of the petroleum-based fuels, lubricants, and other fluids used by construction-related equipment contain Polycyclic Aromatic Hydrocarbons (PAHs). Sediment contaminants can include metals, pesticides, PAHs, Polychlorinated Biphenyls (PCBs), phlalates, and other organic compounds. Depending on the pollutant, its concentration, and/or the duration of exposure, exposed fish may experience effects that can range from avoidance of an affected area, to reduced growth, altered immune function, and mortality (Brette *et al*. 2014; Feist *et al*. 2011; Gobel *et al*. 2007; Incardona *et al*. 2004, 2005, and 2006; Mcintyre *et al*. 2012; Meadore *et al*. 2006; Sandahl *et al*. 2007; Spromberg *et al*. 2015).

The project includes a comprehensive suite of BMPs to reduce the risk and intensity of construction-related discharges. In the unlikely event of a spill or discharge, the amount of material released would likely be very small, and it would be quickly contained and cleaned up. Also, non-toxic and/or biodegradable lubricants and fluids are strongly encouraged by the State, and are commonly used by many of the local contractors. Therefore, the in-water presence of construction-related contaminants would be very infrequent, very short-lived, and at concentrations too low to cause detectable effects on fitness or normal behaviors in exposed fish.

Construction-related Reduced Riparian Vegetation:

Construction related removal of riparian vegetation would cause minor effects in PS Chinook salmon and PS steelhead. The project would require the removal of about 1,838 square feet (0.04 acre) of wetland and riparian buffer vegetation at the project site. The affected area would be about 80 feet long on the west bank, and 40 feet long on the east bank (Figure 2), and would be replanted with native vegetation virtually identical to the vegetation that would be removed. However, it will take several years to decades before the replacement vegetation would provide ecological functions equitable to pre-construction levels.

Reduced riparian vegetation can alter in-stream chemical and biological functions. Chemical processes involve inputs of thermal energy and organic matter, as well as linkages to terrestrial food webs, the retention and export of nutrients and nutrient cycling in the aquatic food web, and gas exchange (Beechie *et al*. 2010). Biological processes include aquatic and riparian plant and

animal growth, and community development and succession, which establish the biodiversity and influence the life histories of aquatic and riparian organisms (Harman *et al*. 2012). Removal of riparian vegetation from the project area would slightly increase summer-time insolation of Coal Creek. The temperature increases are not predictable with any degree of certainty, but the very small size of the affected area suggests that they would likely be very small, and the continuous flows from the upstream reaches of the creek's watershed that are largely shaded by riparian forest canopy suggests that any project-related temperature increases would quickly become undetectable due to mixing. Additionally, project-related increased insolation would diminish over time as the planted replacement vegetation matures. Based on the best available information, project-related temperature increases would be too small to cause detectable effects on the fitness or normal behaviors for any life stage of Chinook salmon in the action area.

Removal of streambank vegetation also reduces the input of terrestrial-origin insects, leaf litter, and woody debris to streams. Terrestrial insects that fall into streams are a forage resource for salmonids, and in-stream vegetative matter often provides cover. Terrestrial organic matter is also important to nutrient cycling in aquatic food webs that support aquatic algae and invertebrates that are important resources for juvenile salmonids. Removal of riparian vegetation at the site would slightly reduce the input of terrestrial-origin organic matter until the riparian vegetation returns to pre-construction levels of maturity. Due to the very small size of the affected area, the huge input of terrestrial material in the adjacent stream reaches, and the diluting effects of flowing water, the impacts on aquatic food webs attributable to the project would likely be too small to cause detectable effects on the fitness or normal behaviors for any life stage of Chinook salmon in the action area.

Structure-related Impacts:

The new revetment would cause or maintain habitat conditions that are likely to cause indirect adverse effects on PS Chinook salmon through alteration of hydrological and biological processes.

