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

**Refer to NMFS No:**
**WCRO-2021-01875**

February 9, 2023

Science Kilner
Regional Environmental Officer
U.S. Department of Homeland Security Region X
130 228th Street, SW
Bothell, Washington 98021-9796

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the City of Anacortes' Wastewater Treatment Plant Outfall Relocation Project in Guemes Channel, Anacortes, Washington (FEMA No. DR-4359-WA, USACE No. NWS-2021-320, HUC: 171100020500 – Guemes Channel)

Dear Ms. Kilner:

Thank you for your letter of July 30, 2021, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the U.S. Department of Homeland Security's (USDHS) Federal Emergency Management Agency (FEMA) funding of the City of Anacortes's Wastewater Treatment Plant Outfall Relocation Project in Guemes Channel. The U.S. Army Corps of Engineers (USACE) also proposes to authorize this project under Section 10 of the Rivers and Harbors Act, and under Section 404 of the Clean Water Act. The FEMA is the lead action agency for this consultation. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)[16 U.S.C. 1855(b)] for this action.

The enclosed document contains the biological opinion (opinion) prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this opinion, the NMFS concludes that the proposed action would adversely affect but is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon, Puget sound/Georgia Basin (PS/GB) bocaccio, and PS/GB yelloweye rockfish. The NMFS also concludes that the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon, PS/GB bocaccio, and southern resident (SR) killer whales, but is not likely to result in the destruction or adverse modification of those designated critical habitats. This opinion also documents our conclusion that the proposed action may affect, but is not likely to adversely affect PS steelhead, southern eulachon, humpback whales of the Central America and Mexico Distinct Population Segments (DPSs), SR killer whales, and designated critical habitat for PS/GB yelloweye rockfish.

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 FEMA and the USACE must comply with to meet those measures. Incidental take from actions that meet these terms and conditions will be exempt from the ESA's prohibition against the take of listed species.

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 Marine EFH for Pacific Coast Salmon, as well as EFH for Pacific Coast Groundfish and Coastal Pelagic Species. Therefore, we have provided three conservation recommendations that can be taken by the applicant, the City of Anacortes, the FEMA, and the USACE, as appropriate, to avoid, minimize, or otherwise offset potential adverse effects on EFH. We also concluded that the action would not adversely affect EFH for Pacific Coast groundfish and coastal pelagic species. Therefore, consultation under the MSA is not required for EFH for Pacific Coast groundfish and coastal pelagic species.

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

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

Sincerely,

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

cc: Jeffrey Parr, FEMA
William Kerschke, FEMA
Kristin Murray, USACE
Todd Tillinger, USACE

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

City of Anacortes' Wastewater Treatment Plant Outfall Relocation Project
in Guemes Channel, Skagit County, Washington
(FEMA No. DR-4359-WA, USACE Number: NWS-2021-320)

**NMFS Consultation Number**: WCRO-2021-01875

**Action Agencies**: U.S. Federal Emergency Management Agency
U.S. Army Corps of Engineers

**Affected Species and NMFS' Determinations:**

| ESA-Listed Species | Status | Is Action Likely to Adversely Affect Species? | Is Action Likely To Jeopardize the Species? | Is Action Likely to Adversely Affect Critical Habitat? | Is Action Likely To Destroy or Adversely Modify Critical Habitat? |
|---|---|---|---|---|---|
| Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound (PS) | Threatened | Yes | No | Yes | No |
| Steelhead (*O. mykiss*) PS | Threatened | No | No | N/A | N/A |
| bocaccio (*Sebastes paucispinis*) Puget Sound /Georgia Basin (PS/GB) | Endangered | Yes | No | Yes | No |
| yelloweye rockfish (*S. ruberrimus*) PS/GB | Threatened | Yes | No | No | No |
| eulachon (*Thaleichthys pacificus*) Southern | Threatened | No | No | N/A | N/A |
| humpback whales (*Megaptera novaeanglia*) | | | | | |
| Central America | Endangered | No | No | N/A | N/A |
| Mexico | Threatened | No | No | N/A | N/A |
| killer whales (*Orcinus orca*) Southern resident (SR) | Endangered | No | No | Yes | No |

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

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

**Consultation Conducted By**: National Marine Fisheries Service, West Coast Region

**Issued By**:

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

**Date**: February 9, 2023

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## LIST OF ABBREIVIATIONS

ACEC – Acute Critical Effluent Concentration
ATC – Anthropogenic Trace Compounds
BA – Biological Assessment
BMP – Best Management Practices
CFR – Code of Federal Regulations
$CBOD_5$ – Carbanaceous Biochemical Oxygen Demand (5-day)
COC – Contaminants of Concern
dB – Decibel (common unit of measure for sound intensity)
DIP – Demographically Independent Population
DPS – Distinct Population Segment
DQA – Data Quality Act
EDC – Endocrine Disrupting Chemical
EF – Essential Feature
EFH – Essential Fish Habitat
ESA – Endangered Species Act
ESU – Evolutionarily Significant Unit
FR – Federal Register
FEMA – Federal Emergency Management Agency
FMP – Fishery Management Plan
HAPC – Habitat Area of Particular Concern
HDPE – High Density Polyethylene
HHCB – Hexahydrohexa methylcyclopentabenzopyran (synthetic musk used in cosmetics)
HUC – Hydrologic Unit Code
HPA – Hydraulic Project Approval
HTL – High Tide Line
ITS – Incidental Take Statement
JARPA – Joint Aquatic Resources Permit Application
MGD - Million Gallons per Day
MLLW – Mean Lower Low Water
MMMP – Marine Mammal Monitoring Plan
MPG – Major Population Group
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NMFS – National Marine Fisheries Service
NOAA – National Oceanic and Atmospheric Administration
NPDES – National Pollutant Discharge Elimination System
PAH – Polycyclic Aromatic Hydrocarbon
PBF – Physical or Biological Feature
PBDE – Polybrominated Diphenyl Ether
PBT – Persistent, Bioaccumulative and Toxic chemicals
PCB- Polychlorinated Biphenyl
PCE – Primary Constituent Element
PFAS – Perfluoroalkyl Substances
PFMC – Pacific Fishery Management Council
POP – Persistent Organic Pollutant

PPCP – Pharmaceuticals and Personal Care Products
PS – Puget Sound
PSP – Paralytic Shellfish Poisoning
PSTRT – Puget Sound Technical Recovery Team
PSSTRT – Puget Sound Steelhead Technical Recovery Team
RL – Received Level
RPA – Reasonable and Prudent Alternative
RPM – Reasonable and Prudent Measure
SAV – Submerged Aquatic Vegetation
SEL – Sound Exposure Level
SL – Source Level
SR – Southern Resident (Killer Whales)
TRC – Total Residual Chlorine
TSS – Total Suspended Solids
USACE – U.S. Army Corps of Engineers
USDHS – U.S. Department of Homeland Security
USEPA – U.S. Environment al Protection Agency
USGS – U.S. Geological Survey
VSP – Viable Salmonid Population
WCR – West Coast Region (NMFS)
WDFW – Washington State Department of Fish and Wildlife
WDOE – Washington State Department of Ecology
WWTP – Wastewater Treatment Plant

# 1. INTRODUCTION

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

## 1.1 Background

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

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

On July 5, 2022, the U.S. District Court for the Northern District of California issued an order vacating the 2019 regulations that were revised or added to 50 CFR part 402 in 2019 ("2019 Regulations," see 84 FR 44976, August 27, 2019) without making a finding on the merits. On September 21, 2022, the U.S. Court of Appeals for the Ninth Circuit granted a temporary stay of the district court's July 5 order. On November 14, 2022, the Northern District of California issued an order granting the government's request for voluntary remand without vacating the 2019 regulations. The District Court issued a slightly amended order two days later on November 16, 2022. As a result, the 2019 regulations remain in effect, and we are applying the 2019 regulations here. For purposes of this consultation and in an abundance of caution, we considered whether the substantive analysis and conclusions articulated in the biological opinion and incidental take statement would be any different under the pre-2019 regulations. We have determined that our analysis and conclusions would not be any different.

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 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 24, 2017, U.S. Army Corps of Engineers (USACE) requested informal consultation with the NMFS for the replacement of 320 feet of the existing outfall in its current location (NWS-2017-101). That consultation was completed on June 26, 2017 (NMFS Consultation Number WCR-2017-6781). A portion of the outfall was repaired under that consultation. However, additional damage occurred during a storm in 2020. The required repairs exceed those covered in the 2017 consultation, and the City of Anacortes has decided to replace the outfall along a new alignment because numerous obstacles above the existing pipe would make repairs cost prohibitive, and replacement of the outfall in its current location would significantly disrupt port operations.

On August 3, 2021, the NMFS received a letter from the U.S. Department of Homeland Security's (USDHS) Federal Emergency Management Agency (FEMA) requesting informal consultation for the FEMA's proposed funding to the City of Anacortes (the City) for their Wastewater Treatment Plant Outfall Relocation Project in Guemes Channel (FEMA 2021a). The request included the City's Biological Assessment (BA; Widener 2021a) and a link to the following five supplemental documents from the City:  A Mixing Zone Study (Cosmopolitan 2021); A Water Quality Monitoring and Protection Plan (WQMPP; Widener 2021b); A Pre and Post Outfall Construction Perimeter Sediment Monitoring Plan (DOF 2021a); A Dredging, Dewatering, and Backfill Plan (DDBP; DOF 2021b); and A Nearshore Sediment Characterization Report (DOF 2021c; Attachment 4 to DOF 2021b). The DDBP also included the following important attachments:  Contract Drawings (HDR 2021; Attachment 2); Final Remedial Investigation/Feasibility Study Work Plan (GeoEngineers 2015; Attachment 3); Geotechnical Engineering Services (GeoEngineers 2021; Attachment 5).

On December 15, 2021, the NMFS informed the FEMA by email that we believed that the proposed action is likely to adversely affect ESA-listed species and critical habitats. The FEMA told the NMFS to proceed with formal consultation the same day (FEMA 2021b). The NMFS considers that formal consultation was initiated for this action on December 15, 2021. On June 8, 2022, the NMFS requested additional information. Partial information was provided by the FEMA in two emails on June 9, 2022, and a third email on June 16, 2022 (FEMA 2022a - c). On June 10, 17, 21, and 24, 2022, the NMFS received emails from the City's agent to provide more information (Widener 2022a – d), including the City's Joint Aquatic Resources Permit Application (JARPA) Form (City of Anacortes 2021a), their Hydraulic Project Approval (HPA; WDFW 2021), and their Marine Mammal Monitoring Plan (MMMP) for this project (City of Anacortes 2021b).

Between July 6, 2022 and January 23, 2023, the NMFS received numerous emails from the City's agent to provide information and documents (Widener 2022g – r; 2023a - b). The information and documents of particular importance that were provided in the July emails included 3 MS Word documents, 1 Google Earth image (Widener 2022m - p), and the conceptual plan for a shoreline park (eccosDesign 2021); the project's MMMP (Widener 2022q); the current National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit for the Anacortes WWTP (WDOE 2017), the project's blasting plan (McMillen Jacobs 2022), the project's Puget Sound Nearshore Habitat Conservation Calculator (City of Anacortes 2022), and final edits concerning the proposed action description (Widener 2023b).

This opinion is based on the information in the emails and documents identified above; in the recovery plans, status reviews, and critical habitat designations for ESA-listed PS Chinook salmon and PS/GB bocaccio; in the published and unpublished scientific information on the biology and ecology of those species; and in 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). Under the MSA, federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded or undertaken by a federal agency (50 CFR 600.910).

The FEMA proposes to provide Public Assistance Program funding to the City of Anacortes (the City) under the Robert T. Stafford Disaster Relief and Emergency Assistance Act to install a new outfall for the City's wastewater treatment plant (WWTP) on T Ave between 4th & 6th Streets, in the City of Anacortes, Washington (Figures 1 and 2). The USACE also proposes to authorize this project under Section 10 of the Rivers and Harbors Act, and under Section 404 of the Clean Water Act. The FEMA is the lead action agency for this consultation.


**Figure 1.** Google Earth photograph of the approximate location of the City of Anacortes's replacement wastewater treatment plant outfall in Guemes Channel in Washington State's Puget Sound. Also visible is Rosario Strait to the west, and Padilla Bay to the east.

The new outfall would replace the existing outfall that was damaged during a 2020 Presidentially Declared Disaster storm event (DR-4539). The new pipeline would be installed east of the current pipeline because the City has determined that the conditions at the existing pipeline's location would make installation of the replacement pipeline in the same location impracticable.

The existing outfall would be decommissioned after this project is complete, and the City would later remove the in-water portion of the existing pipeline as a separate action (Widener 2022e). The removal of the existing pipeline is not considered a part of this action, and it isn't considered in this opinion.

The project would consist of in-water and upland work to install about 2,760 feet of high-density polyethylene (HDPE) pipe between the City's WWTP and the planned diffuser location about 1,097 feet north of the high tide line (HTL) into Guemes Channel (Figure 2). The project also includes the installation of a small shoreline park inland of the existing rip-rap armoring that would be transected by the new outfall pipe, as well as the purchase of 73 credits in an in-lieu fee program through the Puget Sound Partnership's Nearshore Conservation Credit Program, which was based on the NMFS Puget Sound Nearshore Habitat Conservation Calculator (City of Anacortes 2022 and 2023; Widener 2023a). Project work would most likely be completed over 2 calendar years, with in-water work to be completed during the first year, and upland work to be completed the following year. However, the two phases may be performed concurrently, or with some break between the phases if needed.

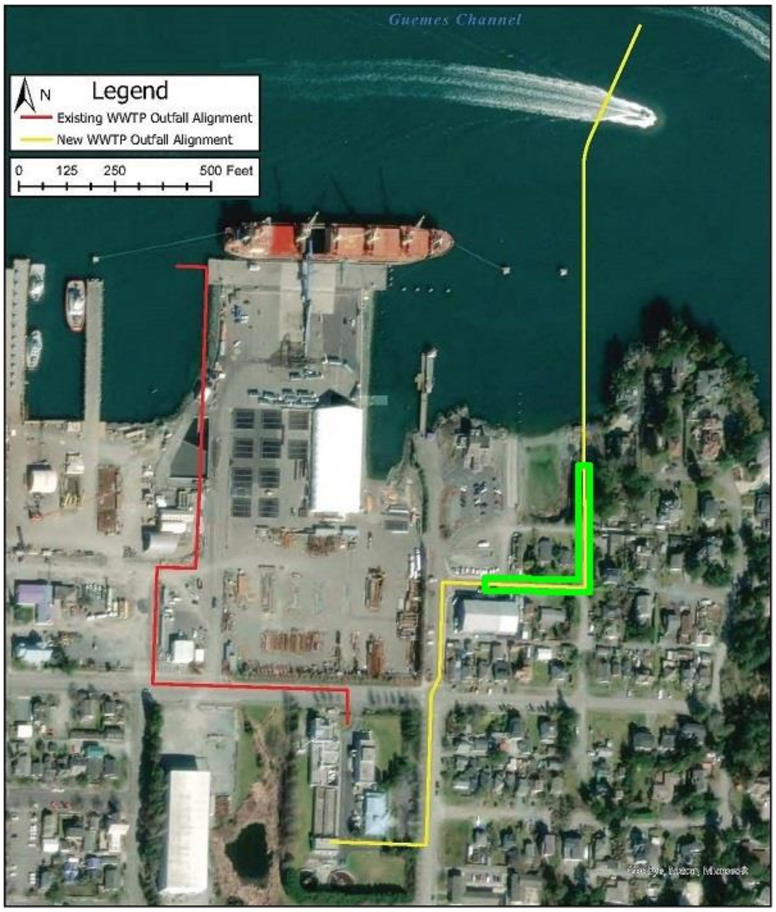


**Figure 2.** Overhead photograph of the project site on the northeast corner of Anacortes, Washington. The existing outfall route is shown in red the proposed new outfall route is shown in yellow (both extending from the City's wastewater treatment plant). The planned upland blasting area is outlined in bright green (Adapted from Figure 2 in Widener 2021a, and Figure 8 in McMillen Jacobs 2022).

The project's upland work would consist of a mix of excavation with some blasting, and trenchless technology (i.e. horizontal directional drilling, micro-tunneling, or similar techniques) to install about 1,667 feet of 48-inch diameter HDPE pipeline along the proposed upland route to a location about 60 feet inland of the shoreline where it would be joined to the marine portion of the pipeline (Figures 2 and 3). The City would also create a small shoreline park inland of the existing rip-rap armoring where the new outfall pipe would cross the shoreline. As part of that work, the construction crew would remove about 3,780 square feet of existing pavement, remove invasive vegetation, and install about 5,000 square feet of vegetation to include at least 10 native trees, and 200 native shrubs (Widener 2022r).

The available information about the proposed upland work, including its location and the planned protective measures and best management practices (BMPs) support the expectation that, with the exception of blasting that would be done along portions of 3rd Street and U Avenue, the upland work would cause no detectable effects on the marine environment. Therefore, the rest of this project description focuses on the installation of the marine portion of the pipeline and on the upland blasting.

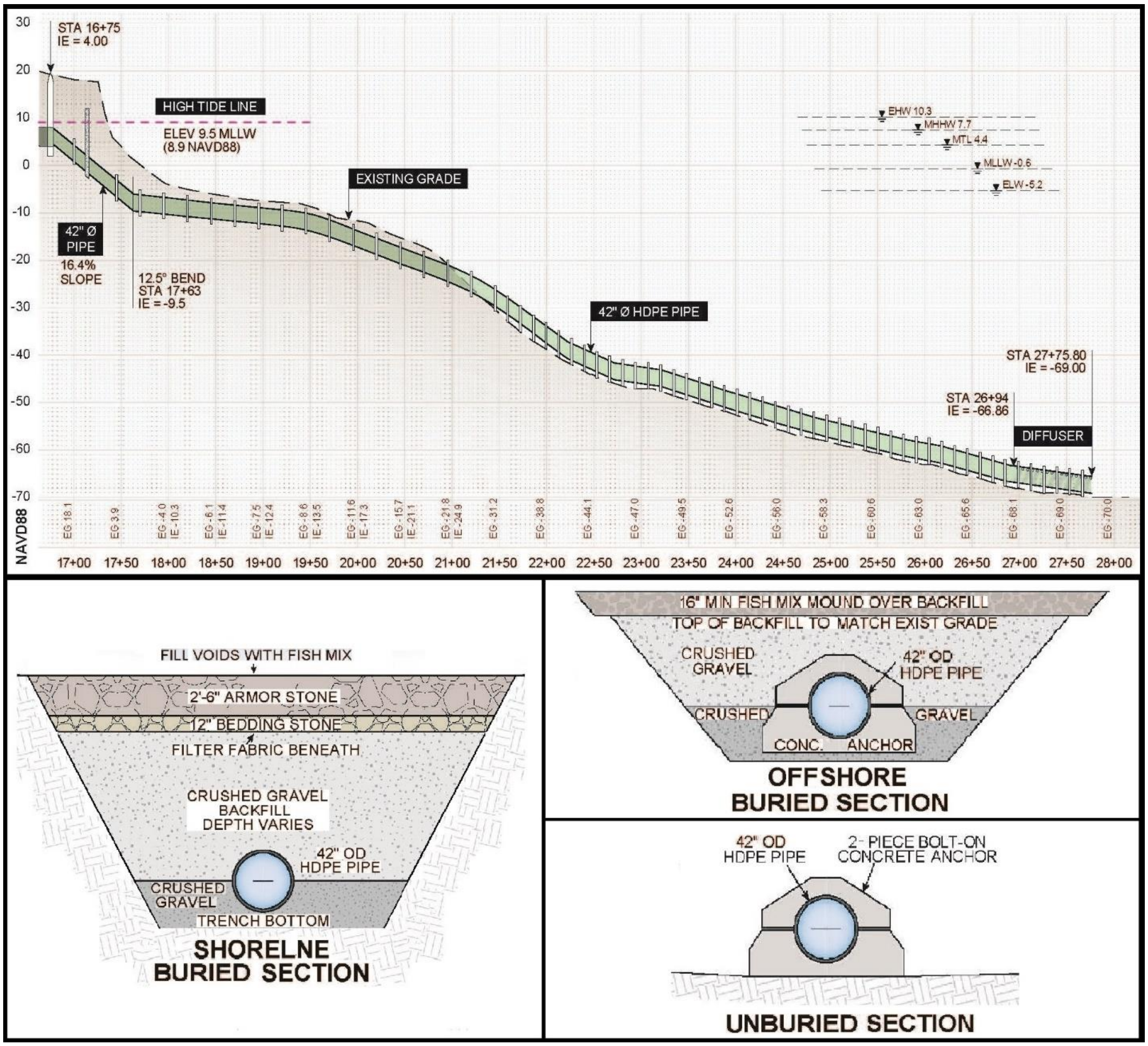


**Figure 3.** Profile and in-line drawings of the marine portion of the proposed pipeline showing the bathymetry, the approximate spacing of the concrete anchors, and the cross-sections of the buried and exposed pipeline sections (Adapted from Sheet 4 -6 of 6 in Widener 2021a).