Riverine habitats are the product of physical, chemical, and biological processes that interact together to form and maintain the streams (Fischenich 2003). Physical processes involve the interaction of hydrological forces with the substrate and objects in the streambed that drive geomorphic adjustments in the channel, floodplain, and riparian habitats. Chemical processes involve inputs of organic matter, retention and export of nutrients and thermal energy, nutrient cycling in the aquatic food web, linkages to terrestrial food webs, and gas exchange (Beechie *et al*. 2010). Biological processes include aquatic and riparian plant and animal growth, and community development and succession, which establish the biodiversity and influence the life histories of aquatic and riparian organisms (Harman *et al*. 2012).

Hydrological Impacts: Under natural conditions, the physical shape and structure of a channel is ever-evolving in response to the interaction between the native substrate, the volume and velocity of water flow, sediment loads, and the availability of large wood. Changes in any of these can alter erosion and deposition rates that drive geomorphic adjustments that can change the channel alignment and depth, as well as drive side channel formation or abandonment. It can

also alter the exposed substrate (rock, gravel, sand, or mud bottoms), and cause changes in the presence of large wood.

By design, bank stabilization structures replace dynamic natural processes with a set of semi-permanent conditions that prevent natural channel migration past the structure and alter fundamental channel and aquatic habitat formation processes (Cramer 2012). Revetments redirect water flows, which often increase erosion upstream and/or downstream of the revetment.

Water flows often continue to cut into the revetments themselves, so most revetments require periodic maintenance and repair to prevent bank failure. The process often leads to an ever-steepening bank, and a simplified aquatic habitat with reductions in velocity diversity, depth diversity, substrate diversity, large wood recruitment and retention, stream bank roughness, and edge habitat features such as undercut banks and alcove habitats (Fischenich 2003; Pracheil 2010). Altered flows may also cause unexpected changes in the physical processes upstream and downstream from the structure that alter sediment recruitment and transport in the streambed, and may discourage the formation of complex off-channel habitats within the affected stream reaches. Also, because revetments are intended to prevent bank failure, it is doubtful that the affected banks would ever again contribute to large wood to their rivers, which would impact natural streambed and bank formation processes.

Due to the complex relationships between the processes that are involved, it is virtually impossible to predict and quantify the exact effects the proposed revetment would have on stream hydrology, geomorphology, and habitat forming processes. The new revetment would include 4 bendway weirs made of 2-man sized river boulders that would extend into the creek along the base of an 80-foot long rip rap structure, with a layer of streambed gravel and cobble installed over the face of the rip rap. The bendway weirs are expected to reduce flow velocities along the west bank and may allow for some natural processes to occur, such as the accumulation of sediments along the length of the revetment.

However, the new revetment would prevent channel migration at the site for up to 10 years. During that time, the revetment is also likely to alter erosion, sediment transport and deposition, and movement of LWD that may not have occurred in its absence. The affected processes may alter or discourage the formation of spawning habitats and complex off-channel habitats within the affected stream reach, which could reduce the reach's ability to support salmonid spawning and rearing.

Given the small size of the revetment, its influence on channel dynamics and channel forming processes is expected to be relatively small. Therefore, the resulting negative effects on habitat forming processes is also expected to be relatively small, and the revetments' influence on those processes will likely decrease with distance from the sites and with increasing size of flood events. The best available information suggests that revetment-related impacts would be limited to the stream reach within the nearest bends in the creek (estimated at about 250 feet upstream and 300 feet downstream of the site based on satellite imagery). However, over the life of the structure low numbers of PS Chinook salmon are likely to be adversely affected by the altered conditions, as described in more detail below.

Biological Impacts: The exact impacts the revetment would have on in-stream chemical and biological processes are uncertain, but likely include increased water temperatures, reduced input of terrestrial-origin organic material, simplified aquatic habitat, and increased exposure to predators.

Separate from the construction-related removal of riparian vegetation discussed earlier, the revetment itself would greatly limit or prevent the growth of streambank vegetation along its length. However, the small size of the revetment, the sites' location relative to the surrounding landscape and riparian vegetation, and the relatively high rates of water exchange past the affected area, support an understanding that the impacts on water temperatures and input of terrestrial-origin organic material that would be caused by the absence of vegetation within the revetment's footprint would be too small to cause detectable effects on individual PS Chinook salmon within the action area.