The marine portion of the project would require up to 5 and a half months of work to complete, and would include up to 14 weeks of in-water work (Widener 2022e). In-water work would be completed within the August 1 to February 15 in-water work window for the area. To further reduce impacts on natural resources, the construction crews would be required to comply with all BMPs and protective measures identified in the BA, and with the provisions of the HPA for this project. Additionally, trenching seaward of the HTL would comply with the dredge and sediment control methods described in the WQMPP (Widener 2021b) approved by the Washington State Department of Ecology (WDOE). A floating turbidity curtain would be installed around the in-water trenching within about 310 feet of the HTL (Widener 2022f). However, due to numerous site-specific considerations, including the water depths and currents in the area, full containment systems such as full-depth sediment curtains and cofferdams have been deemed impracticable and or potentially more environmentally damaging than working without them would be. Based on the WQMPP, the work crew would be required to monitor and limit turbidity such that turbidity would not exceed 5 NTU (~5 mg/L) above background levels of 50 NTU or less, or 10% above background for background levels above 50 NTU at 150 feet from the source of turbidity.

The marine portion of the new HDPE pipeline would have an outer diameter of 42 inches, include a 90-foot long HDPE diffuser, and would extend about 1,097 feet north from the HTL to a depth of about 69 feet below mean lower low water (-69 feet re. MLLW) (Figures 3 & 4). The diffuser would include 20 discharge ports that would be spaced about 4.5 feet apart. The seaward most port (a.k.a. the terminal port, or port #1) would be 7 inches in diameter and oriented in-line with the pipeline (i.e. parallel with the pipeline axis). The remaining ports would be smaller, oriented perpendicular to the pipeline axis, vertical into the water column, and would slightly decrease in size with movement toward shore. Ports 2 - 16 would be 4.75 inches in diameter, and ports 17 - 20 would be 4.625 inches in diameter.

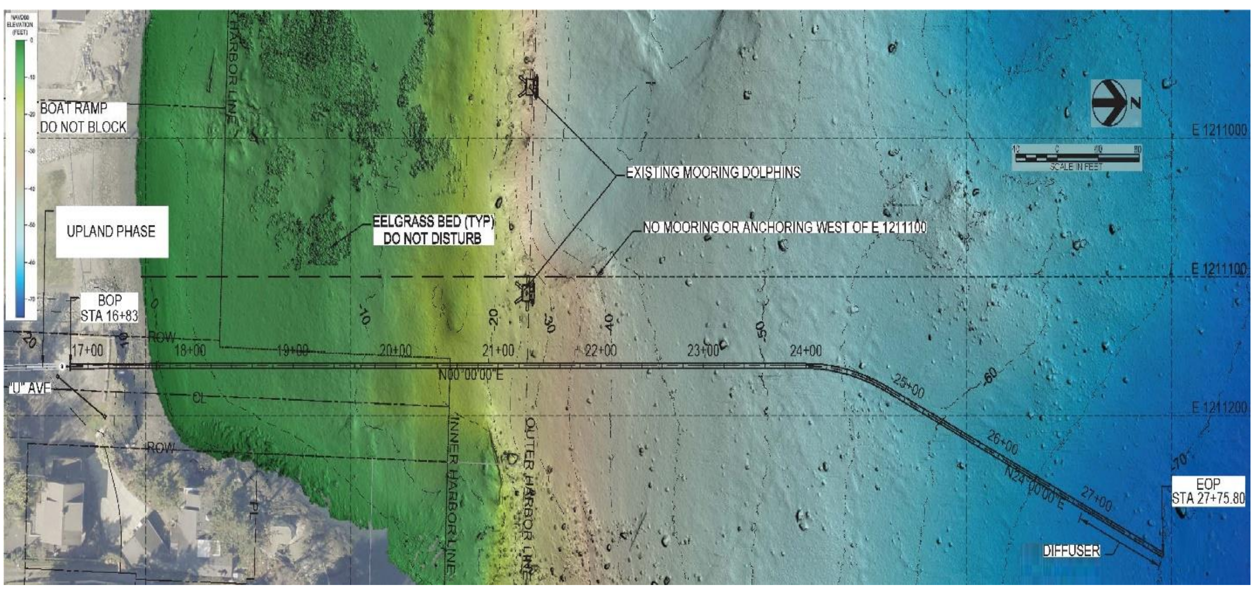


**Figure 4.** Overhead view of the marine portion of the proposed pipeline route showing the bathymetry and approximate location of an eelgrass bed west of the project area. The image is oriented 90 degrees to the right from true north to better fit on the page (Adapted from Sheet C-001 in HDR 2021).

The first 420 feet of new pipe waterward of the HTL (Stations 17+35 to 21+50) would be buried and would also have precast concrete anchor blocks that would be bolted onto the pipe about every 25 feet along its length. The pipe would emerge from the seabed (a.k.a. "daylight") at a depth of about -30 feet re. MLLW. Beyond that point, the remaining 626 feet of pipe (including a 90-foot long diffuser) would be held on the seabed by precast concrete anchor blocks that would be bolted onto the pipe about every 13.5 feet along its length (Figure 3).

Installation of the marine portion of the pipeline would consist of four main components: 1) Trench dredging and preparation; 2) Pipeline fabrication and movement; 3) Pipeline installation; and 4) Backfilling the trench. Although the component descriptions are presented individually, completion of the first 3 components would overlap temporally, and components 1 and 3 would intermesh.

<u>Trench dredging and preparation</u>: Trench dredging and preparation for the marine portion of the outfall would include in-water and upland work that would be interspersed with pipe installation and installation of shoring inland of the HTL. Prior to in-water trenching, debris within the proposed pipe alignment would be removed by divers, likely with the assistance of a crane or hoist of some type. The debris would be disposed of at an approved upland facility. The dredging would remove about 2,350 cubic yards of contaminated sediment from the marine environment. All removed sediments would be disposed of at a licensed and approved upland disposal facility. The City estimates that trench dredging and preparation would take about 42 days to complete. Waterward of the HTL, the construction crew would excavate a 420-foot long trench using a crane or excavator mounted on a spud barge (barge-mounted dredge).

The in-water trench would be dredged in 3 segments (offshore, nearshore, and cross-shore), and each segment would be excavated in two phases (upper layer and lower layer). Within each segment, Phase 1 would consist of removal of the soft upper layer of contaminated sediment using a clamshell type bucket designed to reduce flow out of the bucket while it is closed. During phase 2, they would use a scoop type bucket with teeth or a very heavy clamshell bucket to trench into the harder native material that is below the contaminated soft sediment layer. The barge-mounted dredge would place all sediments into an appropriately equipped sediment barge immediately after removal, where the sediments would be dewatered. All water would pass through filter media before being discharged back to Guemes Channel. Following dredging, a minimum of 12 inches of clean ¾-inch minus crushed gravel bedding material would be installed along the bottom of the trench. The gravel would be installed by pouring the gravel from an excavator bucket within five feet of the sediment surface, and or by divers using a tremie tube or similar device.

Trench segments and pipeline distances are defined in this project description using station numbers (Sta. XX+XX) in which the +XX value indicates the number of feet past the location identified by the first 2 digits, such that 17+50 equals 50 feet past the 17+00 location. The station numbers used here represent the best estimate of locations, but the actual locations and segment lengths may vary slightly in the field.

The construction crew would begin by trenching the offshore segment (Figure 5). They would start close to the MLLW line, about 40 feet waterward of the HTL, and progress about 375 feet offshore to about Sta. 21+50. This trench segment would be about 55 feet wide across the top. They would then excavate the approximately 45-foot long nearshore segment between about Sta. 17+30 and 17+75, which would be about 86 feet wide at the shoreward end and about 55 feet wide at the offshore end.

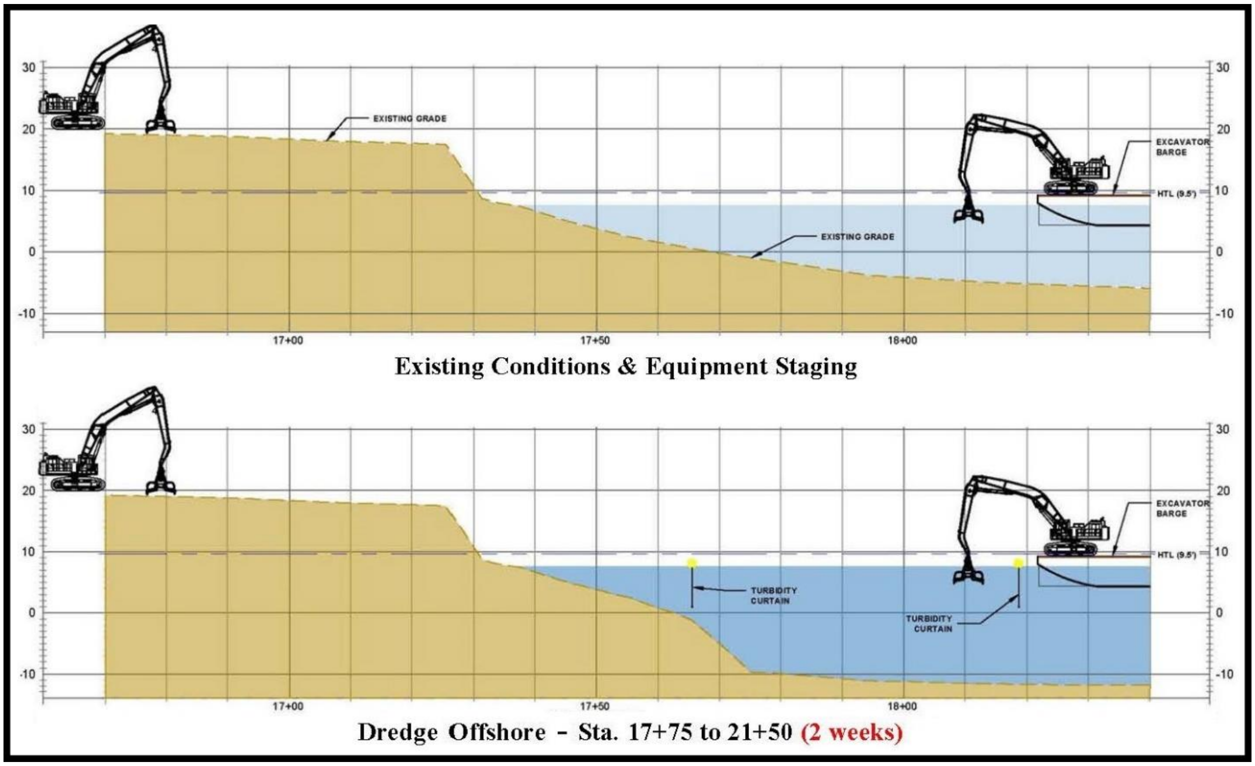


**Figure 5.** Profile drawings of the existing bathymetry, the land-based and barge-mounted excavators, and the offshore dredging (Adapted from page 1 in Widener 2022f).

They would install gravel bedding along the bottom of both trench segments, position a floating 991-foot long section of pipeline and diffuser, sink the shoreward end that pipe section to the bottom of the trench, then sequentially sink the rest of the pipeline and diffuser to about Sta. 27+76 (described under Pipeline fabrication and movement) (Figure 6).

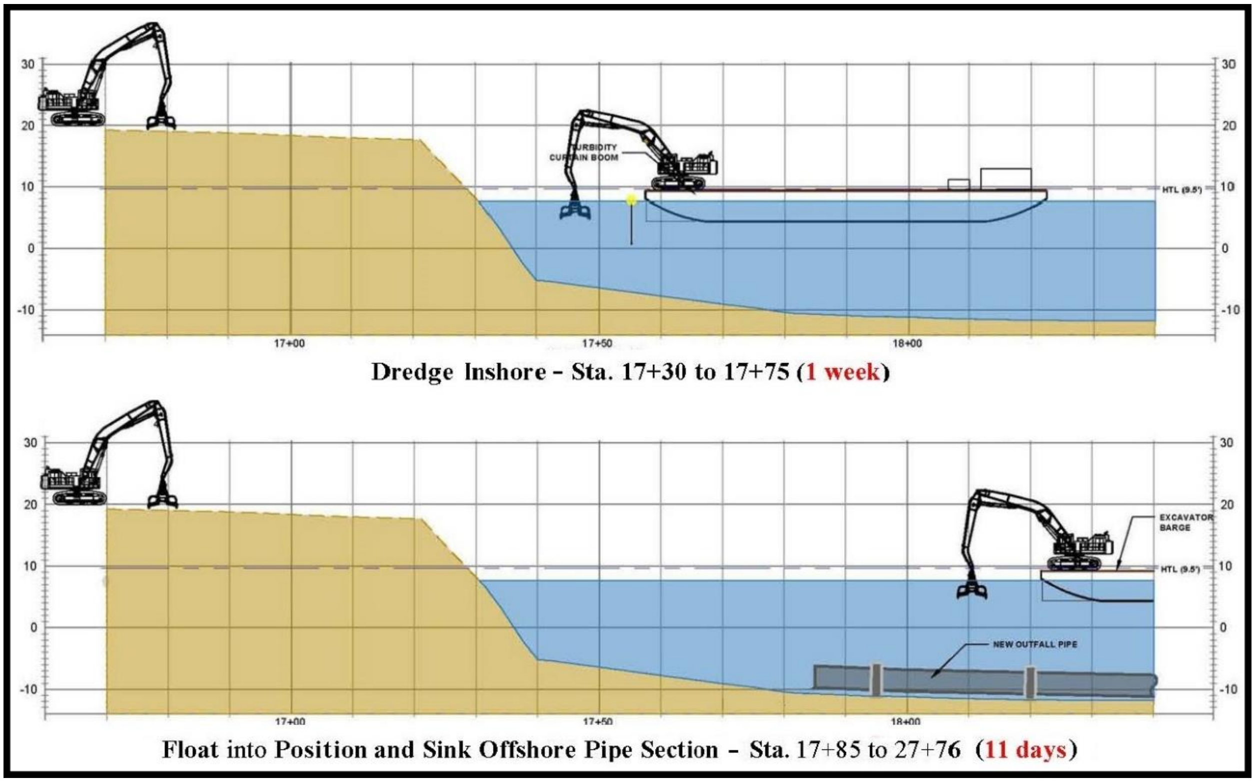


**Figure 6.** Profile drawings of the nearshore dredging, and of the offshore section of outfall pipe installed to Station 17+85 (Adapted from page 2 in Widener 2022f).

The construction crew would operate land-based equipment to install about 60 linear feet of temporary shoring inland of the HTL between about Sta. 16+70 and 17+30, and to excavate a trench within that shoring (Figure 7). The shoring would consist of 2 rows of steel H-piles with steel sheet piles installed between them. The rows would be spaced about 15 feet apart. The H-piles would be installed into pre-drilled holes and or with a vibratory hammer. The steel sheet piles would be installed with a vibratory hammer. The applicant’s agent estimates that 17 8-hour days would be required to install the shoring, and that 5 8-hour days would be required to extract it (Widener 2022p). The project includes a MMMP that requires the use of competent observers that would watch for and report marine mammals during all project-related pile driving. The MMMP requires that all marine mammals observed within 2,000 meters be reported to the on-site supervisor or inspector, and that pile driving be postponed or halted when marine mammals are within 1,000 meters of the pile driving site (Widener 2022q).

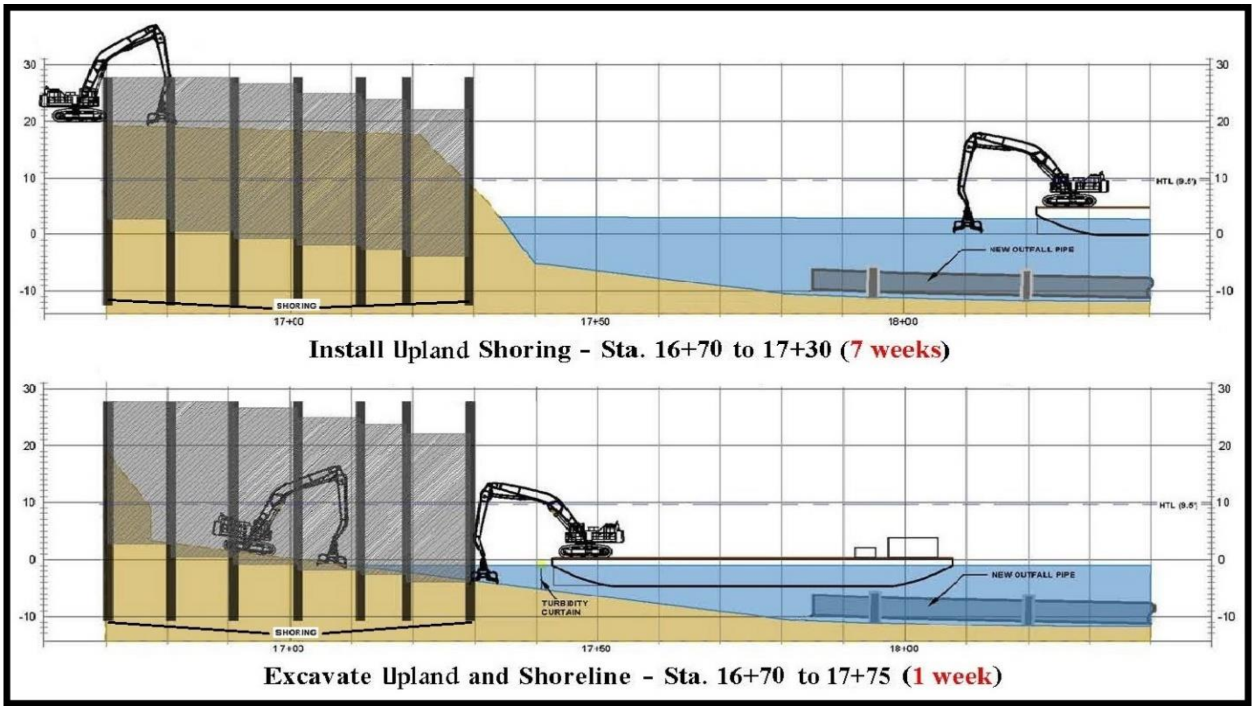


**Figure 7.** Profile drawings of the upland and cross-shore in-water dredging (Adapted from page 3 in Widener 2022f).

After installing the shoring, the crew would excavate the trench with a land-based crane or excavator. Sediments would be placed in trucks and dewatered prior to delivery to an approved upland disposal facility. The barge-mounted dredge would resume in-water dredging toward shore from about Sta. 17+75 to match up with the land-based excavation. After completion of the cross-shore section, the construction crew would install gravel bedding in preparation for the installation of the final pipe section (described below).

<u>Pipeline fabrication and movement:</u> The pipeline would be fabricated at a previously developed, but currently vacant shoreline property on the east side of Anacortes, immediately north of the Anacortes Marina, and about 1.5 miles by boat away from the project site. The construction crew would perform about 3 weeks of upland and in-water work to fuse sections of HDPE pipe and the HDPE diffuser to create two sections of 42-inch diameter pipeline. The main section would be about 991 feet long and would include the diffuser. The cross-shore section would be about 106 feet long. Both pipeline sections would be temporarily sealed on their ends so they would float, and they would be extended onto the water as they are built. The contractors would also attach 2-part concrete anchors to the pipeline sections as they are built and floated. As practicable, pipeline construction would be timed to match trench completion (described above). However, if pipeline sections are completed before their trench section is ready, the pipeline sections would be temporarily stored floating on the water at the site as needed.