As stated above, the revetment would alter habitat conditions within 250 feet upstream and 300 feet downstream of its location. Juvenile salmonids tend to aggregate more densely in edge habitats than in the center of rivers where adult salmonids occur in greater numbers (Washington Trout 2006). They also rely on off-channel habitats for rearing and refugia during high flow events. Studies also show that juvenile salmonids tend to select natural banks over hardened ones, and that the habitat provided by armored banks is typically degraded as compared to natural banks. Juvenile Chinook salmon are consistently more abundant along natural banks with wood, cobble, boulder, aquatic plants, and/or undercut bank cover compared than they are along rip rap banks (Beamer and Henderson 1998; Peters *et al.* 1998). In a study of 667 bank stabilization structures of various designs in Washington State, fish densities were generally positively correlated with increased amounts of large woody debris and overhead vegetation within 30 cm of the water surface. Fish densities under those conditions were also consistently higher than those at the control sites. Conversely, fish densities at sites that were stabilized by rip rap alone were consistently lower than at control sites (Peters *et al.* 1998). Based on these studies, it is likely that some rearing and migrating juvenile Chinook salmonid will selectively avoid the habitat along the revetment in favor of more suitable habitat.

Displaced individuals may experience decreased fitness from increased competition, which may reduce their likelihood of survival. Juveniles that remain in the simplified habitat adjacent to the revetment may also experience decreased fitness and reduced likelihood of survival, due to the suboptimal forage resources are likely to exist there, and from the increased energetic costs that are caused by foraging in the deepened water that would be caused by the revetment's relatively steep face (Heerhartz and Toft 2015). The intensity of effect that any individual may experience due to exposure to altered habitat conditions at the project site is uncertain, but over the life of the revetment, low numbers of juvenile PS Chinook salmon are likely to experience reduced fitness and/or altered normal behaviors due to the conditions that would be caused by the revetment.

The armored banks may also increase juvenile salmonids' exposure to predation. The bankside habitat that is created by a rip rap revetment is often preferred by predatory species such as sculpins and trout. Sculpins are highly sedentary benthic fish that prey on salmonid eggs and juveniles. They prefer fast flowing, well oxygenated water, and unembedded rock and cobble

substrate provide nesting cavities (Edwards and Cunjak 2007). Trout larger than 200mm were found at greater densities along rip rap than along natural banks (Peters *et al.* 1998), suggesting possible increased levels of trout predation on juvenile salmonids near rip rap. Further, armoring typically steepens banks, which places juvenile salmon in deeper waters where predators are more able to swim. Willette (2001) found that piscivorous predation of juvenile salmon increased fivefold when the juvenile salmon were forced to leave shallow nearshore habitats. Although this study was done in marine waters, it is reasonable to expect that a similar increase in predation would occur in freshwater systems under similar conditions. Although the proposed outer layer of stream cobbles and gravel would reduce the predator-supportive effects of rip rap, low numbers of juvenile PS Chinook salmon are likely to experience reduced fitness and mortality due to increased exposure to predators along the revetment.

The number of individuals that may be adversely affected by structure-related impacts is unquantifiable with any degree of certainty. However, based on the design and small size of the planned revetment, the numbers of juvenile Chinook salmon that would be annually exposed to structure-related impacts would comprise such small subsets of their respective cohorts, that their loss would cause no detectable population-level effects.

2.6 Cumulative Effects

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

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

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

The NMFS is unaware of any specific future non-federal activities that are reasonably certain to affect the action area. However, the NMFS is reasonably certain that future non-federal actions such as the previously mentioned activities are all likely to continue and increase in the future as the human population continues to grow across the region. Continued habitat loss and

degradation of water quality from development and chronic low-level inputs of non-point source pollutants will likely continue into the future. Recreational and commercial use of the waters within the action area is also likely to increase as the human population grows.
The intensity of these influences depends on many social and economic factors, and therefore is difficult to predict. Further, the adoption of more environmentally acceptable practices and standards may gradually reduce some negative environmental impacts over time. Interest in restoration activities has increased as environmental awareness rises among the public. State, tribal, and local governments have developed plans and initiatives to benefit ESA-listed PS Chinook salmon within the watersheds that flow into the action area. However, the implementation of plans, initiatives, and specific restoration projects are often subject to political, legislative, and fiscal challenges that increase the uncertainty of their success.

2.7 Integration and Synthesis

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

As described in more detail above at Section 2.4, climate change is likely to increasingly affect the abundance and distribution of the ESA-listed species considered in the Opinion. 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 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 through synergistic interactions with the impacts of climate change are expected.

2.7.1 ESA-listed Species

PS Chinook salmon are listed as threatened, based on declines from historic levels of abundance and productivity, loss of spatial structure and diversity, and an array of limiting factors as a baseline habitat condition. This species will be affected over time by cumulative effects, some positive – as recovery plan implementation and regulatory revisions increase habitat protections and restoration, and some negative – as climate change and unregulated or difficult to regulate

sources of environmental degradation persist or increase. Overall, to the degree that habitat trends are negative, as described below, effects on viability parameters of each species are also likely to be negative. In this context we consider the effects of the proposed action's effect on individuals of the listed species at the population scale.

PS Chinook salmon

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

The PS Chinook salmon that occur in the action area likely consist of returning fall-run Chinook salmon that originated in Coal Creek and stray fall-run adults from the Cedar River and/or the North Lake Washington/Sammamish River populations. Abundance in the two defined populations is relatively low, with a total annual abundances fluctuating between less than 100 and about 2,500 individuals since 1965, and slightly negative average abundance trends.

The revetment construction site is located on the left bank of Coal Creek in the City of Bellevue, Washington. The environmental baseline within the action area has been degraded by the effects of nearby urbanization, agriculture, industry, and road building and maintenance.

Construction- and structure-related impacts are likely to cause a range of effects that both individually and collectively would cause altered behaviors and possible mortality in low numbers of juveniles. However, the annual numbers of individuals that are likely to be impacted by action-related stressors would be extremely low.

Based on the best available information, the scale of the direct and indirect effects of the proposed action, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause detectable effects on any of the characteristics of a viable 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.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species, 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.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt

to engage in any such conduct. “Harm” is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this incidental take statement (ITS).

2.9.1 Amount or Extent of Take

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

Harm of Puget Sound Chinook salmon from:

- Exposure to fish salvage,
- Exposure to construction-related noise, and
- Exposure to structure-related impacts.

The NMFS expects that a maximum of 10 juvenile Chinook salmon may be captured during fish salvage activities, with up to 1 of those fish being seriously injured or killed.

The NMFS cannot predict with meaningful accuracy the number of PS Chinook salmon that are reasonably certain to be injured or killed by exposure to construction-related noise or to structure-related impacts. The distribution and abundance of the fish that occur within an action area are affected by habitat quality, competition, predation, and the interaction of processes that influence genetic, population, and environmental characteristics. These biotic and environmental processes interact in ways that may be random or directional, and may operate across far broader temporal and spatial scales than are affected by the proposed action. Thus, the distribution and abundance of fish within the action area cannot be attributed entirely to habitat conditions, nor can the NMFS precisely predict the number of fish that are reasonably certain to be injured or killed if their habitat is modified or degraded by the proposed action. Additionally, the NMFS knows of no device or practicable technique that would yield reliable counts of individuals that may experience these impacts.

In such circumstances, the NMFS uses the causal link established between the activity and the likely extent and duration of changes in habitat conditions to describe the extent of take as a numerical level of habitat disturbance. The most appropriate surrogates for take are action-related parameters that are directly related to the magnitude of the expected take.

For this action, construction methodology, timing, and duration are the best available surrogates for the extent of take of PS Chinook salmon from exposure to construction-related noise, despite the low density and random distribution of these fish in the action area. Construction methodology is appropriate because performing more intense construction methods or omission

of the described conservation measures and BMPs would likely increase the size of the action area, which in turn would increase the number of exposed individuals. It would also likely increase the intensity of effect caused by exposure to the work. The planned work window is appropriate because it was selected to reduce the potential for salmonid presence at the project site. Starting work later and/or working longer would increase the number of fish likely to be exposed to project-related stressors.