When the offshore and nearshore trench sections are ready, the 991-foot long offshore pipe section with the diffuser would be towed by tug or workboat and positioned over the trench. A barge-mounted crane, divers, and controlled flooding would be used to slowly sink the shoreward end of the pipe section into the trench at about Sta. 17+85 (Figure 6). The rest of the offshore pipeline would then be sequentially sunken in a controlled manner and laid within the trench and over the seafloor along its intended alignment beyond the trench. Positioning and installation of the offshore pipe section would require about 11 days to complete. When the cross-shore trench is ready, the 106-foot long cross-shore pipe section would be towed by tug or workboat to the cross-shore trench section. Both land-based and barge-mounted cranes would be used to position the pipe section within the cross-shore trench, then divers and controlled flooding would be used to slowly sink the section into position, and to join the pipe section to the new maintenance hole at Sta. 16+79 and to the offshore pipe section (Figure 8). Positioning and installation of the cross-shore pipe section would require about 4 days of work.

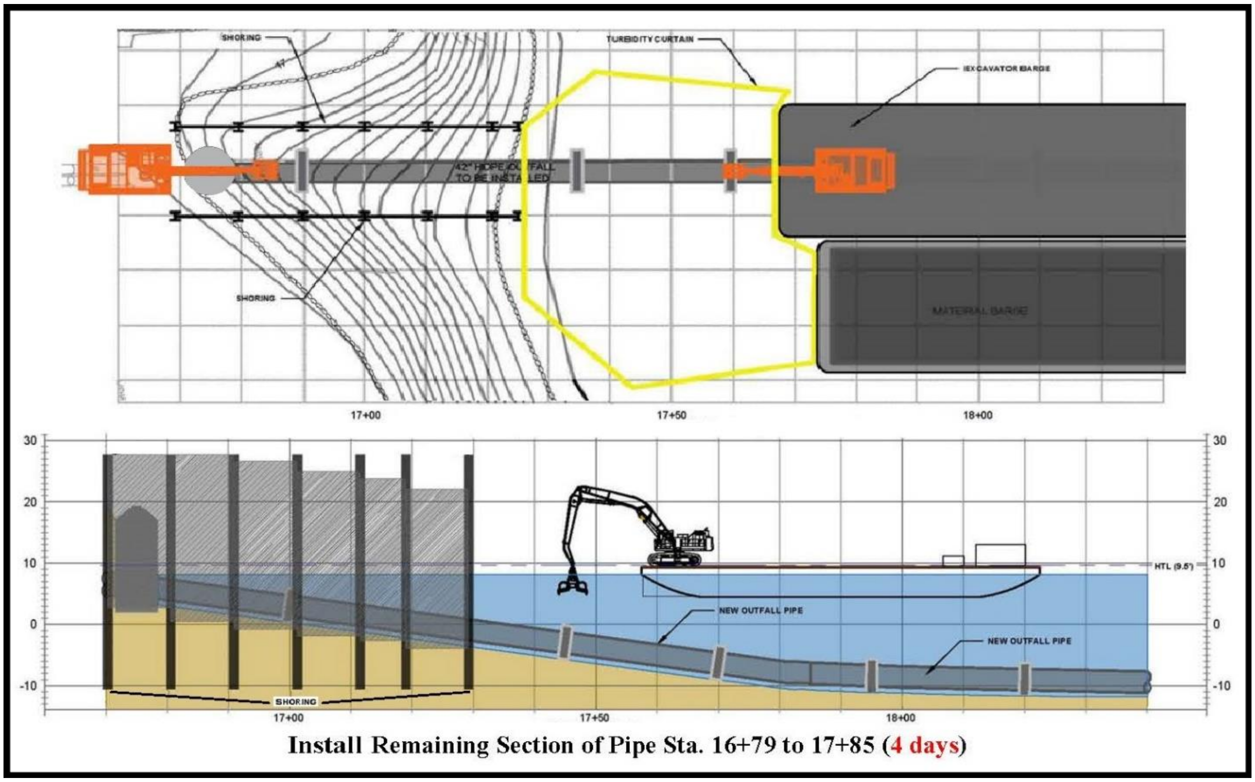


**Figure 8.** Overhead and profile drawings of the cross-shore pipe installation (Adapted from page 4 Widener 2022f).

Backfilling the trench: Within the cross-shore trench section, the work crew would install a layer clean crushed gravel over the pipe, followed by a 1-foot thick layer of bedding stone, and a 2.5-foot thick layer of armor stone with the voids filled with fish mix (sand and round pea gravel). Beyond the cross-shore section, the trench would be backfilled with clean crushed gravel, then a layer of fish mix to match the adjacent seabed. The fish mix layer would be at least 16 inch thick (Figures 3 & 9). As previously described for the gravel bedding material, the backfill would be installed by pouring from an excavator bucket within five feet of the sediment surface, and or by divers using a tremie tube or similar device.

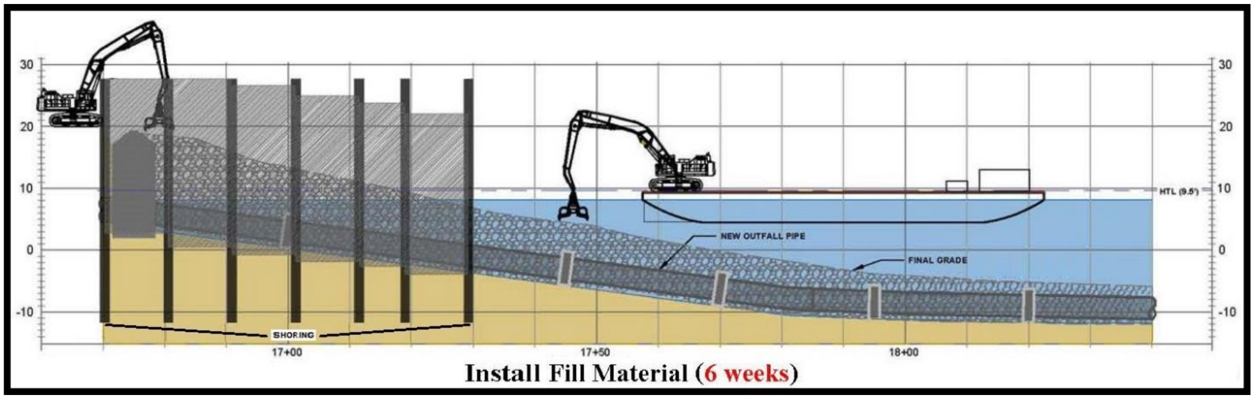


**Figure 9.** Profile drawing of the trench backfilling (Adapted from page 5 Widener 2022f).

Between about Sta. 17+00 and 17+30, the crew would reinstall rip-rap shoreline armoring to match the existing conditions at the site. The rip-rap would be purposefully placed by excavator bucket, not dumped. Landward of the shoreline armoring, the crew would backfill the upper layer of the trench to match the lawn and native vegetation of the City's planned park area at the site. After backfilling, the temporary shoring would be pulled out or cut-off below grade. Backfilling and shoring removal would require up to 6 weeks of work to complete.

Upland Blasting

Blasting is planned for portions of the upland trench excavation along 3rd Street and U Avenue due to shallow bedrock conditions (Figure 2). The closest to the water that basting would occur would be on U Avenue, about 180 feet south of the MLLW line (McMillen Jacobs 2022; Widener 2022r). Drill and blast work would be limited to normal business hours, with a maximum of 3 blasts per day, over about 25 days of blasting (McMillen Jacobs 2022). Blasting would take place between August 1 and February 15 (Widener 2023b).

Each blast would consist of a maximum of 6 separate 1.5- to 4-pound charges that would be detonated with an 8-millisecond delay between detonations (McMillen Jacobs 2022; Widener 2023b). Blasting mats, consisting of heavy rubber tires tied together with steel cables would be laid over the blast holes to control rock ejection and blast noise.

Other activities that could be caused by the proposed action

The NMFS also considered, under the ESA, whether or not the proposed action would cause any other activities that could affect our trust resources. We determined that although the proposed action would cause no change in the chemical nature or volume of the discharged WWTP effluent, it would result in the continued discharge of effluent into the Guemes Channel, and also relocate the discharge point. Therefore, we included an analysis of the effects of the continued and relocated effluent discharge in the effects section of this Opinion.

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

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

The FEMA originally determined that the proposed action is not likely to adversely affect (NLAA) the species and designated critical habitats identified in Table 1. After the NMFS informed the FEMA that formal consultation was required for the proposed action, the FEMA requested formal consultation without specifically revising their individual effects determinations (FEMA 2021b).

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

| **ESA-listed species and or critical habitat likely to be adversely affected (LAA)** | | | | |
|---|---|---|---|---|
| **Species** | **Status** | **Species** | **Critical Habitat** | **Listed / CH Designated** |
| Chinook salmon (*Oncorhynchus tshawytscha*) Puget Sound | Threatened | LAA | LAA | 06/28/05 (70 FR 37160) / 09/02/05 (70 FR 52630) |
| bocaccio (*Sebastes paucispinis*) Puget Sound/Georgia Basin | Endangered | LAA | LAA | 04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041) |
| yelloweye rockfish (*S. ruberrimus*) PS/GB | Threatened | LAA | NLAA | 04/28/10 (75 FR 22276) / 11/13/14 (79 FR 68041) |
| killer whales (*Orcinus orca*) southern resident | Endangered | NLAA | LAA | 11/18/05 (70 FR 57565) / 11/29/06 (71 FR 69054) |
| **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) |
| Southern Eulachon (Thaleichthys pacificus) | Threatened | NLAA | N/A | 03/18/10 (75 FR 13012) / 10/20/11 (76 FR 65324) |
| Humpback whales (Megaptera novaeangliae) | | | | |
| Mexico DPS | Threatened | NLAA | N/A | 09/08/16 (81 FR 62260) / N/A |
| Central American DPS | Endangered | NLAA | N/A | 09/08/16 (81 FR 62260) / N/A |

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

The NMFS has proceeded with formal consultation for the proposed action because we concluded that the proposed action is likely to adversely affect PS Chinook salmon, PS/GB bocaccio, PS/GB yelloweye rockfish, and designated critical habitat for PS Chinook salmon, PS/GB bocaccio, and SR killer whales. As described in the "Not Likely to Adversely Affect" Determinations section of this opinion (2.12), the NMFS concurs with the FEMA's NLAA determinations for PS steelhead, southern eulachon, SR killer whales, humpback whales, and PS/GB yelloweye rockfish critical habitat (Table 1).

## 2.1 Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "jeopardize the continued existence of" a listed species, which is "to engage in an action that reasonably would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

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

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

The ESA Section 7 implementing regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the final rule revising the definition and adding this term (84 FR 44976, 44977; August 27, 2019), that revision does not change the scope of our analysis, and in this opinion, we use the terms "effects" and "consequences" interchangeably.

We use the following approach to determine whether a proposed action is likely to jeopardize listed species or destroy or adversely modify critical habitat:

- Evaluate the range-wide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.
- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce

appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.

- If necessary, suggest a reasonable and prudent alternative to the proposed action.

## 2.2 Range-wide Status of the Species and Critical Habitat

This opinion examines the status of each species that is likely to be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" for the jeopardy analysis. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species.

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

**Listed Species**

Viable Salmonid Population (VSP) Criteria

For Pacific salmonids, we commonly use four VSP criteria (McElhany et al. 2000) to assess the viability of the populations that constitute the species. These four criteria (spatial structure, diversity, abundance, and productivity) encompass the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. When these parameters are collectively at appropriate levels, they maintain a population's capacity to adapt to various environmental conditions and allow it to sustain itself in the natural environment.

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

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

“Abundance” generally refers to the number of naturally-produced adults that return to their natal spawning grounds.
“Productivity” refers to the number of naturally-spawning adults produced per parent. When progeny replace or exceed the number of parents, a population is stable or increasing. When progeny fail to replace the number of parents, the population is in decline.

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

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

Puget Sound (PS) Chinook Salmon

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

- The viability status of all populations in the ESU is improved from current conditions, and when considered in the aggregate, persistence of the ESU is assured;
- Two to four Chinook salmon populations in each of the five biogeographical regions of the ESU achieve viability, depending on the historical biological characteristics and acceptable risk levels for populations within each region;
- At least one population from each major genetic and life history group historically present within each of the five biogeographical regions is viable;
- Tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations are functioning in a manner that is sufficient to support an ESU-wide recovery scenario; Production of Chinook salmon from tributaries to Puget Sound not identified as primary freshwater habitat for any of the 22 identified populations occurs in a manner consistent with ESU recovery; and
- Populations that do not meet all the Viable Salmon Population (VSP) parameters are sustained to provide ecological functions and preserve options for ESU recovery.

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

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

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

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

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

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

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

Hatchery-origin spawners are present in high fractions in most populations within the ESU, with the Whidbey Basin the only MPG with consistently high fractions of natural-origin spawners. Between 1990 and 2019, the fraction of natural-origin spawners has declined in many of the populations outside of the Skagit watershed, and the ESU overall remains at a "moderate" risk of extinction (Ford 2022).

<u>Abundance and Productivity:</u> Available data on total abundance since 1980 indicate that abundance trends have fluctuated between positive and negative for individual populations, but productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit watershed. Further, across the ESU, 10 of 22 MPGs show natural productivity below replacement in nearly all years since the mid-1980s, and the available data indicate that there has been a general decline in natural-origin spawner abundance across all MPGs over the most-recent fifteen years. Further, escapement levels for all populations remain well below the PSTRT planning ranges for recovery (Ford 2022). Based on the current information on abundance, productivity, spatial structure and diversity, the most recent 5-year status review concluded that the PS Chinook salmon ESU remains at "moderate" risk of extinction, that viability is largely unchanged from the prior review, and that the ESU should remain listed as threatened (Ford 2022).

<u>Limiting Factors:</u> 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

<u>PS Chinook Salmon within the Action Area:</u> The PS Chinook salmon that are most likely to pass through the project area would be a mix of spring-, summer-, and fall-run fish from the Skagit and Nooksack River basins, with some fish from the Stillaguamish and Snohomish River basins also likely present (Ford 2022; WDFW 2022a). Both stream- and ocean-type Chinook salmon are present in all of these populations, with the majority being ocean-types.

The WDFW considers the Skagit River basin Chinook salmon populations to be native stocks with wild production. Since 1974, the total abundance trend within the basin has been slightly negative. However, across the basin, the trend has been slightly positive since the early 1990s, and the fraction of natural-origin spawners is high (Ford 2022; WDFW 2022b). Between 1974 and 2018, the estimated total abundance for returning adults has fluctuated between about 409 and 5,590 in the Lower Skagit River, and about 3,586 and 20,040 in the Upper Skagit River, with 2018 total abundances of 1,923 and 8,602 adults in the lower and upper watersheds, respectively (WDFW 2022b).The Cascade, Upper and Lower Sauk, and Suiattle River populations add to the basin's numbers, but they are smaller populations. The 2018 total abundances were 128, 1,603, and 378 adults in the Cascade, Upper and Lower Sauk, and Suiattle Rivers, respectively.

In the Nooksack River basin, between 1984 and 2019, the total abundance for PS Chinook salmon has fluctuated with the average trend being stable to slightly positive (Ford 2022). However, abundance has been dominated by hatchery returns since 1996, with the proportion of natural-origin fish declining (Ford 2022; WDFW 2022b). The WDFW considers the North Fork Nooksack River population a native stock with composite production that has been supplemented by the Kendall Creek Hatchery since 1980. Between 1984 and 2016, escapement in the North Fork Nooksack River fluctuated between about 10 and 3,748 fish (1990 and 2002, respectively, WDFW 2022b). Between 1996 and 2016, natural-origin spawner abundance wavered between 37 and 401 fish, whereas hatchery-origin spawners exceeded 500 fish for 16 of those 20 years, and accounted for about 94% of the 3,748 fish in 2002. Total abundance was 922 fish in 2016, with natural-origin fish accounting for only 20% of the return. The WDFW considers the South Fork Nooksack River Chinook salmon population to be a native stock with wild production. In the South Fork Nooksack River between 1984 and 2016, escapement fluctuated between about 103 and 668 fish (1992 and 2016, respectively, WDFW 2020b). Discounting stays from the North Fork, spawning by natural-origin fish in the South Fork Nooksack River has fluctuated between 10 and 323 fish since origin counts began in 1999, accounting for about 4 to 48% of the total count for returning adults. Natural-origin strays from the North Fork consistently comprised a significant proportion of the annual counts, often outnumbering South Fork natural-origin spawners. Total abundance was 668 fish in 2016, with South Fork natural-origin spawners (323 fish) accounting for 48% of the return, 182 fish were natural-origin strays from the North Fork.

In Both basins, returning adult Chinook salmon tend to enter freshwater early-June through early-September. Yearling stream-type fish tend to leave their rivers late winter through spring, and move relatively directly to nearshore marine areas and pocket estuaries. Ocean-type juveniles begin to migrate out of their natal streams as early as February, with migration being heaviest between early-March and mid-July. Those fish tend to rear in the tidal delta estuaries of their natal stream for about 2 weeks to 2 months before migrating to marine nearshore areas and pocket estuaries in late May to June before moving into marine nearshore areas and pocket estuaries, where they remain through the end of summer.

Puget Sound/Georgia Basin (PS/GB) Bocaccio and Yelloweye Rockfish

On April 28, 2010, the PS/GB bocaccio distinct population segment (DPS) was listed as endangered, and the PS/GB yelloweye rockfish DPS was listed as threatened (75 FR 22276). In April 2016, we completed a 5-year status review that recommended the DPSs retain their endangered and threatened classifications (Tonnes et al. 2016), and we released a recovery plan in October 2017 (NMFS 2017).

The waters of Puget Sound and Straits of Georgia can be divided into five interconnected basins that are largely hydrologically isolated from each other by relatively shallow sills (Burns 1985; Drake et al. 2010). The basins within US waters are: (1) San Juan, (2) Main, (4) South Sound, and (4) Hood Canal. The fifth basin consists of Canadian waters west and north of the San Juan Basin into the Straights of Georgia (Tonnes et al. 2016). Most individuals of the PS/GB bocaccio and PS/GB yelloweye rockfish DPSs are believed to remain within the basin of their origin, including larvae and pelagic juveniles. However, some movement between basins occurs, and both DPSs are currently considered single populations.

There are no estimates of historic or present-day DPS-wide abundance for either species across the full range of their respective DPSs. However, available data suggest that total rockfish abundance declined across the area at a rate of 3.1 to 3.8 percent per year from 1977 to 2014, representing a 69 to 76 percent total decline over that period, and the population growth rates for PS/GB bocaccio and PS/GB yelloweye rockfish over that period are believed to have been more negative. Additionally, there is little to no evidence of any recovery in total rockfish abundance in response to recent protective measures. In 2013, the Washington State Department of Fish and Wildlife (WDFW) published abundance estimates for both species in the San Juan basin based on a remotely operated vehicle (ROV) survey conducted in 2008. The survey estimated abundances of about 47,000 yelloweye rockfish, and 4,600 bocaccio in the San Juan basin (Tonnes et al. 2016).

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

General Rockfish Life History: To reduce redundant common text for both species, common general life history information is discussed here, with important species-specific discussed for each species below.

Rockfish are long-lived species, with life histories that include a larval to pelagic juvenile stage that is followed by largely benthic juvenile, subadult, and adult stages. Rockfish eggs are fertilized internally, and the young are extruded as larvae that are about 4 to 5 mm in length. In general, embryo production increases with the age and or size of the female rockfish. For example, 20-cm long female copper rockfish produce about 5,000 eggs while 50-cm long females can produce about 700,000 eggs (Palsson et al. 2009). Based on observations of other rockfish species, mature female bocaccio and yelloweye rockfish are believed to produce from several thousand to over a million eggs annually, depending on their size and or maturity (Love et al. 2002).

Rockfish larvae tend to occur in two peaks in Puget Sound (early spring and late summer) that coincide with the main primary production peaks in Puget Sound, and they essentially disappear by the beginning of November. Additionally, larval densities tended to be lower in the more northerly basins (Whidbey and Rosario) than in the Central and South Sound basins (Greene and Godersky 2012).

Rockfish larvae are distributed by prevailing currents until they are large enough to actively swim toward preferred habitats, but they can pursue food within short distances immediately after birth (Tagal et al. 2002). Rockfish larvae are typically pelagic, distributed throughout the water column. They are often observed in the upper water layers, under detached floating algae, seagrass, and kelp (Love et al. 2002; Shaffer et al. 1995). The oceanographic conditions within Puget Sound likely result in most larvae staying within the basin where they are released rather than their being broadly dispersed (Drake et al. 2010). Natural mortality is believed to be quite high (up to about 70%) during early life stages (Green and Godersky 2012). At about 3 to 6 months old and 1.2 to 3.6 inches (3 to 9 cm) long, juvenile rockfish swim toward their preferred habitats (described in species-specific detail below).