The size and design of the revetment is the best available surrogate for the extent of take of PS Chinook salmon from exposure to structure-related impacts because fitness impacts would be positively correlated with the amount of degraded aquatic habitat and with the intensity of the degradation. As the size of impacted habitat increases, the number of fish that are likely to be exposed would increase as would the duration of their exposure. As the revetment's divergence from similarity to a natural streambank increases, so too would the intensity of its impacts on fish fitness increase through its impacts on natural hydrological and biological processes in the stream.

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

- A total of 10 juvenile PS Chinook salmon captured, with a maximum of 1 seriously injured or killed during fish salvage;
- Two weeks of in-stream and bank-side work to be completed by August 30, 2020; and
- The size and configuration of the revetment, the construction methodology, and the conservation measures and BMPs as described in the proposed action section of this biological opinion.

Exceedance of any of these exposure limits 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 still function as effective reinitiation triggers because the Corps has authority to conduct compliance inspections and to take actions to address non-compliance (33 CFR 326.4).

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

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

The COE shall require the County to:

1. Minimize incidental take of PS Chinook salmon from fish salvage.

2. Minimize incidental take of PS Chinook salmon from construction-related noise.

3. Minimize incidental take of PS Chinook salmon from structure-related impacts.

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

2.9.4 Terms and Conditions

The terms and conditions described below are non-discretionary, and the COE or any applicant must comply with them in order to implement the RPMs (50 CFR 402.14). The COE or any applicant has a continuing duty to monitor the impacts of incidental take and must report the progress of the action and its impact on the species as specified in this ITS (50 CFR 402.14). If the entity to whom a term and condition is directed does not comply with the following terms and conditions, protective coverage for the proposed action would likely lapse.

1. To implement RPM Number 1, Minimize incidental take of PS Chinook salmon from exposure to fish salvage, the COE shall require the County to require their contractors to:
   a. Comply with the Fish Exclusion Protocols identified in the proposed action section of this opinion (USFWS 2012; WSDOT 2016).

2. To implement RPM Number 2, Minimize incidental take of PS Chinook salmon from construction-related noise, the COE shall require the County to comply with the construction methodology, timing, and duration as described in the proposed action section of this opinion, including:
   a. In-stream and bankside motorized equipment shall be limited to mini excavators and track loaders less than 4 feet wide;
   b. Revetment construction would only occur in-the-dry after installation of a temporary stream bypass;
   c. In-stream and bankside construction would be limited to 2 weeks of work that would be completed by August 30, 2020; and
   d. All work would be done in compliance with the protective measures and BMPs identified in the County's BE, and with the provisions of the WDFW HPA for this project.

3. To implement RPM Number 3, Minimize incidental take from structure-related impacts, the COE shall require the County to ensure that the size and configuration of the revetment comply with the design and dimensions described in the proposed action section of this opinion. In particular, the revetment shall:
   a. Not exceed 90 feet in length ("about 80 feet long");
   b. Not exceed a slope steepness of 1:1.5 (V:H);
   c. Incorporate 4 bendway weirs, each about 6 feet long by 2 feet wide and 2 feet high; and
   d. Incorporate a layer of stream gravel and cobble that is at least 10 inches thick over all rip rap.

4. To implement RPM Number 4, Implement monitoring and reporting to confirm that the take exemption for the proposed action is not exceeded, the COE shall require the County to develop and implement a plan to collect and report details about the take of listed fish. That plan shall:
    a. Require the contractor to maintain and submit fish salvage logs to verify that all take indicators are monitored and reported. Minimally, the logs should include:
        i. The identity (name, title, organization), qualification, and contact information of the persons conducting fish salvage, and the person completing the report;
        ii. The date, time, and air and water temperatures during salvage work;
        iii. The method(s) of capture and handling procedures that were used; and
        iv. The species and quantities of captured fish, and their disposition at release (i.e. alive with no apparent injuries, alive with apparent minor/serious injuries, dead with/without apparent injuries).
    b. Require the contractor to maintain and submit construction logs to verify construction methodology, timing, and duration, as well as the size and design of the revetment. Minimally, the logs should include:
        i. The dates and start and stop times for all work;
        ii. The locations and installation and removal dates of the barrier nets;
        iii. The linear extent and slope of the revetment;
        iv. Identification of the fill layers and materials that are installed; and
        v. Locations of photo points and direction of view for photographs.
    c. Require the contractor to maintain and submit construction photographs to verify the size and design of the revetment;
    d. Require the contractor to establish procedures for the submission of the construction logs, photographs, and other pertinent materials to the County; and
    e. Require the County to submit reports as needed to the appropriate COE office, and to submit an electronic post-construction report with the above information to NMFS within six months of project completion. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2020-01678 in the subject line.