PS/GB Bocaccio

General Life History: Bocaccio are a long-lived fish species with a maximum recorded age of 46 years in Alaskan waters, typically mature between 6 and 11 years old, and have a maximum size of about 36 inches (91 cm) (Palsson et al. 2009). They tend to school above the bottom or off of steep slopes, and some have large home ranges and move long distances (NMFS 2017).

The timing of larval parturition in PS/GB bocaccio is uncertain, but based on coastal bocaccio, parturition likely occurs between January and April (NMFS 2017). At about 5 to 6 months old and 1.2 to 3.6 inches (3 to 9 cm) long, juvenile bocaccio move to shallow nearshore habitats, most typically with rocky or cobble substrates with kelp, but they also utilize sandy areas with eelgrass (NMFS 2017).

Juvenile bocaccio may spend months or more in shallow nearshore rearing habitats before transitioning to deeper water habitats (Palsson et al. 2009). As they grow, their habitat preference shifts toward increasingly deep waters. Sub-adult to adult bocaccio are most commonly found between 131 to 820 feet (40 to 250 m) deep, typically in areas with high relief rocky substrates, but they also utilize sand, mud, and other unconsolidated sediment substrates (NMFS 2017).

Spatial Structure and Diversity: The PS/GB bocaccio DPS includes all bocaccio from inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia. As described above, within US waters, the PS/GB is subdivided into the San Juan, Main, South Sound, and Hood Canal basins with limited exchange of individuals occurring between the basins, and the DPS is currently considered a single population. The available data indicate that the historical distribution of PS/GB bocaccio was likely spatially limited, being most abundant in the Main and South Sound basins, but never a predominant segment of the total rockfish abundance within the region (Drake et al. 2010). There were no documented occurrences in the San Juan Basin until 2008 (Pacunski et al.2013).

Abundance and Productivity: Because bocaccio are long-lived, slow to mature, and their episodes of successful reproduction are sporadic, they are considered to have generally low levels of inherent productivity. Productivity may be further negatively impacted by the situation where the low density of reproductive aged adults reduces the likelihood of locating mates, which may further reduce population density. However, there is insufficient information to determine that this is currently occurring.

No reliable range-wide historical or current population estimates are available for the PS/GB bocaccio DPS. However, their abundance is very low, and observations of the species are relatively rare. Bocaccio were always infrequent in recreational fisheries, with low occurrences in localized areas of the Main and South Sound basins, and a few erratic occurrences in the North Sound. However, they have not appeared in recent research or recreational catches (Palsson et al. 2009).

The best available information indicates that total rockfish populations in the Puget Sound region have declined by about 70 percent, and that bocaccio have declined by an even greater extent (NMFS 2017). The apparent decrease in PS/GB bocaccio population size in the Main Basin and South Sound could result in further reduction in the historically limited distribution of PS/GB bocaccio, and add significant risk to long-term viability of the DPS.

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

- Degraded Habitat (water quality, derelict fishing gear, climate change);
- Overutilization (commercial and recreational bycatch); and
- Inadequacy of existing regulatory mechanisms.

PS/GB Bocaccio within the Action Area: Very little specific information is available to describe PS/GB bocaccio in the action area, with the exception that they are likely to be uncommon to rare. The intertidal and shallow subtidal zones at the project site consists of shallow low-relief substrate that consists mostly of rip-rap and debris immediately adjacent to the HTL, and fine sediments with high levels of wood waste below that (DOF 2021b; GeoEngineers 2015; Widener 2021a). This habitat is likely unfavorable for juvenile bocaccio settlement and early growth. However, an eelgrass bed that may be suitable for juvenile bocaccio settlement and early growth is present about 100 feet north of the proposed pipeline alignment, and larvae may episodically pass through the area on the currents.

No deep-water habitat that is likely to support adult bocaccio is present within the area of affect for fish (NOAA 2022a & b). Therefore, the bocaccio that may be present within the area of affect would likely be limited to pelagic larvae that may be carried in by the currents and young of the year juveniles that may rear in the eelgrass bed north of the pipeline route. Based on bocaccio life history characteristics, larva and/or young of the year juvenile bocaccio could be present at the project site almost year-round, but are most likely to be present between March and October. The best available information suggests that bocaccio were never very common near the action area, and they are now considered rare in Puget Sound, including in the areas where they were historically most common, such as the South Sound (Palsson et al. 2009).

PS/GB Yelloweye Rockfish

General Life History: Yelloweye rockfish are a long-lived fish species with a maximum recorded age of 118 years in Alaskan waters, 90 years in North Puget Sound, and 55 years in South Puget Sound. They typically mature between 19 and 22 years old, and can reach a maximum size of about 36 inches (91 cm) (Palsson et al. 2009). They tend to remain near the substrate at depths from 90 to 1,640 feet (30 to 500 m) deep, and to remain within relatively small home ranges (NMFS 2017).

The available information suggests that larval parturition in PS/GB yelloweye rockfish occurs from April to September, with the highest abundances in June and July (Palsson 2006). Juvenile and adult yelloweye rockfish typically occur in similar habitats, with juveniles tending to inhabit the shallower end of the shared deepwater range. At about 4 months old and 1.2 to 3.6 inches (3 to 9 cm) long, juvenile yelloweye rockfish typically settle in areas at depths greater than 98 feet (30 m) with complex rocky/boulder habitats with cloud sponges or with cobble substrates. They are not typically found in shallow nearshore waters (NMFS 2017). As they grow, their habitat preference shifts toward increasingly deep waters. Adult yelloweye rockfish prefer areas with moderate to extreme steepness, and substrates consisting of fractured bedrock, and or boulder-cobble complexes. They are most commonly found in highly rugose rocky areas and pinnacles that are between 164 and 1,640 feet (50 to 500 m) deep (NMFS 2017; Palsson et al. 2009).

Spatial Structure and Diversity: The PS/GB yelloweye rockfish DPS includes all yelloweye rockfish from inland marine waters east of the central Strait of Juan de Fuca and south of the northern Strait of Georgia. As described above, within US waters, the PS/GB is subdivided into the San Juan, Main, South Sound, and Hood Canal basins with limited exchange of individuals occurring between the basins, and the DPS is currently considered a single population. However, recent research has found evidence that may support separating Hood Canal yelloweye rockfish from the rest of the PS/GB DPS. Within U.S. waters, PS/GB yelloweye rockfish are believed to be most abundant within the San Juan Basin. However, Hood Canal has the greatest frequency of yelloweye rockfish observations in both trawl and scuba surveys. Yelloweye rockfish are considered rare in Central and Southern Puget Sound.

Abundance and Productivity: Because yelloweye rockfish are long-lived, slow to mature, and their episodes of successful reproduction are sporadic, they are considered to have generally low levels of inherent productivity. Yelloweye rockfish productivity may be further negatively impacted by the situation where the low density of reproductive aged adults reduces the likelihood of locating mates, which may further reduce population density. However, there is insufficient information to determine that this is currently occurring.

No reliable range-wide historical or current population estimates are available for the PS/GB yelloweye rockfish DPS. However, their abundance is low. The best available information indicates that total rockfish populations in the Puget Sound region have declined by about 70 percent, and that yelloweye rockfish have declined by an even greater extent (NMFS 2017).

Limiting Factors: Factors limiting recovery for PS/GB yelloweye rockfish include:

- Degraded Habitat (water quality, derelict fishing gear, climate change);
- Overutilization (commercial and recreational bycatch); and
- Inadequacy of existing regulatory mechanisms.

PS/GB Yelloweye Rockfish within the Action Area: Very little specific information is available to describe PS/GB yelloweye rockfish presence and habitat use in Guemes Channel, with the exception that they are likely to be very uncommon.

No deep-water habitat that is likely to support juvenile and or adult yelloweye rockfish is present within the area of affect for fish (NOAA 2022a & b). Therefore, the yelloweye rockfish that may be present within the area of affect would likely be limited to pelagic larvae that may be carried in by the currents. Based on yelloweye rockfish life history characteristics, their larvae are most likely to be present between from April to September, with the highest abundances in June and July.

## Critical Habitat

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

The project site and surrounding area has been designated nearshore marine critical habitat for PS Chinook salmon and PS/GB bocaccio, and Puget Sound inland water critical habitat SR killer whales.

Puget Sound Chinook Salmon Critical Habitat

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

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

Major tributary river basins in the Puget Sound basin include the Nooksack, Samish, Skagit, Sauk, Stillaguamish, Snohomish, Lake Washington, Cedar, Sammamish, Green, Duwamish, Puyallup, White, Carbon, Nisqually, Deschutes, Skokomish, Duckabush, Dosewallips, Big Quilcene, Elwha, and Dungeness rivers and Soos Creek. Critical habitat throughout the Puget Sound basin has been degraded by numerous activities, including hydropower development, loss of mature riparian forests, increased sediment inputs, removal of large wood from the waterways, intense urbanization, agriculture, alteration of floodplain and stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, dredging, armoring of shorelines, marina and port development, road and railroad construction and maintenance, logging, and mining. Changes in habitat quantity, availability, and diversity, and flow, temperature, sediment load and channel instability are common limiting factors of critical habitat throughout the basin.

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

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

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

Diking, agriculture, revetments, railroads and roads in lower stream reaches have caused significant loss of secondary channels in major valley floodplains in this region. Confined main channels create high-energy peak flows that remove smaller substrate particles and large wood. The loss of side-channels, oxbow lakes, and backwater habitats has resulted in a significant loss of juvenile salmonid rearing and refuge habitat. When the water level of Lake Washington was lowered 9 feet in the 1910s, thousands of acres of wetlands along the shoreline of Lake Washington, Lake Sammamish and the Sammamish River corridor were drained and converted to agricultural and urban uses. Wetlands play an important role in hydrologic processes, as they store water which ameliorates high and low flows. The interchange of surface and groundwater in complex stream and wetland systems helps to moderate stream temperatures. Thousands of acres of lowland wetlands across the region have been drained and converted to agricultural and urban uses, and forest wetlands are estimated to have diminished by one-third in Washington State (FEMAT 1993; Spence et al. 1996; SSPS 2007).

Loss of riparian habitat, elevated water temperatures, elevated levels of nutrients, increased nitrogen and phosphorus, and higher levels of suspended sediment, presumably from urban and highway runoff, wastewater treatment, failing septic systems, and agriculture or livestock impacts, have been documented in many Puget Sound tributaries (SSPS 2007).
Peak stream flows have increased over time due to paving (roads and parking areas), reduced percolation through surface soils on residential and agricultural lands, simplified and extended drainage networks, loss of wetlands, and rain-on-snow events in higher elevation clear cuts (SSPS 2007). In urbanized Puget Sound, there is a strong association between land use and land cover attributes and rates of coho spawner mortality likely due to runoff containing contaminants emitted from motor vehicles (Feist et al. 2011).

Dams constructed for hydropower generation, irrigation, or flood control have substantially affected PS Chinook salmon populations in a number of river systems. The construction and operation of dams have blocked access to spawning and rearing habitat, changed flow patterns, resulted in elevated temperatures and stranding of juvenile migrants, and degraded downstream spawning and rearing habitat by reducing recruitment of spawning gravel and large wood to downstream areas (SSPS 2007). These actions tend to promote downstream channel incision and simplification (Kondolf 1997), limiting fish habitat. Water withdrawals reduce available fish habitat and alter sediment transport. Hydropower projects often change flow rates, stranding and killing fish, and reducing aquatic invertebrate (food source) productivity (Hunter 1992).

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

The nearshore marine habitat has been extensively altered and armored by industrial and residential development near the mouths of many of Puget Sound's tributaries. A railroad runs along large portions of the eastern shoreline of Puget Sound, eliminating natural cover along the shore and natural recruitment of beach sand (SSPS 2007). Degradation of the near-shore environment has occurred in the southeastern areas of Hood Canal in recent years, resulting in late summer marine oxygen depletion and significant fish kills. Circulation of marine waters is naturally limited, and partially driven by freshwater runoff, which is often low in the late summer. However, human development has increased nutrient loads from failing septic systems along the shoreline, and from use of nitrate and phosphate fertilizers on lawns and farms. Shoreline residential development is widespread and dense in many places. The combination of highways and dense residential development has degraded certain physical and chemical characteristics of the near-shore environment (HCCC 2005; SSPS 2007).

The PS Chinook salmon nearshore marine critical habitat at and adjacent to the project site supports adult and juvenile migration, and nearshore marine rearing for juveniles as they migrate and continue to adapt to the marine environment (NOAA 2022a & b).

Puget Sound/Georgia Basin Bocaccio Critical Habitat

The NMFS designated critical habitat for PS/GB bocaccio on November 13, 2014 (79 FR 68042). That critical habitat includes marine waters and substrates of the US in Puget Sound east of Green Point in the Strait of Juan de Fuca. Nearshore critical habitat is defined as areas that are contiguous with the shoreline from the line of extreme high water out to a depth no greater than 98 feet (30 m) relative to mean lower low water. The PBF of nearshore critical habitat includes settlement habitats with sand, rock, and/or cobble substrates that also support kelp. Important site attributes include: (1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; and (2) Water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities. The PBF of Deepwater critical habitat is defined as areas at depths greater than 98 feet (30 m) that possess or are adjacent to complex bathymetry consisting of rock and/or highly rugose habitat. Important site attributes include: (1) Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities; (2) Water quality and sufficient levels of DO to support growth, survival, reproduction, and feeding opportunities; and (3) The type and amount of structure and rugosity that supports feeding opportunities and predator avoidance. Both nearshore and deepwater critical habitat include the entire water column above those substrates. Table 4 lists the PBFs and corresponding life history events for PS/GB bocaccio critical habitat.

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

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

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

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

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

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

The PS/GB bocaccio nearshore marine critical habitat at and adjacent to the project site supports settlement, growth, and development for juveniles (NOAA 2022a & b).

Southern Resident (SR) Killer Whale Critical Habitat

The NMFS designated critical habitat for the SR killer whale DPS on November 29, 2006 (71 FR 69054), and then revised the designation on August 2, 2021 to expand the range of the designated critical habitat (86 FR 41668). SR killer whale critical habitat currently includes approximately 2,560 square miles of inland waters of Washington in three specific areas: 1) the Summer Core Area in Haro Strait and waters around the San Juan Islands; 2) Puget Sound; and 3) the Strait of Juan de Fuca. It also includes 15,910 square miles of coastal marine waters from the U.S./Canada border with to Point Sur, California, with the exclusion of the Quinault Range Site off the coast of Washington.

Within the inland waters of Washington State, SR killer whale critical habitat includes all waters waterward of a line at a depth of 20 feet (6.1 m) relative to extreme high water. Along the coast, SR killer whale critical habitat includes all waters waterward of a line at a depth of 20 feet (6.1 m) relative to extreme high water out to the 656-ft (200-m) depth contour.

The NMFS identified the following physical or biological features that are essential to SR killer whale conservation: (1) Water quality to support growth and development; (2) Prey species of sufficient quantity, quality and availability to support individual growth, reproduction and development, as well as overall population growth; and (3) Passage conditions to allow for migration, resting, and foraging.

Water Quality: Waters that are free of contaminants or other agents at concentrations that would inhibit reproduction, impair immune function, result in mortalities, or otherwise impede the growth of SR killer whales is a habitat feature that is essential for the species' recovery. Good water quality is especially important in high-use areas where foraging behaviors occur and contaminants can enter the food chain.

As described in the Puget Sound Partnership's 2022-2026 Action Agenda for Puget Sound, the water quality in Puget Sound is degraded and continues to decline (Puget Sound Partnership 2022). Despite bans of some harmful substances in the 1970s, and subsequent cleanup efforts, several toxicants persist in Puget Sound and build up in marine organisms including SR killer whales and their prey resources. High levels of maritime activity discharge pollutants into the sound, and hundreds of outfalls continuously discharge stormwater and wastewater treatment plant effluents into Puget Sound. Water quality varies in the coastal waters from Washington to California. For example, high levels of DDTs have been found in SR killer whales, especially in K and L pods, which spend time during the winter in California where DDTs still persist in the marine ecosystem (Sericano et al. 2014).

Exposure to oil spills poses additional direct threats and long-term population level impacts. Oil spills can also have long-lasting impacts on other habitat features. Oil spill risk exists throughout the SR killer whales' coastal and inland range. For example, off the California coast, 463,848 gallons of crude oil was released in 2008, 141,680 gallons in 2015, and 44,755 gallons in 2016 (Stephens 2015 and 2017). Non-crude oil spills into the marine environment also occurred off California, Oregon, and Washington in 2015 and 2016 (Stephens 2015 and 2017).

Prey Quantity, Quality, and Availability: Access to adequate numbers of uncontaminated Chinook salmon and other fish species is essential to support individual SR killer whale growth and reproduction, and to support the recovery of the SR killer whale DPS. However, most wild salmon stocks throughout the geographic range of the SR killer whale DPS are at fractions of their historic levels. Beginning in the early 1990s, 28 ESUs and DPSs of salmon and steelhead in Washington, Oregon, Idaho, and California were listed as threatened or endangered under the ESA, and many wild salmon stocks continue to decline. Some of these losses have been partially offset hatchery production.

Pollution also affects the quality and availability of SR killer whale prey across the range of the DPS. Contaminants enter marine waters and sediment from numerous sources, but are typically concentrated near areas of high human population and industrialization. Once in the environment these substances migrate across the food web, and accumulate in in long-lived top predators like SR killer whales. Despite the increasing implementation of modern pollution controls in recent decades, those measures only reduce the presence of targeted contaminants in the environment. They don't completely eliminate them, and they often do little to reduce the presence of non-targeted substances, many of which becoming of increasing concern as new science comes to light. In addition to potentially accumulating in SR killer whale prey species, pollutants can directly and indirectly reduce the long-term survival of those prey species, which can reduce the amount of available prey resources for SR killer whales.

Passage: Southern Residents are highly mobile and use a variety of areas for foraging and other activities, as well as for traveling between these areas. Human activities and in-water structures can impede SR killer whale movement across their range. In particular, vessel operation and mod-frequency military sonars are believed to present obstacles to whale passage, often causing whales to change direction, and potentially having to swim further, which can increase energy expenditure and reduce foraging efficiency.

The Puget Sound inland waters critical habitat at and adjacent to the project site supports migration, feeding, and growth for juvenile and adult SR killer whales (NOAA 2022a & b).

## 2.3 Action Area

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

The project site is located on the northern shoreline of Fidalgo Island and in Guemes Channel, Puget Sound, near the northeast corner of the City of Anacortes, Washington (Figures 1 and 10). As described in section 2.5, the extent of detectable work-related effects and altered benthic habitat would be limited to the marine waters and substrates within about 300 feet either side of the proposed marine pipeline route. Detectable effluent would be limited to the area within about 700 feet around the new outfall diffuser. The described area overlaps with the geographic ranges of the ESA-listed species and the boundaries of designated critical habitats identified in Table 1. The action area also overlaps with areas that have been designated, under the MSA, as EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species.

## 2.4 Environmental Baseline

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

Environmental conditions at the project sites and the surrounding area: The project site is located on the northern shoreline of Fidalgo Island and in Guemes Channel, Puget Sound, near the northeast corner of the City of Anacortes, Washington (Figures 1 and 10). The geography and ecosystems in and adjacent to the project area have been heavily altered by human activity since European settlers first arrived in the 1850s. Much of the city's shoreline has been modified by dredge and fill activity, particularly along its eastern shore and along a mile-long stretch of the northern shoreline extending west from the project site. The city was founded in 1879. Waterfront development in the late 1880s and the 1890s included saw mills, ship builders, maritime support services, marine shipping terminals, ferry terminals, fishing boat docks, and canneries. In the 1920s, Anacortes was called the "City of Smokestacks", with timber mills lining its eastern shore, and salmon canneries lining its northern shore (Anacortes WA 2022).


**Figure 10.** Google Earth photograph of Anacortes, Washington. The southern shoreline of Guemes Island, and the Guemes Channel are at the top of the photograph.

Between the 1880's and 1941, the site immediately west of the proposed pipeline route across the shoreline (202 U Avenue) was a lumber mill that burned down in 1941. In 1942, the site was converted to a marina that was demolished in 2013 (Anacortes City 2020; DOF 2021b). The area immediately west of 202 U Avenue has been used by the Port of Anacortes (the Port) since 1926. For many years, Pier 2 was used to store and load timber. Currently, Pier 2 is used mainly for exporting dry bulk cargoes as well as for short term moorage for barges and other vessels (DOF 2021b).

Today, concrete and sheet pile bulkheads, steeply sloped riprap banks, marinas, piers, wharves, and jetties predominate in along the city’s eastern shore and the northern-most shoreline. Upland, most of the land cover consists of commercial and residential buildings, parking lots and roads.

The shoreline at the project site consists of a highly eroded rip-rap embankment with a stormwater outfall pipe that extends from the bank. The shoreline east of the site includes a mixture of rip-rap, remnant structures, and natural rock outcroppings. The west of the site is a sloped gravel and sand beach. Moving farther west, there is a small boat ramp, small pier, the Port’s Pier 2, and numerous old log mooring piles (Figure 11).


**Figure 11.** Overhead photograph of the shoreline portion of the project area at the north end of Anacortes, Washington. The yellow line indicates where the proposed replacement pipeline would cross the shoreline. The existing outfall pipeline route is shown in red, running west of the Port's Pier 2 (Adapted from Figure 2 in Widener 2021a).

South and landward of the rip-rap at the site, the substrate consists of fill that contains high levels of concrete and other debris, with concrete debris, pavement, and remnant structures present on the surface. Shoreline vegetation consists of patches of grass, invasive plants such as the Himalayan blackberry, and a few shrubs and a couple of trees.

The upper intertidal area is sloped sharply, whereas the lower intertidal and subtidal areas are relatively flat. The upper intertidal substrate consists predominantly of rip-rap, concrete rubble and other debris with very little attached macro algae. The lower intertidal and subtidal substrate consists predominately of a layer of soft sediments overlaying a hard layer. An eelgrass bed is located about 100 feet west of the proposed pipeline alignment, but aquatic vegetation along the pipeline route is limited small amounts of macroalgae (GeoEngineers 2015; Widener 2021a).

The marine sediments at the project site are contaminated. The proposed outfall alignment crosses Sediment Management Area 2 of the Anacortes Port Log Yard site, which is identified on the WDOE's Confirmed and Suspected Contaminated Sites List. The site is regulated by the WDOE under the Model Toxics Control Act and by the WDOE's toxics cleanup program (DOF 2021b).

Contaminants of Concern (COCs) exceeded screening levels for one or more COC at 7 of 8 surface sampling (top 10 cm) locations. Sample location #8 (the farthest from shore) had no exceedances. Tributyltin exceeded the screening level in 2 of 8 surface samples, but not in subsurface samples; Total carcinogenic Polycyclic Aromatic Hydrocarbons (cPAHs) exceeded the screening level in 6 of 8 surface samples and in 2 subsurface samples; Polychlorinated

Biphenyls (PCBs) Aroclors exceeded the screening level in 6 of 8 surface samples, but not in subsurface samples; and Total Dioxin/Furans (TEQ) exceeded the screening level in 1 of 8 surface samples, but not in subsurface samples. Total cPAH is the only COC that exceeded the screening level in subsurface samples, and did so only at locations SS-1 and SS-3 in the 1- to 3-foot depth intervals. Samples deeper than 3 feet were below screening levels. Additionally, the surface sediments contained up to 75 percent wood debris by volume within a matrix of silt and fine sand, and the total organic carbon and total volatile solids exceed recommended levels for wood waste in sediments (DOF 2021b & c).

Adult PS Chinook salmon migrate through the project area to reach their spawning habitats. Juvenile PS Chinook salmon shelter and forage in the nearshore zone of the project area as they migrate and continue to adapt to the marine environment. Larval PS/GB bocaccio are likely to drift though the project area on the currents, and some juveniles may utilize the nearby eelgrass bed as rearing habitat before moving into deep-water habitats offshore. The project area has also been designated as critical habitat for both species. The past and ongoing anthropogenic impacts described above have impacted these species and critical habitats through reduced quantity and quality of the migratory and rearing habitat.

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

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

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

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

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

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

## 2.5 Effects of the Action

Under the ESA, “effects of the action” are all consequences to listed species or critical habitat that are caused by the proposed action, including the consequences of other activities that are caused by the proposed action (see 50 CFR 402.02). A consequence is caused by the proposed action if it would not occur but for the proposed action and it is reasonably certain to occur. Effects of the action may occur later in time and may include consequences occurring outside the immediate area involved in the action (see 50 CFR 402.17). In our analysis, which describes the effects of the proposed action, we considered the factors set forth in 50 CFR 402.17(a) and (b).

As described in Section 1.3, the City of Anacortes would install a new WWTP outfall that would extend into Guemes Channel. The marine portion of the pipeline would require up to 14 weeks of in-water work that would be done during the August 1 to February 15 in-water work window for the area. The work crew would work 8-hour workdays. They would operate barge-mounted heavy equipment to excavate/dredge about 415 feet of trench waterward of the HTL, and land-based heavy equipment to excavate about 60 feet of trench landward of the HTL. The substrate to be dredged is contaminated, and the landward excavation would include drilling and vibratory installation of sheet pile shoring. The work crew would also fabricate and float a 42-inch diameter HDPE pipeline that they would install in the trench and on the seafloor beyond, to a point about 1,097 feet from the HTL. They would backfill the trench with clean fill and cap it with fish-mix gravel. After the new outfall is complete, the pipeline would discharge effluent from the City's WWTP.

The best available information about the proposed work supports the understanding that the construction would cause direct effects on fish and habitat resources at the project site through exposure to work-related elevated noise, entrainment or bucket strike, water contamination, and propeller wash. The proposed work would also cause indirect effects on fish and habitat resources through work-related forage diminishment, and altered benthic habitat.

Additionally, although the proposed action would cause no change in the chemical nature or volume of the effluent carried by outfall pipeline, it would relocate the point of discharge, and cause several decades of continued municipal effluent discharge into Guemes Channel. Therefore, the project would also cause indirect effects on fish and habitat resources through effluent-related impacts.

As described in Section 2.2, adult and juvenile PS Chinook salmon migrate annually through the project area, larval and juvenile PS/GB bocaccio, and larval PS/GB yelloweye rockfish could also be episodically present in the area, and the project area has been designated as critical habitat for PS Chinook salmon, PS/GB bocaccio, and SR killer whales.

The proposed in-water work window overlaps with the latter part of the nearshore marine rearing and migration season for juvenile Chinook salmon as well the end of the season for returning adult Chinook salmon. Therefore, both adult and juvenile PS Chinook salmon and their critical habitat are likely to be exposed to the direct and indirect effects of the proposed action.

The proposed in-water work window also overlaps with parts of the seasons when larval and juvenile bocaccio and larval yelloweye rock fish are most likely to be present. However, due to the rarity of PS/GB bocaccio and PS/GB yelloweye rockfish in Puget Sound, it is extremely unlikely that individuals of either species would be present in the project area during the 14 weeks of in-water construction. Further, there is no suitable habitat for adult bocaccio and or juvenile and adult yelloweye rockfish in reasonable proximity to the project site. Therefore, it is extremely unlikely that any PS/GB bocaccio or PS/GB yelloweye rockfish would be exposed to the direct effects of the action, and it is extremely unlikely that any adult PS/GB bocaccio or juvenile or adult PS/GB yelloweye rockfish would exposed to any of the action's indirect effects.

### 2.5.1 Effects on Listed Species

Work-related Elevated Noise

The proposed nearshore pile driving, in-water dredging, and tugboat operations, including spud deployment, and upland blasting would cause fish-detectable levels of in-water noise. Exposure to that noise would adversely affect juvenile PS Chinook salmon, and cause minor effects on adults. For the reasons stated at the beginning of this section, it is extremely unlikely that any PS/GB bocaccio would be exposed to this stressor.

Until the end of their first summer in marine water, the normal behaviors of most juvenile Chinook salmon include a strong tendency toward shoreline obligation, which means that until mid- to late September, most individuals that pass through the project area would be biologically compelled to stay close to the shoreline. Therefore, it is very likely that juvenile Chinook salmon could be present along the shoreline at the project site during the first part of the project's August 1 to February 15 in-water work window. Conversely, adults migrating past the area would be independent of shoreline habitats, and therefore unlikely to be meaningfully exposed to this stressor.

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

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

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

Elevated in-water noise at levels capable of causing detectable effects in exposed fish would be caused by up to 4 weeks of nearshore pile driving, 3 weeks of in-water dredging, 6 weeks of backfilling of the trench, 14 weeks of tugboat operations, including spud deployment, and about 5 weeks of upland blasting. Work days would be about 8 hours long.

The estimated source levels (SL, sound level at 1 meter from the source) and acoustic signature information used in this assessment for in-water work are based on the best available information, as described in a recent biological opinion (NMFS 2018a) and multiple acoustic assessments for similar projects (NMFS 2016a; 2016b; 2017c & 2018b), and in other sources (Blackwell and Greene 2006; CalTrans 2015; Dickerson et al. 2001; FHWA 2017; McKenna et al. 2012; Picciulin et al. 2010; Reine et al. 2012 & 2014; Richardson et al. 1995; USACE 2011a).

The acoustic signature information and estimated SLs used in this assessment for upland blasting are based on the best available information, as described in the applicant's blasting plan (McMillen Jacobs 2022), a recent underwater sound level report for a project with upland blasting (Laughlin 2017), and other blasting-related documents (Brand 2021; Evans-Hamilton 2006; USN 2017).

According to the blasting plan, 3 blasts that would consist of a maximum of 6 separate 1.5- to 4-pound charges would be detonated with an 8-millisecond delay between detonations (McMillen Jacobs 2022; Widener 2023X). The closest point of blasting to the water would be about 180 feet (54.9 m).

The acoustic signature of a blast consists of a short-duration (fraction of second) impulse, in the frequency range of less than 10 Hz to over 10 kHz. However, the greatest amount of energy is below 500 Hz, and peak energy is typically between 10 and 100 Hz.

The applicant's blasting plan reports that charge weights and delay timing would be coordinated to limit in-air overpressures to no more than 0.5 psi to prevent damage to nearby structures, and they predict an in-air noise level (re 20 µPa) of 164 $dB_{peak}$. As a general rule of thumb, 26 dB must be added to an in-air sound level to estimate the in-water sound level (re 1 µPa) for the same source (Bradley and Stern 2008), suggesting that the planned blasting would have an equivalent in-water SL of about 190 $dB_{peak}$ (re 1 µPa).

However, Evans-Hamilton (2006) report in-water sound levels that suggest SLs of 203.4 $dB_{peak}$ and 180.6 $dB_{SEL}$ for 5.3-lb. charges, and Laughlin (2017) reports in-water sound levels that suggest SLs of 204 $dB_{peak}$, 195 $dB_{RMS}$, and 187 $dB_{SEL}$ for 7.5-lb. charges. To be protective of the fish and marine mammals that may be exposed to the planned blasting noise, this assessment assumes SLs of about 203 $dB_{peak}$, 194 $dB_{RMS}$, and 180 $dB_{SEL}$ for the planned 4-lb. charges.

The best available information supports the understanding that all of SLs for in-water work and upland blasting would be below the 206 $dB_{peak}$ threshold for the onset of instantaneous injury in fish.

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

Application of the practical spreading loss equation to the expected SL for upland blasting suggests that in-water noise levels above the 150 $dB_{SEL}$ threshold could extend 148 feet (45 m) into Guemes Channel during blasting. Similarly applying that equation to the SLs for in-water work suggests that noise levels above the 150 $dB_{SEL}$ threshold could extend to about 177 feet (54 m) around the barges when they deploy spuds, 151 feet (46 m) around vibratory pile driving, 72 feet (22 m) around tugboats, and about 13 feet (4 m) around bucket strikes during dredging (Table 5).

**Table 5.** Estimated in-water source levels for the loudest expected project-related sources with the estimated ranges to the source-specific effects thresholds for fish.

| Source | Acoustic Signature | Source Level | Threshold Range |
|---|---|---|---|
| Upland Blasting | < 1,600 Hz Impulsive | 203 $dB_{peak}$ | 206 @ N/A |
| 3 blast events per day over a 5-week period | | 180 $dB_{SEL}$ | 150 @ 100 m |
| Spuds | < 1,600 Hz Impulsive | 201 $dB_{peak}$ | 206 @ N/A |
| Sporadic episodes of 2 to 4 impulses anytime a barge is positioned | | 176 $dB_{SEL}$ | 150 @ 54 m |
| Vibrate 24-inch Steel Sheet Piles | < 2.5 kHz Non-Impulsive | 190 $dB_{peak}$ | 206 @ N/A |
| Periodic over 4 weeks of 8-hour days | | 175 $dB_{SEL}$ | 150 @ 46 m |
| Tugboat | < 2 kHz Combination | 185 $dB_{peak}$ | 206 @ N/A |
| Episodic periods measured in minutes to hours over 14 weeks | | 170 $dB_{SEL}$ | 150 @ 22 m |
| Dredge Bucket Strike | < 370 Hz Impulsive | 184 $dB_{peak}$ | 206 @ N/A |
| | | 167 $dB_{SEL}$ | 150 @ 4 m |

Upland blasting would consist of 3 daily blast events that would occur over an 8-hour period. Each blast would consist of numerous charges going off with a microsecond delay between each charge, such that the sound would likely be perceived as a very brief (likely less than 1 second duration) low-frequency impulse that would be fish-detectable up to 148 feet from the shoreline. The 3 daily blast events would be too few in number to be a concern for accumulated sound energy impacting listed fish.  Further, detectable noise would likely be limited to blasting along the portion of U Avenue that is within 328 feet (100 m) of the shoreline. Beyond that distance and along 3rd Street, in-water blasting noise would be below 150 $dB_{SEL}$.

Project-related dredging would last 3 weeks, extend to about 415 feet from the shoreline, and include the use of a spud-barge and a tugboat. Spud-barges typically have 2 or more spuds (steel pipes or girders) that they drop to the substrate and lock in place to hold their position (instead of using anchors). Each time a spud strikes the substrate, it would cause a brief sound impulse that would be fish-detectable up to 177 feet away. The exact per-day number spud deployments for this project is unknown and would be highly variable over time, but they would be relatively infrequent and too few in number to be a concern for accumulated sound energy impacting listed fish.

Up to 17 8-hour days of vibratory pile driving would be done over a 7-week period to install trench shoring from the HTL to 60 feet inland. An additional 5 8-hour days of vibratory extraction would be done to remove the shoring after the trench is backfilled. During that work, fish-detectable sound would extend up to 151 feet from the shoreline.

Project-related tugboat operations would likely occur almost daily during the 14 weeks of in-water work, and consist of relatively continuous periods during any day they are used. Fish-detectable sound would extend up to 72 feet around the tugboats.

Three weeks of project-related in-water dredging would be done within the first 415 feet from the shoreline. The acoustic characteristics of mechanical dredging with a clamshell bucket consists of a series of six distinct sound sources: 1) winch and derrick movement noises related to lowering the bucket; 2) bucket contact with the substrate; 3) bucket digging into the substrate; 4) bucket closing; 5) winch and derrick movement noises related to raising the bucket; and 6) noise from dumping dredge spoils into the hopper barge. The series repeats about every minute, with episodic breaks to reposition the barge or to dump the hopper (Dickerson et al. 2001). Bucket contact with the substrate is the loudest source, but fish-detectable noise would extend only about 13 feet from the bucket strikes.

Any or all of these sound sources could overlap temporally during the completion of this project. However, these sound sources are very unlikely to have any additive effects on sound intensity due the differences in the frequencies and other characteristics of their sounds. At most, the combination of the various types of equipment noise during any given day would cause fish-detectable in-water noise levels across the entire workday.

To be protective of fish, this assessment estimates work-related in-water noise levels above the 150 $dB_{SEL}$ threshold would be continuously present at the project site for 14 weeks of in-water work, and that the area of effect for fish would be described as a semicircle with a 151-foot radius around the pile driving location closest to the HTL, with an overlapping oval that would extend about 72 feet either side of the pipeline's 1,097-foot length, with brief periods where fish detectable noise would extend 177 feet from the barge when spuds are deployed. Additionally, 3 daily impulses of in-water noise levels above 150 $dB_{SEL}$ would be present over 5 weeks of upland blasting that could occur during, or completely separately, from the in-water work period. At most, the of effect from blasting would encompass a semicircular in-water area with a radius of about 148 feet situated off the north end of U Avenue.

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

The number of juvenile PS Chinook salmon that would be impacted by this stressor, and the intensity of any effects that an exposed individual may experience are unquantifiable with any degree of certainty. However, based on the work area's location relative to the numerous routes juvenile Chinook salmon follow along marine shorelines, on the relatively short duration of work, and on the expectation that, at most, the work would overlap with the latter part of the nearshore marine rearing and migration season for juvenile Chinook salmon when most individuals would have begun to move offshore, the number of individuals likely to pass the project area during the proposed work would comprise a very small subset of their population's cohort. Further, the number of individuals that are likely to be measurably affected by the exposure would most likely comprise a small subset of the total number of exposed individuals. Therefore, the number of PS Chinook salmon that would be meaningfully affected by work-related elevated noise would be too low to cause detectable population-level effects.

<u>Work-related Entrainment or Bucket Strike</u>

Work-related entrainment or bucket strike is not likely to adversely affect PS Chinook salmon or PS/GB bocaccio because it is extremely unlikely that individuals of either species would be exposed to the stressor. As stated earlier, it is extremely unlikely that any PS/GB bocaccio would be present during the proposed work.

In this context, entrainment refers to the uptake of aquatic organisms by dredge equipment. Entrainment could occur if an organism is enclosed and transported out of the water within the clamshell or scoop bucket. As it sounds, bucket strike is the situation where an organism is struck by the bucket as it descends to the substrate. Any fish that become entrained within the digging bucket, or that are struck by the bucket as it descends would likely be killed.

Both mechanical and hydraulic dredges commonly entrain slow-moving and sessile benthic epifauna, burrowing infauna, as well as algae and aquatic vegetation. However, the documented occurrences of dredging-related entrainment and/or bucket strike of mobile fish are extremely rare. In the southeast region of the US, where closely monitored heavy dredging operations occur regularly in areas inhabited by sturgeon and sea turtles, only two live sturgeon (NMFS 2012) and two live sea turtles (NMFS 2011) are known to have been taken by clamshell dredging since 1990. The rarity of these occurrences is likely due to a combination of factors. In order to be entrained in a clamshell bucket, a fish must be directly under the bucket when it drops, and the relatively small size of the bucket, compared against the scattered and low-density distribution of the fish across the available habitat within a project area strongly suggest that the potential for overlap between fish and bucket presence is very low, and that potential would decrease after the first few bucket cycles because mobile organisms such as salmon are likely to move quickly away from the noise and turbid water. Further, mechanical dredges typically stay within an area limited to the range of the crane/excavator arm for many minutes to several hours before moving to an adjacent area. Therefore, based on the best available information, the NMFS considers it extremely unlikely that any PS Chinook salmon would be entrained or struck by the bucket during the planned maintenance dredging.

Work-related Water Contamination

The proposed project would cause water quality impacts through increased turbidity, reduced dissolved oxygen, and introduction of toxic materials. Exposure to these stressors would adversely affect juvenile PS Chinook salmon, and cause minor effects on adults. For the reasons stated at the beginning of this section, it is extremely unlikely that any PS/GB bocaccio would be exposed to this stressor.

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

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

Mechanical dredging in areas containing high levels of fine-grained material can cause suspended sediment plumes that may extend 200 to 500 feet down-current from the point of dredging, and take hours after work has stopped to return to background levels. LaSalle et. al. (1991) reported suspended sediment concentrations of about 700 mg/L at the surface, and 1,100 mg/L near the bottom, about 300 feet from clamshell dredging in areas containing high levels of fine-grained material. During monitored clamshell dredging of inner Grays Harbor, the suspended sediment concentrations exceeded 500 mg/L in 23 of 600 samples, and seven of those samples were for tests of ambient conditions (USACE 2011b). The single highest reported concentration was 3,000 mg/L when the ambient TSS concentration was 700 mg/L.