2.10 Conservation Recommendations

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

1. The COE should require the use of non-toxic and/or biodegradable lubricants and fluids for all project related heavy equipment.

2.11 Reinitiation of Consultation

This concludes formal consultation for the U.S Army Corps of Engineers' authorization of King County's Coal Creek Trunk Maintenance Hole 25B Protection Project in Bellevue, King County, Washington.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

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

As described in Section 1.2 and below, the NMFS has concluded that the proposed action would be not likely to adversely affect PS steelhead. Detailed information about the biology, habitat, and conservation status and trends of PS steelhead 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, 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 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 2020d). Given the project location, 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 action is not likely to adversely affect PS steelhead.

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

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

This analysis is based, in part, on the EFH assessment provided by the COE and the descriptions of EFH for Pacific Coast Salmon contained in the fishery management plan developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce (PFMC 2014).

3.1 Essential Fish Habitat Affected by the Project

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

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

As part of Pacific Coast Salmon EFH, five Habitat Areas of Particular Concern (HAPCs) have been defined: 1) complex channels and floodplain habitats; 2) thermal refugia; 3) spawning habitat; 4) estuaries; and 5) marine and estuarine submerged aquatic vegetation. The action area within Coal Creek contains spawning habitat. The action area provides no other 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 as such is relevant to the assessment of effects on EFH. Based on the analysis of effects presented in Section 2.5 the proposed action will cause short- and long-term minor adverse effects, and long-term minor beneficial effects on EFH for Pacific Coast Salmon as summarized below.

1. Water quality: – The proposed action would cause a mix of short-term minor adverse effects and long-term minor beneficial effects on water quality. For up to 2 weeks, construction would slightly increase turbidity, and could introduce very low levels of pollutants that would affect water quality up to 300 feet downstream from the construction site. The new revetment would reduce ongoing bank erosion that would likely reduce downstream turbidity and sedimentation over its 10-year life.

2. Water quantity, depth, and velocity: – The proposed action would cause a mix of short-term and long-term minor adverse effects on water quantity, depth, and velocity. The stream bypass would dewater about 100 feet of the stream thalweg for up to 2 weeks. Post-construction, the new revetment would slightly alter the direction and velocity of water flow along its length, and may slightly alter erosion, sediment transport and deposition that could slightly alter water depths and velocities within the creek from about 250 feet upstream to about 300 feet downstream of the revetment.

3. Riparian-stream-marine energy exchanges: – The proposed action would cause long-term minor effects on energy exchanges. The new revetment would slightly alter the direction and velocity of the stream flow along its length, and may cause minor detectable effects from about 250 feet upstream to about 300 feet downstream of its location. It is uncertain if the effects would be wholly adverse or beneficial, or a mix both, but they are likely to be minor in either case.

4. Channel gradient and stability: – The proposed action could cause long-term minor effects on the stream channel gradient and stability. The revetment would prevent channel migration along its length, which may slightly alter erosion, sediment transport and deposition, and other channel forming processes from about 250 feet upstream to about 300 feet downstream of its location. It is uncertain if the effects would be wholly adverse or beneficial, or a mix both, but they are likely to be minor in either case.

5. Prey availability: – The proposed action would cause long-term minor adverse effects on prey availability. The project would remove riparian vegetation along 80 feet of the west bank and 40 feet along the east bank of the creek. The loss of that vegetation would slightly reduce the input of terrestrial-origin organic material to the creek until the area vegetation matures to current levels. Detectable effects are expected to be limited to the area within about 300 feet downstream of the project site.