Tugboat propeller wash would also mobilize bottom sediments. The intensity and duration of the resulting turbidity plumes are uncertain, and would depend on a combination of the tugboat's thrust, the water depth under it, and the type of substrate. The higher the thrust and the finer the sediment, the more sediment that is likely to be mobilized. Fine material (silt) remains mobilized longer than coarse material (sand). The shallower the water, the more thrust energy that would reach the substrate. A recent study described the turbidly caused by large tugboats operating in Navy harbors (ESTCP 2016). At about 13 minutes, the plume extended about 550 yards (500 m), where the TSS concentration was about 80 mg/L. The plume persisted for hours and extended far from the event, but the TSS concentration fell to 30 mg/L within 1 hour and to 15 mg/L within 3 hours. At its highest concentration, the plume was below the concentrations required to elicit physiological responses reported by Newcombe and Jensen (1996). The exact extent of turbidly plumes from tugboat operations for this project are unknown, but it is extremely unlikely that they would exceed those described above. Based on that information, and on the consultations for similar projects in the region, sediment mobilization from tugboat propeller wash would likely consist of relatively low-concentration plumes that could extend to about 300 feet from the tugboat, and last a low number of hours hour after the disturbance.

The City's WQMPP for this project requires the work crew to monitor and limit turbidity such that, at 150 feet from the source of turbidity, turbidity would not exceed 5 NTU over background levels of 50 NTU or less, or 10% over background for background levels above 50 NTU. However, this doesn't guarantee that some project-related mobilized sediments and turbidity will not spread beyond 150 feet. To be protective, this assessment assumes that work-related turbidity may extend as far as 300 feet from in-water work, but at levels below the limits stated immediately above. The most likely effects of salmonid exposure to the expected action-related turbidity concentrations would be temporary behavioral effects such as avoidance of the plume, mild gill flaring, and slightly reduced feeding rates.

Dissolved Oxygen: Mobilization of anaerobic sediments can decrease dissolved oxygen levels (Hicks et al., 1991; Morton 1976). The impact on dissolved oxygen is a function of the oxygen demand of the sediments, the amount of material suspended in the water, the duration of suspension, and the water temperature (Lunz and LaSalle 1986; Lunz et al. 1988). Reduced dissolved oxygen can affect salmonid swimming performance (Bjornn and Reiser 1991), as well as cause avoidance of water with low dissolved oxygen levels (Hicks 1999). Based on the project's Dredging, Dewatering, and Backfill Plan and Nearshore Sediment Characterization Report (DOF 2021b & c), the surface sediments at the site contain up to 75 percent wood debris by volume in a matrix of silt and fine sand, and the total organic carbon and total volatile solids exceed recommended levels for wood waste in sediments. Therefore, the NMFS considers it very likely that sediment mobilization during dredging could lower dissolved oxygen levels within the 150-foot point of compliance for turbidity, especially in the area immediately adjacent to the dredging. The most likely effects of salmonid exposure to action-related reduced dissolved oxygen would be temporary behavioral effects such as reduced swimming performance and avoidance of the area of effect.

Toxic Materials: The proposed dredging would mobilize contaminated sediments, and the operation of vessels and construction equipment is likely to introduce toxic materials to the water from equipment-related spills and discharges.

As described in the environmental baseline section of this opinion, the sediments along the proposed trench alignment are contaminated with PAHs, PCBs, Aroclors, and Dioxin/Furans (DOF 2021b & c). The planned dredging would mobilize these pollutants into the water column. The exact in-water concentrations of contaminants that would be mobilized by the planned dredging is uncertain, but are likely to be low. The concentrations of contaminants that would be mobilized by the planned dredging would be proportional to the amount of dredging and the levels of contamination. The best available information suggest that sediment resuspension rates for clamshell dredging would somewhere between 1 and 3 percent (Bridges et al. 2008; USACE 2016). The City estimates that the project would remove about 2,350 cubic yards of contaminated sediment. Assuming 3 percent resuspension suggests that about 70.5 cubic yards of contaminated sediment would be re-suspended into the water column over 42 days of dredging. Based on this information, about 1.7 cubic yards of contaminated sediment would be mobilized per day, and about 0.2 cubic yard of contaminated sediment would be mobilized per hour, based on the assumption of 8 hours of continuous dredging per workday. Given the high levels of very fine sediment in the area, much of the material could remain suspended for hours after it is initially mobilized (Bridges et al. 2008). Therefore sediments are likely to accumulate in the water column. Assuming 0.2 cubic yard of sediment mobilization per hour and a 4-hour suspension time for mobilized sediments, up to about 0.8 cubic yard of contaminated sediment could be suspended in the water around the dredge.

The operation of vessels and construction equipment routinely results in leaks and spills of fuels, lubricants, and other fluids that can enter the water. Many of the fuels, lubricants, and other fluids commonly used in vessels and construction equipment are petroleum-based hydrocarbons that contain PAHs, PCBs, phlalates, other organic compounds, and metals. The project includes BMPs specifically intended to reduce the risk and intensity of discharges and spills. In the event of a spill or discharge, the event would likely be relatively small, quickly contained and cleaned. Based on the best available information, the in-water presence of contaminants related to vessel and equipment operation would be infrequent, short-lived, and at relatively low concentrations.

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). Depending on the pollutant, its concentration, and/or the duration of exposure, exposed fish may experience effects that can range from avoidance of an affected area, to reduced growth, altered immune function, and mortality (Beitinger and Freeman 1983; Brette et al. 2014; Feist et al. 2011; Gobel et al. 2007; Incardona et al. 2004, 2005, and 2006; Mcintyre et al. 2012; Meadore et al. 2006; Sandahl et al. 2007; Spromberg et al. 2015).

PAHs can cause reduced growth, increased susceptibility to infection, and increased mortality in juvenile salmonids (Eisler 1987; Meador et al. 2006; Varanasi et al. 1993). Gill tissues are highly susceptible to damage because they actively pass large volumes of water and are thereby exposed to PAHs present in water (USACE 2016). Other effects include damage to the skin, fins, and eyes, as well as damage to internal organs as liver tumors.

Dioxins and dioxin-like PCBs are highly toxic pollutants that can cause cancer, reproductive and developmental problems, damage to the immune system, and can interfere with hormones in nearly every vertebrate species, at nearly every stage of development (CHEJ 2020; Eisler 1986;

Meador et al. 2002; NIEHS 2020; Singh et al. 2016; USEPA 2020). The specific effects of salmonid exposure to dioxins, and to the other pollutants identified in the Dredging, Dewatering, and Backfill Plan and the Nearshore Sediment Characterization Report are poorly understood, and no thresholds of effect are available.

To summarize, the proposed project would cause water quality impacts through increased turbidity, reduced dissolved oxygen, and the introduction of toxic materials. The resulting pollutant concentrations are undeterminable with the available information, but are expected to undetectable beyond 300 feet of on-going work. Within that distance, pollutant concentrations are unlikely to exceed thresholds for acute injuries or mortality. However, at a minimum, exposure to project-related pollutants would cause temporary behavioral disturbance that would likely include avoidance of the affected area, gill flaring, reduced feeding rates, and reduced swimming performance. At closer proximity to the work and or longer periods within the affected area, exposed individuals may experience long-term fitness impacts such as reduced growth and altered immune function that could reduce their long-term survival.

In summary, work-related turbidity, reduced dissolved oxygen, and toxics concentrations are expected to be undetectable beyond 300 feet of on-going work. Within that distance, they are unlikely to be directly injurious to exposed juvenile Chinook salmon. However, at a minimum, they are likely to be intense enough to cause temporary behavioral disturbances such as avoidance of the affected area, altered migration, gill flaring, reduced feeding rates, reduced swimming performance, and increased vulnerability to predators. It may also act synergistically with work-related noise to increase the likelihood and or intensity of avoidance and vulnerability to predators in exposed individuals. At closer distances and or longer periods of exposure, exposed individuals may experience long-term fitness impacts such as reduced growth and altered immune function that could reduce their long-term survival.

The number of juvenile PS Chinook salmon that would be impacted by this stressor, and the intensity of any effects that an exposed individual may experience are unquantifiable with any degree of certainty. However, for the same reasons stated above for work-related noise, the number of individuals likely to pass the project area during the proposed work would comprise a very small subset of their population's cohort. Further, the number of individuals that are likely to be measurably affected by the exposure would most likely comprise a small subset of the total number of exposed individuals. Therefore, the number of PS Chinook salmon that would be meaningfully affected by work-related elevated noise would be too low to cause detectable population-level effects.

<u>Work-related Propeller Wash</u>

Work-related propeller wash is likely to adversely affect juvenile PS Chinook salmon, but cause only minor effects in adults. For the reasons stated at the beginning of this section, it is extremely unlikely that any PS/GB bocaccio would be exposed to this stressor.

Spinning boat propellers kill fish and small aquatic organisms (Killgore et al. 2011; VIMS 2011). Spinning propellers also generate fast-moving turbulent water (propeller wash) that can displace and disorient small fish, as well as dislodge benthic aquatic organisms and submerged aquatic vegetation (SAV), particularly in shallow water and or at high power settings (propeller scour).

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

Juveniles that are struck or very nearly missed by the spinning propellers would be injured or killed by the exposure. At greater distances, the boats' propeller wash may displace and disorient fish. Depending on the direction and strength of the thrust plume, displacement could increase energetic costs, reduce feeding success, and may increase the vulnerability to predators for individuals that tumble stunned and or disoriented in the wash. Although the likelihood of this interaction is very low for any individual fish or individual boat trip, it is reasonably likely that at least some juvenile PS Chinook salmon would experience reduced fitness or mortality from exposure to this project's work-related propeller wash.

The project would dredge the area that would be vulnerable to propeller scour, thereby removing the SAV and benthic organisms from that area. Therefore, work-related propeller scour would cause little to no measurable effects on benthic resources at the site. Therefore, it is extremely unlikely that work-related propeller scour would cause any detectable effects on the fitness and normal behaviors of juvenile Chinook salmon.

The number of juvenile PS Chinook salmon that would be exposed to propeller wash, and the intensity of any effects that an exposed individual may experience are unquantifiable with any degree of certainty. However, for the same reasons stated above for work-related noise, the number of juvenile PS Chinook salmon that would be meaningfully affected by work-related propeller wash would be too low to cause detectable population-level effects.

<u>Work-related Forage Diminishment</u>

Forage diminishment is likely to adversely affect juvenile PS Chinook salmon and juvenile PS/GB bocaccio. As described earlier, the project would excavate a marine trench that would be about 420 feet long by 50 feet wide, and doing so would mobilize about 70.5 cubic yards of sediment that is contaminated with PAHs, PCBs, Aroclors, and Dioxin/Furans (DOF 2021b & c). The dredging would also remove the SAV and other benthic organisms along the trench's alignment.

Romberg (2005) discusses the spread of contaminated sediments that were mobilized by work that included digging into contaminated sediment with a clamshell bucket. Soon after the work, elevated PAH levels were detected across the surface of a clean sand cap 250 to 800 feet away. Contaminant concentrations decreased with distance from the work site, and over time. However, PAH concentrations remained above pre-contamination levels 10 years later. Lead and mercury values also increased on the cap, but the concentrations of both metals decreased to background levels after 3 years.

Most of this project's mobilized sediments are likely to settle back to the seafloor fairly close to the trench. Therefore contaminant concentrations would be highest close to the trench, with concentrations diminishing with distance to about 300 feet from the trench. Within that area, the contaminants would be biologically available for years, at steadily decreasing levels as they become covered by new sediments. While present, some of those contaminants are likely to be taken up by some of the invertebrate prey organisms within the affected area.

Fish can absorb contaminants through dietary exposure (Meador et al. 2006; Varanasi et al. 1993). Amphipods and copepods can uptake PAHs from contaminated sediments (Landrum and Scavia 1983; Landrum et al. 1984; Neff 1982), and pass them to juvenile Chinook salmon and other small fish through the food web. Varanasi et al. (1993) found high levels of PAHs in the stomach contents of juvenile Chinook salmon in a contaminated waterway (Duwamish). They also reported reduced growth, suppressed immune competence, as well as increased mortality in juvenile Chinook salmon that was likely caused by the dietary exposure to PAHs. Meador et al. (2006) demonstrated that dietary exposure to PAHs caused "toxicant-induced starvation" with reduced growth and reduced lipid stores in juvenile Chinook salmon. The authors surmised that these impacts could severely impact the odds of survival in affected juvenile Chinook salmon. Some subset of the annual cohort of juvenile Chinook salmon would migrate past the project site each year, and some juvenile bocaccio may also settle out and rear in the area over the years that project-related contaminated are likely to be biologically available. While in the affected area, at least some of those juveniles are likely to feed on the invertebrate resources, some of which may be contaminated by dredge-mobilized sediments.

Adjacent to the trench, the increased levels of contaminants at the project site may also kill some of benthic infaunal and epifaunal invertebrate organisms, further diminishing the number, size, and species diversity of prey organisms that would be available to foraging juvenile Chinook salmon and bocaccio. When juvenile fish encounter areas of diminished prey, competition for those limited resources increases, and less competitive individuals are forced into suboptimal foraging areas (Auer et al. 2020). Further, individuals with an inherently higher metabolism tend to be bolder and competitively dominant, and may outcompete other individuals for resources within a microhabitat, potentially increasing interspecific mortality (Biro and Stamps 2010).

The dredging would also remove the benthic infaunal and epifaunal invertebrate organisms from an area of about 21,000 square feet along its alignment (Armstrong et al. 1981), and exposed pipeline anchors would permanently cover about 1,000 square feet of benthic habitat between about -30 and -69 feet re. MLLW, thereby reducing invertebrate abundance in the project area. Dredging would also remove SAV, which provides important structural environments that form the base of detrital-based food webs that are a source of secondary production by supporting epiphytic plants, animals, and microbial organisms that in turn are grazed upon by other invertebrates and by larval and juvenile fish (NMFS 1997). The removal of the resident benthic invertebrates reduces the availability of their larvae, as well as larger invertebrates and larval fish that prey on them, and in turn are prey for juvenile salmon (NMFS 2006). The available information to describe ecosystem responses to dredging indicates that little recovery occurs during the first seven months after dredging. After that, early successional fauna would begin to dominate over the next six months (Jones and Stokes 1998). The rate and degree of SAV recovery is uncertain, but could also take more than a year. Therefore, the proposed dredging would temporarily reduce the availability of benthic organisms and SAV along the trench alignment and full recovery of the dredged area may take years. Most of the benthic substrate under the pipe anchors would be largely lost to SAV and invertebrate production into perpetuity. However, that area would be comparatively small, and may be partially offset by SAV and invertebrate development on the pipe and its anchors.

In summary, some of the juvenile Chinook salmon and juvenile bocaccio that swim through and or settle out within the affected area would be exposed to some combination of dredging-related contaminated forage and or reduced forage availability that would reduce their long-term fitness. The annual numbers of either species that may be exposed to this stressor are unquantifiable with any degree of certainty. Further, they are likely to vary and diminish over time. Similarly, the amount of contaminated prey, the contaminant concentration levels in the affected prey, and or the amount of reduced prey availability that any individual fish may be exposed to are uncertain and likely to be variable over time.

Based on the work area’s location relative to the numerous routes juvenile Chinook salmon follow along Puget Sound shorelines, on the rarity of bocaccio in Puget Sound, and on the small size of the affected area, the annual numbers of individuals from either species likely to be present within the affected area would comprise very small subsets of their respective populations’ cohort. Further, based on the small affected area, the low volume of contaminated sediment that would settle back on the substrate, and the expectation that most individuals would pass through the area relatively quickly to reach more favorable habitat, the numbers of individuals that would be measurably affected by action-related forage impacts would most likely comprise small subsets of the total number of exposed individuals. Therefore, the number of PS Chinook salmon and PS/GB bocaccio that would be meaningfully affected by action-related forage diminishment would be too low to cause detectable population-level effects.

Altered Benthic Habitat

Altered benthic habitat would adversely affect juvenile PS Chinook salmon and PS/GB bocaccio. The work crew would excavate a marine trench that they would backfill with clean material within weeks of its creation. The backfill would include a cap of location appropriate sand and gravel. They would also install 1,097 feet of 42-inch diameter pipeline waterward of the HTL. The seaward 677 feet of pipeline would be exposed and anchored to the seafloor by 50 concrete anchors that would be spaced about 13.5 feet apart.

Although SAV is limited at the project site, the dredging would remove all of it from about 21,000 square feet of substrate between the HTL and -30 feet re. MLLW. The exposed pipeline’s concrete anchors would also permanently cover about 1,000 square feet of benthic habitat from about -30 to -69 feet re. MLLW. In addition to SAV’s support of food webs, it also provides structure and shelter that are important for juvenile salmon and rockfish in nearshore marine habitats. Therefore, the loss of the SAV would reduce the suitability of the project area for juvenile Chinook salmon and other small fish, and would increase their exposure and vulnerability to predators until the SAV fully recovers.

Based on the timing and duration of the work, any effects the loss of the SAV may have on juvenile Chinook salmon during the work season are likely to be virtually undetectable against the effects of the on-going work, and juvenile bocaccio are very unlikely to be present during the construction. However, because it could take more than a year for the SAV to fully recover, it is likely that some of the juvenile Chinook salmon cohort that migrates past the project area during the spring and summer of the following year would experience reduced SAV availability that would increase their exposure and vulnerability to predators, and may act synergistically with the diminished forage discussed above to reduce the fitness and long-term survival of some individuals. Because of their rarity, it is very unlikely that any juvenile bocaccio would be present it the area the following year.

The clean fill and capping over the trench would create a 50- foot wide band of substrate between the HTL and -30 feet re. MLLW that would be relatively free of surface layer contaminants. As such, it may slightly improve nearshore habitat conditions at the site. However the degree to which it would improve habitat conditions is uncertain.

The exposed pipeline would extend along the seafloor for about 677 feet, and at depths from about -30 to -69 feet re. MLLW. The pipeline would provide hard surface structure that may provide shelter for benthic fish, and may also support increased growth of attached macroalgae and kelps. Because migrating juvenile Chinook salmon are most likely to remain in shallow water very close to shore while in the area, they are very unlikely to interact with the exposed pipeline and the organisms that populate it. Therefore, it is very unlikely that the exposed pipeline would cause any detectable effects on their normal behaviors or fitness.

The new structure created by the pipeline may improve shelter and rearing resources for juvenile bocaccio. However, those features are also likely to attract fish to the pipeline section that is within the effluent mixing zone. Therefore, over the pipeline’s decades-long expected life, it is likely that some juvenile bocaccio would be attracted to the pipeline, and that some of those fish would enter and remain within the mixing zone long enough to experience reduced fitness from exposure to the effluent. The potential effects of exposure to the effluent is discussed in more detail in the next effects assessment.

The annual numbers of PS Chinook salmon and juvenile PS/GB bocaccio that may be annually exposed to action-related altered benthic habitat are unquantifiable with any degree of certainty. Further, they are likely to vary, and in the case of reduced SAV availability, diminish over time.

Based on the same reasoning as expressed above under diminished forage, the annual numbers of either species that are likely to be present within the affected area would comprise very small subsets of their respective populations’ cohort. Further, based on the expectation that the SAV would fully recover within two years, no more than 2 Chinook salmon cohorts would be detectably affected by the temporary loss of SAV. Based on their rarity in Puget Sound, very few juvenile bocaccio are expected to be present at the project site over the life of the pipeline, and only a small subset of those fish are likely to be meaningfully affected by exposure to the effluent due to the physical presence of the pipeline. Therefore, the annual numbers of PS Chinook salmon and PS/GB bocaccio that would be meaningfully affected by action-related altered benthic habitat would be too low to cause detectable population-level effects.

Effluent-related Impacts

The proposed action result in the decades-long continuation of WWTP effluent discharge in Guemes Channel, and relocate point of discharge in the channel (Figures 1 & 2). Exposure to that effluent would adversely affect PS Chinook salmon, PS/GB bocaccio, and PS/GB yelloweye rockfish.

Background: The Anacortes WWTP treats the sewer and stormwater for a population of about 17,000 individuals. It provides secondary treatment, using activated sludge to remove about 85 percent of the influent's suspended and dissolved solids. The existing diffuser is located in the marine waters of Guemes Channel, off the west side of the Port of Anacortes Pier 2 (Figures 2 & 11). The outfall is located about 400 feet waterward of the HTL, at a depth of about -33 feet re. MLLW (City of Anacortes 2017).