6. Cover and habitat complexity: – The proposed action would cause long-term minor adverse effects on cover and habitat complexity. Over its 10-year life, the revetment would eliminate

overhanging bankside vegetation along its length, and the removal of riparian vegetation along 80 feet of the west bank and 40 feet along the east bank would slightly reduce in-stream branch and leaf litter until the area vegetation matures to current levels. This would slightly reduce the available cover for juvenile salmonids up to 300 feet downstream of the revetment. The revetment may also cause hydrological effects that could reduce the formation of complex in-channel habitat features from about 250 feet upstream to about 300 feet downstream of its location.

7. Space: – No changes expected.

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

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

10. Substrate composition: – The proposed action could cause long-term minor effects on substrate composition. The revetment would prevent channel migration along its length, which would reduce ongoing bank erosion that is likely to reduce downstream sedimentation of the substrate. However, it may also slightly alter erosion, sediment transport and deposition, and other channel forming processes from about 250 feet upstream to about 300 feet downstream of its location. It is uncertain if the effects of those altered processes would be wholly adverse or beneficial, or a mix both, but they are likely to be minor in either case.

3.3 Essential Fish Habitat Conservation Recommendations

The proposed action includes a comprehensive set of conservation measures and BMPs to reduce construction-related impacts on the quantity and quality of Pacific Coast salmon EFH. Also, the proposed revetment includes design features that were selected to maximize its ability to be installed before the upcoming flood season, while simultaneously minimizing construction and removal impacts, as well as structure-related impacts on listed species and EFH. With the exception of the following conservation recommendations to reduce impacts on water quality, NMFS knows of no other reasonable measures to further reduce the proposed action's effects on EFH for Pacific Coast Salmon.

Implementation of the following conservation recommendation would minimize the proposed action's adverse effects on the water quality component of Pacific Coast Salmon EFH.

1. The COE should require the use of non-toxic and/or biodegradable lubricants and fluids for all project related power equipment to be used.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the COE must provide a detailed written response in to the NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of the NMFS' EFH Conservation Recommendations unless the NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency

response. The response must include a description of measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with the NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects (50 CFR 600.920(k)(1)).

In response to increased oversight of overall EFH program effectiveness by the Office of Management and Budget, the NMFS established a quarterly reporting requirement to determine how many conservation recommendations are provided as part of each EFH consultation and how many are adopted by the action agency. Therefore, we ask that in your statutory reply to the EFH portion of this consultation, you clearly identify the number of conservation recommendations accepted.

3.5 Supplemental Consultation

The COE must reinitiate EFH consultation with NMFS if the proposed action is substantially revised in a way that may adversely affect EFH, or if new information becomes available that affects the basis for NMFS' EFH Conservation Recommendations (50 CFR 600.920(l)).

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

The Data Quality Act (DQA) specifies three components contributing to the quality of a document. They are utility, integrity, and objectivity. This section of the opinion addresses these DQA components, documents compliance with the DQA, and certifies that this opinion has undergone pre-dissemination review.

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this Opinion is the COE and King County. Other users could include WDFW, the government and citizens of the Cities of Bellevue, Renton, Kirkland, Kenmore, and Seattle, and Native American tribes. Individual copies of this Opinion were provided to the COE and King County. The document will be available within two weeks at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adheres to conventional standards for style.

4.2 Integrity

This consultation was completed on a computer system managed by NMFS in accordance with relevant information technology security policies and standards set out in Appendix III, 'Security of Automated Information Resources,' Office of Management and Budget Circular A-130; the Computer Security Act; and the Government Information Security Reform Act.

4.3 Objectivity

Information Product Category: Natural Resource Plan

Standards: This consultation and supporting documents are clear, concise, complete, and unbiased; and were developed using commonly accepted scientific research methods. They adhere to published standards including the NMFS ESA Consultation Handbook, ESA regulations, 50 CFR 402.01 et seq., and the MSA implementing regulations regarding EFH, 50 CFR 600.

Best Available Information: This consultation and supporting documents use the best available information, as referenced in the References section. The analyses in this opinion and EFH consultation contain more background on information sources and quality.

Referencing: All supporting materials, information, data and analyses are properly referenced, consistent with standard scientific referencing style.

Review Process: This consultation was drafted by NMFS staff with training in ESA and MSA implementation, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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