The WWTP currently discharges its effluent under National Pollutant Discharge Elimination System (NPDES) Waste Discharge Permit No. WA0020257, which was issued by the WDOE and expires November 30, 2022 (WDOE 2017). The permit requires that discharges comply with the provisions of the State of Washington Water Pollution Control Law Chapter 90.48 Revised Code of Washington and the Federal Water Pollution Control Act (Clean Water Act) Title 33 United States Code, Section 1342 et seq. This assessment assumes that the current NPDES permit will be renewed with similar limitations as the existing permit.

The Anacortes WWTP is a small facility, permitted for a maximum month design flow of 4.5 million gallons per day (MGD), with authorized combined sewer overflow (CSO)-related bypasses of the secondary treatment portion of the WWTP when precipitation events cause the instantaneous inflow rate to exceed 7.8 MGD. The City reports that the average daily effluent flow is 2.1 MGD and that the maximum flow rate is 10.1 MGD (Widener 2022p). By comparison, the King County South WWTP is permitted for a maximum month design flow of 144 MGD (WDOE 2015).

The NPDES permit limits the discharge of Carbanaceous Biochemical Oxygen Demand (5-day; $CBOD_5$) to a weekly average of 1,501 pounds per day, Total Suspended Solids (TSS) to a weekly average of 1,689 pounds per day, pH to 6.0 to 9.0 standard units, Fecal Coliform Bacteria to a weekly geometric mean of 400 cfu/100ml, Total Residual Chlorine (TRC) to a daily maximum of 403 µg/L, and Acute Toxicity to no exceedance of the acute critical effluent concentration (ACEC) at the boundary of the acute mixing zone. The permitted chronic and acute mixing zones are cylinders that extend from the seafloor to the top of the water column around the diffuser ports with respective radii of 231 and 23.1 feet (70.4 and 7.04 meters) (WDOE 2017).

Based on the best available information, we have identified acute toxicity, chronic toxicity, and exposure to altered environmental conditions as potential effects associated with the discharge of wastewater from the King County South WWTP.

**Acute Toxicity and Chronic Accumulation of Contaminants**

Contaminants and Potential Effects: As described under Work-related Water Contamination, fish can uptake contaminants directly through their gills, and through dietary exposure. Direct exposure to effluent-borne pollutants can cause effects in exposed fish that range from avoidance behaviors, to reduced growth, altered immune function, and immediate mortality in exposed individuals. The intensity of effects depends largely on the pollutant, its concentration, the duration of exposure, and the lifestage of the exposed individual.

In addition to the pollutants identified above, WWTP effluent typically includes Anthropogenic Trace Compounds (ATCs), which are unregulated and of growing concern in aquatic habitats. ATCs include micropollutants, such as pharmaceuticals and personal care products (PPCPs), as well as surfactants, industrial chemicals, and pesticides that are discharged in municipal wastewater (Gerbersdorf et al. 2015; USEPA 2013). Microplastics and automotive-related pollutants are other pollutants of growing concern that are discharged in municipal wastewater (Chan et al. 2019; Du et al. 2017; Garcia et al. 2020; Gola et al. 2021; Mason et al. 2016; Masoner et al. 2019; NWFSC 2022a & b; Peter et al. 2018; Tian et al. 2020).

WWTP effluents are a major source of ATCs in aquatic habitats, including marine and coastal environments (Fabbri and Franzellitti 2016; Harding et al. 2016; Lubliner et al. 2010; Mottaleb et al. 2015; Srain et al. 2020; Valder et al. 2014). ATCs and microplastics are continuously discharged into all of the sanitary sewer systems of the world due to routine household and industrial use of source products. Automotive-related pollutants are sometimes improperly disposed of directly into sanitary sewer systems. They also enter sanitary sewer systems that are combined with local stormwater discharge systems.

Standard waste water treatment systems, including secondary treatment systems are not designed to remove ATCs, microplastics, and automotive-related pollutants, and consequently remove only a portion of those pollutants from the wastewater stream (Gerbersdorf et al. 2015; Lubliner et al. 2010; Mason et al. 2016; Ramirez et al. 2009; USEPA 2013). Tertiary treatment systems typically remove only select pollutants effectively (USEPA 2013).

Therefore, nearly all municipal WWTP effluents contain a complex mixture of ATCs that include antibiotics, analgesics, endocrine disruptors, microbial disinfecting substances, carcinogens, toxic chemicals, as well as microplastics that are discharged to receiving waters on a continuous basis (Gerbersdorf et al. 2015; Jobling et al. 1998; Kidd et al. 2007; Lubliner et al. 2010; Mason et al. 2016; Ramirez et al. 2009; USEPA 2013). A recent survey of surface and groundwater sources that was done by the U.S. Geological Survey (USGS) found Hexahydrohexa methylcyclopentabenzopyran (HHCB; a synthetic musk used as a fragrance in cosmetics) was the most commonly detected PPCP, followed by chloroform and tri(2-utoxyethyl)phosphate (Valder et al. 2014). HHCB is considered very toxic to aquatic life with long lasting effects (NIH 2022). The U.S. Environmental Protection Agency's (USEPA)

National Rivers and Streams Assessment found 7 pharmaceuticals and 2 personal care product chemicals in the fish tissue samples, with antihistamines, antidepressants, and musks being the most prevalent (USEPA 2013). Nearly all municipal WWTP effluents also continuously contain millions of microplastic particles (Mason et al. 2016). During rainstorms, the effluents from WWTPs like the Anacortes WWTP would also include automotive-related pollutants such as PAHs, 6-PPD and 6-PPD Quinone (6PPD-q), trace metals, and other pollutants that enter the wastewater stream from roadway stormwater drainage systems (NWFSC 2022a).

ATCs, microplastics, and automotive-related pollutants usually occur in aquatic habitats at low but consistent concentrations. However, many aquatic species, including salmonids, experience sub-lethal adverse effects from exposure to ATCs at environmentally relevant concentrations (low nanogram per liter ng/L range), particularly for pharmaceuticals and pesticides that are designed to cause physiological effects at very low concentrations (Fabbri and Franzellitti 2016; Gerbersdorf et al. 2015; Lubliner et al. 2010; Parrott and Blunt 2005; Srain et al. 2020; USEPA 2013). In freshwater environments, adult coho salmon are known to experience lethal effects from exposure to environmentally relevant concentrations of automotive-related pollutants (NWFSC 2022a)

ATCs are increasingly reported in a variety of biological matrices, including fish tissue (Ramirez et al. 2009). Additionally, most PPCPs are persistent and tend to bioaccumulate in cell tissue (Mottaleb et al. 2015; Muir et al. 2017; Srain et al. 2020). Therefore, for fish that remain in within an affected waterbody, on for those that migrate past numerous WWTP discharges, there is a high probability of cumulative effects from chronic exposure to the persistent and complex cocktail of ATCs in their environments (Gerbersdorf et al. 2015; Jobling et al. 1998; USEPA 2013)

Exposure to PPCPs at environmentally relevant concentrations has been shown to cause a wide range of sub-lethal metabolic effects and or tissue damage across a diverse list of aquatic species that included fish, arthropods, mollusks, echinoderms, planktonic invertebrates, plants, and bacteria, and some organisms experienced lethal effects at higher concentrations (Srain et al. 2020). PPCPs interfere with endocrine systems, disrupt homeostasis, and cause a host of abnormalities in aquatic organisms that are exposed to them (Fabbri and Franzellitti 2016; Gerbersdorf et al. 2015; Srain et al. 2020). Further, mixtures of PPCPs led to toxic effects, even when individual PPCP concentrations were below their threshold for effect (Srain et al. 2020).

Reproductive impacts are the most commonly reported effects in fish that are exposed to PPCPs environmentally relevant concentrations. Environmental exposure to PPCPs during the sexual differentiation phase of embryonic development has been shown to induce sex reversal and or intersexuality, while exposure during sexual maturation has been shown to inhibit gonadal development in both males and females. It also causes feminization in juvenile males (intersexuality), and reduced fecundity (Fabbri and Franzellitti 2016; Gerbersdorf et al. 2015; Harding et al. 2016; Jobling et al. 1998; Kidd et al. 2007; Lubliner et al. 2010; Parrott and Blunt 2005; Srain et al. 2020). Lubliner et al. (2010) also report that the female to male ratio in white sucker fish that were downstream of a WWTP discharge was 90% female to 10% male, and that there was also an increased incidence of intersex fish. Kidd et al. (2007) report that exposure to environmentally relevant concentrations of a synthetic estrogen quickly led to the near extirpation of fathead minnows in a test lake.

Microplastics are widely detected in U.S. municipal WWTP effluent, and it is estimated that over 4 million microplastic particles are discharged per facility per day. Plastic fragments, pellets, and fibers are the most common type of microplastic particles within the effluent. Many of the plastic fragments and pellets found in the effluent are thought to come from the ‘microbeads’ that are found in many cosmetics and personal care products, but some likely originate from other plastic objects that enter the wastewater stream. Although most microfibers are plastic, some probably originate from non-plastic sources (Mason et al. 2016).

Aquatic animals close to urban areas have high accumulations of microplastics in their tissues, with no significant difference in accumulation between fish species (Chan et al. 2019; Garcia et al. 2020; Gola et al. 2021). Ingestion of microplastics can cause physiological responses such as alterations in metabolic processes and intestinal activity, as well as altered predation behaviors and swimming performance (Chan et al. 2019; Garcia et al. 2020). Microplastics accumulate in the gills, guts, and liver of fish, and cause multiple toxic effects including inflammation, increased enzyme activity, and altered metabolic pathways (Lu et al. 2016). The accumulation of microplastics can create a false sense of satiety and or cause blockage of the gastrointestinal tract that may prevent the ability to consume adequate forage, both of which can lead to starvation (Chan et al. 2019; Garcia et al. 2020). Microplastics can also act as a carrier of other pollutants, and accelerate bioaccumulation through food chains. Organic pollutants, heavy metals, and other chemicals easily attach to microplastics, which enter the food web when the particles are mistakenly ingested by organisms that are subsequently consumed by other aquatic animals (Garcia et al. 2020; Gola et al. 2021).

Automotive-related pollutants are likely to be present in WWTP effluents during rainstorms for systems that are combined with stormwater drainage systems.  They may also be episodically present when automotive-related products are improperly disposed of directly into sanitary sewer systems. The full suite of roadway-related chemicals under possible review now numbers in the thousands. However, three distinct but co-occurring classes of harmful automotive-related contaminants have been identified, and are ubiquitous in roadway stormwater runoff: PAHs (particularly phenanthrene), metals (particularly copper) and 6PPD and its abiotic transformation product 6PPD-q (NWFSC 2022a).

PAH toxicity in fish, including salmonids, is often sub-lethal and delayed in time, but all fish species studied to date are vulnerable to PAH toxicity, with thresholds for severe developmental abnormalities often in the low parts-per-billion (µg/L) range. PAHs bioconcentrate to high levels in fertilized fish eggs, and have been shown to cause complete heart failure and extra-cardiac defects that often lead to mortality at or soon after hatching. In larval fish, PAH exposure has been shown to cause abnormal development of the heart, eye and jaw structure, and energy reserves (Harding et al. 2020; NWFSC 2022a). In juvenile fish, PAHs can cause reduced growth, increased susceptibility to infection, and increased mortality (Eisler 1987; Meador et al. 2006; Varanasi et al. 1993). Gill tissues are highly susceptible to damage from PAHs present in the water (USACE 2016). Other effects include damage to the skin, fins, and eyes, as well as damage to internal organs such as liver tumors.

Exposure to dissolved copper concentrations between 0.3 to 3.2 µg/L above background levels has been shown to cause avoidance of an area, to reduce salmonid olfaction, and to induce behaviors that increase juvenile salmon's vulnerability to predators in freshwater (Giattina et al. 1982; Hecht et al. 2007; McIntyre et al. 2012; Sommers et al. 2016; Tierney et al. 2010). However, copper is much less toxic to fish in saltwater than in freshwater. Baldwin (2015) reports that dissolved copper's olfactory toxicity in salmon is greatly diminished with increased salinity. In estuarine waters with a salinity of 10 parts per thousand (ppt), no toxicity was reported for copper concentrations below 50 µg/L. Sommers et al. (2016) report no copper-related impairment of olfactory function in salmon in saltwater.

6PPD and its abiotic transformation product 6PPD-q is deposit onto roads from motor vehicle tire ware, and is the primary cause of urban runoff coho mortality syndrome in adult Puget Sound coho (Tian et al. 2020). The mechanisms underlying mortality in salmonids is under investigation, but likely involve cardiorespiratory disruption (NWFSC 2022a). Coho juveniles appear to be similarly susceptible to the acutely lethal toxicity of 6PPD/6PPD-q (Chow 2021; McIntyre 2015). Laboratory studies have also demonstrated that juvenile steelhead and juvenile Chinook salmon are also susceptible to varying degrees of mortality when exposed to urban stormwater (McIntyre and Scholz, unpublished results, 2020). The onset of mortality is very rapid in coho (i.e., within the duration of a typical runoff event), but more delayed in steelhead and Chinook salmon (NWFSC 2022a).

<u>Exposure:</u> Mixing zones are specific portions of a waterbody within which wastewater discharges are allowed to mix with and become diluted by the surrounding waters. It is beyond the boundary of the zone where specified standards must be met. Acute mixing zones are intended to prevent lethality of organisms that pass beyond the zone's boundary. However, organisms that are within the acute mixing zone may be exposed to lethal effluent concentrations. Similarly, the chronic mixing zone is intended to prevent chronic effects in organisms that pass beyond the zone's boundary, but organisms that are within the chronic mixing zone can be exposed to effluent concentrations capable of causing chronic effects (USEPA 2014). Therefore, in Guemes Channel, marine organisms that are within the 23.1-foot radius acute mixing zone around the new outfall diffuser may be exposed to lethal effluent concentrations, and organisms that are within the 231-foot radius chronic mixing zone may be exposed to contaminants at concentrations that would cause chronic effects.

As described earlier, the existing outfall is located in Guemes Channel, about 400 feet offshore, and at a depth of about 33 feet. The proposed action would relocate the outfall to a position about 1,097 feet offshore (Figure 2), at a depth of about 69 feet. The new outfall would be almost 3 times farther from shore, at over twice the depth as the existing outfall, and in a location where currents are expected to greatly increase dilution over existing conditions. However, the new diffuser would remain within a habitat zone that is annually used by migrating juvenile and adult PS Chinook salmon, could be used by rearing juvenile PS/GB bocaccio, and currents could carry larval bocaccio and yelloweye rockfish through the affected area. Additionally, the area has been designated as critical habitat for PS Chinook salmon, PS/GB bocaccio, and SR killer whales. Therefore, both juvenile and adult Chinook salmon are extremely likely to annually present with the affected area. Also, over the decades-long presence of the outfall, it is reasonably likely that at least some larval and or juvenile bocaccio and larval yelloweye rockfish would pass through the affected area, and the outfall itself would provide structure that may be attractive to rearing juvenile bocaccio.

At the outer edges of the fish-detectable effluent plume, some subset of the Chinook salmon and juvenile bocaccio that enter the area would experience avoidance behaviors when they detect effluent-altered water quality (Beitinger and Freeman 1983). The maximum distance that the effluent would be fish-detectable is unknown. However, to be protective, this assessment assumes that fish-detectable effluent concentrations would at least occasionally extend to the shoreline near the project site. In the case of juvenile Chinook salmon that avoid the plume, avoidance of the affected area could delay migration past the site and or induce the fish to swim over deep water to avoid the plume, both of which could cause negative impacts on their fitness and long-term survival. Avoidance of the affected area is unlikely to cause any detectable negative impacts on adult Chinook salmon or on juvenile bocaccio.

Other individuals are likely to enter deeper into the plume area where some of those individuals are likely ingest and or absorb some combination of the contaminants discussed above. The increasing effluent concentrations, diminishing salinity, and increasing temperature within the chronic mixing zone would likely cause fish to avoid the acute mixing zone. Therefore, few, if any, Chinook salmon and or juvenile bocaccio are likely to experience acute mortality from effluent exposure. However, over the decades-long discharge through the outfall, it is very likely that some pelagic bocaccio and yelloweye rockfish larvae would be carried by currents through the acute mixing zone where some are reasonably likely to experience acute mortality.

The annual numbers of individuals that would be directly exposed to the effluent is uncertain and likely to be highly variable over time, as are the intensity of effects that exposed individuals are likely to experience. Based on the best available information, as described above, direct exposure to the effluent is likely to cause non-lethal behavioral and fitness impacts such as, areal avoidance, reduced long-term survival, and negative reproductive effects in some of the exposed juvenile and adult Chinook salmon and juvenile bocaccio, and some bocaccio larvae are reasonably likely to experience acute mortality.

**Altered Environmental Conditions**

In addition to directly exposing fish to the numerous contaminants discussed above, the relocated effluent discharge would alter habitat conditions within the new mixing zones and in adjacent areas that are within the detectable effluent plume.

The effluent plume would create temperature, salinity, contaminant, and dissolved oxygen gradients that would increase in intensity with movement toward the diffuser. Also, effluent-borne nitrogen and other nutrients likely affect local productivity, which alters forage quality and availability, and potentially creates conditions that are favorable to certain harmful algae. Further, the settlement of suspended solids from the effluent would likely alter the benthic habitat around the outfall. The exact extent of detectable effluent as well as the maximum settlement distance of sediments is unknown. However, to avoid underestimating potential impacts, this assessment assumes that detectable effluent-borne contaminants and sediments could extend about three times the width of the chronic mixing zone (~700 feet) around the diffuser.

How the listed fish under consideration here would respond to the effluent-altered environmental conditions are likely to be highly variable even within a given species at the same life stage. Depending on the conditions of the exposure, some fish are likely to experience avoidance behaviors soon after detecting chemical changes in the water, whereas others may exhibit no overt response, and others may be attracted to the plume. Some individuals are likely to exhibit a mix of behaviors, such as an initial avoidance response that is followed by habituation and possible attraction, and vice versa.

Avoidance: Based on the location of the proposed outfall diffuser and mixing zones, avoidance of the plume area may occasionally delay migration past the area for some juvenile Chinook salmon, and or induce those fish to swim over deep water to avoid the plume, both of which could cause negative impacts on their fitness and long-term survival. Avoidance of the affected area is unlikely to cause any detectable negative impacts on adult Chinook salmon or on juvenile bocaccio.

Altered forage availability and quality: The effluent's nutrient load likely increases productivity for planktonic organisms and SAV within the detectable plume, creating an area of increased forage availability. However, as discussed earlier, organisms that are exposed to the plume are likely to uptake contaminants, and those that are consumed by other organisms will connect the effluent-borne contaminants to the food web.

For example, West et al. (2008) found that the three known Pacific herring populations in the Puget Sound region have different persistent organic pollutant (POP) loading patterns that are likely due to differential exposure to POPs based on where those herring populations feed. Further, because Pacific herring rely heavily on planktonic krill, calapnoid copepods, and larval invertebrates and fishes that have no direct connection to sediments, it is believed that those planktonic species are accumulating the POPs through the directly from the water column and from the planktonic food web (West et al. 2008).

Therefore, fish that forage in the affected area are likely to consume contaminated prey. Additionally, the increased forage availability may create the situation where foraging species, including the listed fish under consideration here may preferentially remain within the affected area. Those fish that delay their migration past the area due to the area's increased forage availability would increase both their direct exposure to effluent-borne contaminants as well as their consumption of contaminated prey.

Harmful Algae: As described in the NMFS biological opinion for the reissuance of the NPDES permit for the Hyperion WWTP in Los Angeles, CA (NMFS 2018c); nitrogen is the primary nutrient that limits phytoplankton production in coastal waters, the addition of nitrogen increases phytoplankton production, and reduced forms of nitrogen that are present in WWTP effluents can tilt phytoplankton communities toward the development of harmful diatom and dinoflagellate species and lead to harmful algal blooms.

Harmful diatoms such as the Pseudo-nitzschia delicatissima group and the P. seriata group produce domoic acid, which is a water-soluble neurotoxin that accumulates in shellfish and planktivorous fish. It is responsible for toxic events in marine mammals and birds, as well as amnesiac shellfish poisoning in humans, but its impacts on schooling fish are believed to be less intense. Under laboratory conditions, fish that ingested domoic acid producing diatoms seemed able to isolate and eventually excrete the domoic acid. However, it is unknown if there is a metabolic cost to this process for the fish.

Harmful dinoflagellates such as the Alexandrium tamarense complex produce saxitoxins, which have been implicated in numerous fish kills, and Paralytic Shellfish Poisoning (PSP) in humans. Studies have documented paralysis, morphological impacts, and heavy mortality in larval and juvenile fish that were exposed to direct saxitoxin intoxication and through the food web. The effects of saxitoxin on crustacean larvae ranged from lethality in brine shrimp to sublethal effects in crab larvae. The dinoflagellate Lingulodinium polyedrum produces a yessotoxin, which is a large family of toxins. Yessotoxins have been identified as the major causative agent in an invertebrate mass mortality event, but its potential impacts on fish are still unclear and under research.

<u>Settlement of Suspended Solids:</u> The effluent is authorized to discharge a weekly average of 1,689 pounds of TSS per day. Although the suspended solids that would be discharged through the outfall would be initially carried up in the rising effluent plume, and carried laterally by the currents, most of the solids would eventually settle out onto the seafloor nearby. In general, the greatest amount of deposition would occur near the diffuser, with decreasing levels of deposition with increasing distance from it.

The settlement of solids alters the availability and quality of SAV and forage within the affected area. Where deposition rates are high, the solid material that settles out of the effluent may smother SAV and other sessile organisms. Additionally, many heavy metals and persistent organic compounds, such as pesticides and PCBs, tend to adhere to solid particles discharged from outfalls. Therefore, the layer of settled solids would very likely contain a low but steady load of heavy metals and persistent organic compounds that would be taken up by the benthic organisms within the affected area, and those contaminants would likely bioaccumulate in the local food web at higher rates than in unaffected areas.

<u>Dissolved Oxygen:</u> The effluent is authorized to discharge a weekly average of 1,501 pounds of CBOD per day, and a weekly average of 1,689 pounds of TSS per day, both of which reduce dissolved oxygen levels in the receiving water. Respiration related to the biological breakdown of the effluent’s carbonaceous components reduces the dissolved oxygen concentration within the plume. TSS typically reduces dissolved oxygen through decreased photosynthesis due to turbidity-related reduced light. Also, the increased water temperature within the effluent plume reduces the water’s ability to hold oxygen. Additionally, algal blooms that may be triggered by the increased availability of nutrients within the plume can reduce dissolved oxygen in the water column due to respiration by the algae and or by increased respiration by bacteria during the decomposition of dead algae. Reduced dissolved oxygen may cause avoidance of the affected area (Hicks 1999). It can also reduce swimming performance (Bjornn and Reiser 1991), and mortality can occur when oxygen levels become severely depleted.

In summary:  Over the decades of effluent discharge through the new outfall, some juvenile and adult Chinook salmon, larval and juvenile bocaccio, and larval yelloweye rockfish are likely to be exposed to the effluent-borne pollutants. In addition to possible avoidance behaviors, individuals that enter the new outfall's plume area are likely to uptake contaminants directly from the water column and through the consumption of contaminated forage. The intensity of their exposures and responses are likely to be highly variable.

Due to the expectation that their exposures would be relatively brief and outside of the acute mixing zone, no direct mortality is expected for any Chinook salmon. However, the small size and state of immaturity of exposed juveniles increases the likelihood that some exposed individuals would experience fitness impacts that would reduce their likelihood of survival to adulthood and or reduce their future reproductive success, both of which would be exacerbated by repeated exposures to other effluent discharges, especially while within Puget Sound. Some exposed adult Chinook salmon are also likely to experience fitness impacts that could reduce their reproductive success.

The exact numbers of PS Chinook salmon that would be annually exposed to the effluent is unpredictable and likely to be highly variable over time. However, the outfall's location, low volume of discharge, and the small size of its mixing zones relative to the surrounding shorelines and to the mouths of the rivers that support the potentially affected populations suggest that the routes taken by most retuning adults and emigrating juveniles are extremely unlikely to intersect with the affected area. Therefore, the exposed individuals would comprise extremely small subsets of the affected populations' cohorts. Further, only a subset of the individuals that pass through the area would be detectably affected. Consequently, the numbers of annually affected individuals would be too low to cause any detectable population-level effects on PS Chinook salmon.

Some larval bocaccio and yelloweye rockfish may experience acute mortality, but no direct mortality is expected for juvenile bocaccio because their exposures would likely occur outside of the acute mixing zone.  However, their small size and state of immaturity increases the likelihood that some exposed juvenile bocaccio would experience fitness impacts that would reduce their likelihood of survival to adulthood and or reduce their future reproductive success, especially for those individuals that habituate to the conditions and remain within the affected area for extended periods of time.

The exact numbers of bocaccio and yelloweye rockfish that would be exposed to the effluent is unpredictable and likely to be variable over time. However, based on the historic and current rarity of both species within the affected area, on the very limited quantity and quality of rearing habitat at the location of the outfall, and the outfall's small affected area, the numbers of exposed individuals would be too small to cause any detectable population-level effects on PS/GB bocaccio and PS/GB yelloweye rockfish.

### 2.5.2 Effects on Critical Habitat

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

The proposed action is likely to adversely affect critical habitat for PS Chinook salmon, PS/GB bocaccio, and SR killer whales.

Puget Sound Chinook Salmon Critical Habitat: The proposed action, including full application of the planned conservation measures and BMPs, is likely to adversely affect designated critical habitat for PS Chinook salmon as described below.

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

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

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

4. Estuarine areas free of obstruction and excessive predation: None in the action area.

5. Nearshore marine areas free of obstruction and excessive predation: None in the action area.
   a. Obstruction and predation – The proposed action caused short- and long-long minor adverse effects on this attribute. During construction, in-water noise and activity would cause short-term avoidance of the project area, which lies across marine nearshore migratory habitat for juvenile Chinook salmon. Effluent discharge is also likely to episodically cause migratory delays for some juveniles that avoid the effluent plume. Construction noise and activity would also cause short-term conditions that may increase the vulnerability of juvenile Chinook salmon to predators within about 177 feet of in-water work.
   b. Water quality – The proposed action would cause short- and long-term minor adverse effects on this attribute. The project would relocate an existing WWTP outfall from about 400 feet offshore to 1,097 feet offshore where dilution would be much higher due to increased water depth and high current flows. Project work would cause brief increases in suspended contaminated sediments and low levels of work-related contaminants within about 300 feet of ongoing work. Additionally, the proposed action would facilitate the decades-long continuation of an average daily discharge of about 2.1 MGD of WWTP effluent flow to Guemes Channel. Within the 23.1-foot radius acute mixing zone around the diffuser, some pollutant concentrations are reasonably likely to be acutely toxic to exposed Chinook salmon, especially juveniles, and other marine organisms. Within the 231-foot radius chronic mixing zone, some contaminant concentrations are likely to be high enough to cause non-lethal fitness impacts and reduced reproductive success in some exposed individuals, as well as chronic adverse effects in exposed juvenile salmon

and other marine organisms that are repeatedly exposed to pollutants over their lives. The exact spatial extent of impacted water quality is uncertain, but estimated to extend about 700 feet around the outfall.

c. Water quantity – The proposed action would cause no detectable effect on this attribute.
d. Forage – The proposed action would cause long-term minor adverse effects on this attribute. The planned excavation would mobilize contaminated sediments that would be biologically available at decreasing concentrations for the next several years. Also, the effluent's nutrient load is likely to slightly increase productivity and create an area of slightly increased forage availability around the outfall. However, some contaminants from the effluent would enter the food web and bioaccumulate in forage organisms that are directly exposed to the effluent and or consume contaminated forage organisms. However, given the very small amount effluent that would be discharged, action attributable effects on forage quantity, quality, and availability would be minor.
e. Natural Cover – The proposed action would cause long-term minor adverse effects on this attribute. Dredging would reduce SAV availability along the trench route for 1 to 2 years after the end of construction. Sediment deposition from the effluent may also affect SAV availability. However, based on the location and existing conditions around the proposed diffuser's location, it is unlikely that effluent impacts on SAV would be meaningful.

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

Critical Habitat for PS/GB bocaccio: The proposed action, including full application of the planned conservation measures and BMPs, is likely to adversely affect designated critical habitat for PS/GB Bocaccio as described below.

1. Nearshore marine areas from the shoreline to a depth of 98 feet (30 m) with substrates such as sand, rock, and/or cobble compositions that support kelp:
   a. Quantity, quality, and availability of prey species – The proposed action would cause long-term minor adverse effects on this attribute. The planned excavation would mobilize contaminated sediments that would be biologically available at decreasing concentrations for the next several years. Also, the effluent's nutrient load is likely to slightly increase productivity and create an area of slightly increased forage availability around the outfall. However, some contaminants from the effluent would enter the food web and bioaccumulate in forage organisms that are directly exposed to the effluent and or consume contaminated forage organisms. However, given the very small amount effluent that would be discharged, action attributable effects on forage quantity, quality, and availability would be minor.
   b. Water quality – Water quality and sufficient dissolved oxygen – The proposed action would cause short- and long-term minor adverse effects on this attribute. The project would relocate an existing WWTP outfall from about 400 feet offshore to 1,097 feet offshore where dilution would be much higher due to increased water depth and high current flows. Project work would cause brief increases in suspended contaminated sediments and low levels of work-related contaminants within about 300 feet of ongoing work. Additionally, the proposed action would facilitate the decades-long continuation of an average daily discharge of about 2.1 MGD of WWTP effluent flow to Guemes

Channel. Within the 23.1-foot radius acute mixing zone around the diffuser, some pollutant concentrations are reasonably likely to be acutely toxic to exposed rockfish, rockfish larvae, and to other marine organisms. Within the 231-foot radius chronic mixing zone, some contaminant concentrations are likely to be high enough to cause non-lethal fitness impacts and reduced reproductive success in some exposed individuals, as well as chronic adverse effects in exposed juvenile rockfish other marine organisms that are repeatedly exposed to pollutants over their lives. Additionally, the effluent would contain large amounts of material that would create a biological oxygen demand, which would reduce the dissolved oxygen concentration in the water. The exact spatial extent of impacted water quality is uncertain, but estimated to extend about 700 feet around the outfall.

2. Deepwater marine areas at depths greater than 98 feet (30 m) that possess or are adjacent to complex bathymetry consisting of rock and/or highly rugose habitat: None in the action area.

Critical Habitat for SR Killer Whales: The proposed action, including full application of the planned conservation measures and BMPs, is likely to adversely affect designated critical habitat for SR Killer Whales as described below.

Inland waters of Puget Sound waterward of a line at a depth of 20 feet (6.1 m) relative to extreme high water:

a. Water quality to support growth and development – The proposed action would cause short- and long-term minor adverse effects on this attribute. The project would relocate an existing WWTP outfall from about 400 feet offshore to 1,097 feet offshore where dilution would be much higher due to increased water depth and high current flows. Project work would cause brief increases in suspended contaminated sediments and low levels of work-related contaminants within about 300 feet of ongoing work. Additionally, the proposed action would facilitate the decades-long continuation of an average daily discharge of about 2.1 MGD of WWTP effluent flow to Guemes Channel. Within the 23.1-foot radius acute mixing zone around the diffuser, some pollutant concentrations are reasonably likely to be acutely toxic to marine organisms, especially small and immature ones. Within the 231-foot radius chronic mixing zone, some contaminant concentrations are likely to be high enough to contribute to chronic adverse effects in exposed marine organisms. As discussed in more detail in Section 2.12, exposure to the effluent is not likely to adversely affect SR killer whales. However, the continued discharge of the service area's effluent would contribute to maintaining water quality within about 700 feet around the outfall at a state where its ability to support growth and development of SR killer whales would be degraded as compared to non-impacted waters.
b. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth – The proposed action would cause long-term minor effects on this attribute. Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth – The proposed action would cause long-term minor effects on this attribute. The planned excavation would mobilize contaminated sediments that would be biologically available at decreasing concentrations for several years. Also, the proposed action would facilitate the decades-long

continuation of an average daily discharge of about 2.1 MGD of WWTP effluent to Guemes Channel. As described in the summary under Effluent-related Impacts, very low numbers of juvenile Chinook salmon and bocaccio are likely to experience some combination of reduced long-term survival and reduced reproductive success due to the uptake of action-related contaminants. Additionally, some adult Chinook salmon that annually pass through the project area may similarly absorb action-attributable contaminants that may slightly add to their tissue contaminant loads, and may slightly reduce their reproductive success. Based on the project's location, the small volume of discharge, the small size of the affected area, and the naturally high attrition rates of larval and juvenile fish, any action-attributable reduction in prey availability and or increase in prey contamination would likely be too small to meaningfully reduce the quantity or quality of available prey for SR killer whales.

c. Passage conditions to allow for migration, resting, and foraging – The proposed action would cause no detectable effects on passage conditions.

## 2.6 Cumulative Effects

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

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

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

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

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

## 2.7 Integration and Synthesis

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

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

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

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

### 2.7.1 ESA Listed Species

PS Chinook salmon and PS/GB yelloweye rockfish are listed as threatened, and PS/GB bocaccio are listed as endangered, all 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. All three 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, the effects on viability parameters of each species are also likely to be negative. In this context we consider how the proposed action's impacts on individuals would affect the listed species at the population and ESU/DPS scales.

PS Chinook salmon

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

The most recent 5-year status review reported a general decline in natural-origin spawner abundance across all PS Chinook salmon MPGs over the most-recent fifteen years. It also reported that escapement levels remain well below the PSTRT planning ranges for recovery for all MPGs, and concluded that the PS Chinook salmon ESU remains at "moderate" risk of extinction (Ford 2022).

The project site is located near the northeast corner of the City of Anacortes and in Guemes Channel, Puget Sound (Figures 1 and 10). The PS Chinook salmon that are most likely to pass through the project area would be an indeterminate mix of spring-, summer-, and fall-run fish from the Skagit and Nooksack River basins, with some fish from the Stillaguamish and Snohomish River basins also likely present (WDFW 2022a).

In combination, the Skagit River basin Chinook salmon populations are relatively large, with a high proportion of natural-origin spawners, a slightly negative long-term abundance trend, but a slightly positive abundance trend since the early 1990s. In the Nooksack River basin, the two Chinook salmon populations are relatively small, with composite production that has been heavily hatchery-supplemented since 1980, but with a stable to slightly positive mid-term abundance trend.

The project area serves primarily as a marine migration route for adult and juvenile PS Chinook salmon, as well as marine nearshore rearing habitat for juveniles. The environmental baseline at and adjacent to the project site has been degraded by more than 100 years of shoreline development and maritime activities, by point and non-point stormwater and sewer discharges related to upland development and urbanization around Northern Puget Sound, including effluent discharge from the Anacortes WWTP.

The proposed construction would cause a range of effects that both individually and collectively would cause altered behaviors and possible mortality in very low numbers of juveniles over two work seasons. Additionally, for several decades to come, exposure to WWTP effluent is likely to annually cause sub-lethal fitness impacts in very low numbers of juveniles and adults that annually pass through the area. The exposure would reduce the long-term survival and or cause negative reproductive effects in some of the exposed juveniles, and some of the exposed adults may experience fitness impacts that may slightly reduce their spawning success.

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

PS/GB bocaccio

No reliable population estimates are available for PS/GB bocaccio. The best available information indicates that they were never a predominant segment of the total rockfish abundance in Puget Sound, and that abundance has declined by more than 70 percent since 1965. They are considered rare in the action area, and it is uncertain whether they currently utilize the habitat within the action area. Fishing removals and derelict fishing gear, combined with degraded water quality appear to be the greatest threats to the recovery of the DPS.

The project site is located near the northeast corner of the City of Anacortes and in Guemes Channel, Puget Sound (Figures 1 and 10). The environmental baseline at and adjacent to the project site has been degraded by more than 100 years of shoreline development and maritime activities, by point and non-point stormwater and sewer discharges related to upland development and urbanization around Northern Puget Sound, including effluent discharge from the Anacortes WWTP.

Based on the rarity of bocaccio in the action area, it is extremely unlikely that any individuals would be exposed to the direct effects of planned construction. However, over the decades-long effects that are expected from the proposed action, low numbers of larval and juvenile bocaccio may be directly and indirectly exposed to contaminants related to excavation of contaminated sediments and to WWTP effluent discharge. Exposure to those contaminants is likely to cause some combination of altered behaviors, reduced fitness, and mortality in some exposed individuals. However, based on their rarity in Puget Sound, and on the paucity of habitat features near the project area that are typically preferred by juvenile bocaccio, the numbers of individuals that may be annually exposed to these 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 population (abundance, productivity, distribution, or genetic diversity) for the PS/GB bocaccio DPS. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

<u>PS/GB yelloweye rockfish</u>

No reliable population estimates are available for PS/GB yelloweye rockfish. The best available information indicates that they were never a predominant segment of the total rockfish abundance in Puget Sound, and that abundance has declined by more than 70 percent since 1965. They are considered rare in the action area, and it is uncertain whether they currently utilize the habitat within the action area. Fishing removals and derelict fishing gear, combined with degraded water quality appear to be the greatest threats to the recovery of the DPS.

The project site is located near the northeast corner of the City of Anacortes and in Guemes Channel, Puget Sound (Figures 1 and 10). The environmental baseline at and adjacent to the project site has been degraded by more than 100 years of shoreline development and maritime activities, by point and non-point stormwater and sewer discharges related to upland development and urbanization around Northern Puget Sound, including effluent discharge from the Anacortes WWTP.

Based on the rarity of yelloweye rockfish in the action area, it is extremely unlikely that any individuals would be exposed to the direct effects of planned construction. However, over the decades-long effects that are expected from the proposed action, low numbers of larval yelloweye rockfish may be directly exposed to contaminants related to WWTP effluent discharge. Exposure to those contaminants is likely to cause some combination of reduced fitness and mortality in some exposed larvae. However, based on their rarity in Puget Sound, and on the paucity of habitat features near the project area that are typically preferred by juvenile and adult yelloweye rockfish, the numbers of individuals that may be annually exposed to these 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 population (abundance, productivity, distribution, or genetic diversity) for the PS/GB yelloweye rockfish DPS. Therefore, the proposed action would not appreciably reduce the likelihood of survival and recovery of this listed species.

### 2.7.2 Critical Habitat

Critical habitat was designated PS Chinook salmon, PS/GB bocaccio, and SR killer whales to ensure that specific areas with PBFs that are essential to the conservation of those listed species are appropriately managed or protected. These critical habitats will be affected over time by cumulative effects, some positive – as restoration efforts and regulatory revisions increase habitat protections and restoration, and some negative –as climate change and unregulated or difficult to regulate sources of environmental degradation persist or increase. Overall, to the degree that trends are negative, the effects on the PBFs of these critical habitats are also likely to be negative. In this context we consider how the proposed action’s impacts on the attributes of the action area's PBFs would affect these designated critical habitats' abilities to support the conservation of their respective species as a whole.

Critical Habitat for PS Chinook Salmon

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

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

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

The PBF for PS Chinook salmon critical habitat at and adjacent to the project site is limited to nearshore marine areas free of obstruction and excessive predation. The attributes of that PBF that would be affected by the action are obstruction and excessive predation, water quality, forage, and natural cover. The project site is located along a heavily impacted marine shoreline, and all of these attributes currently function at reduced levels as compared to undisturbed nearshore marine areas. As described in the effects section, the proposed action would cause short- and long-term minor adverse effects on all of those attributes.

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

Critical Habitat for PS/GB Bocaccio

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

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

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

The PBF for PS/GB bocaccio critical habitat at and adjacent to the project site is limited to nearshore marine areas with substrates such as sand, rock, and/or cobble compositions that support kelp. The site attributes of that PBF that would be affected by the action are prey quantity, quality, and availability; and water quality and dissolved oxygen. The project site is located along a heavily impacted marine shoreline, and these attributes currently function at reduced levels as compared to undisturbed nearshore marine areas. As described in the effects section, the proposed action would cause short- and long-term minor adverse effects on all of those attributes.

Based on the best available information, the scale of the proposed action's effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term negative changes in the quality or functionality of the deep-water rockfish critical habitat in the action area. Therefore, this critical habitat will maintain its current level of functionality, and retain its current ability for PBF to become functionally established, to serve the intended conservation role for PS/GB bocaccio.

Critical Habitat for SR Killer Whales

Past and ongoing land and water use practices have degraded SR killer whale critical habitat throughout the Puget Sound basin. Urbanization, shoreline development, and point and non-point stormwater and wastewater discharges have reduced water quality across the region. Shoreline industries and high levels of vessel traffic have increase ambient noise levels, and anthropogenic impacts on Chinook salmon and other fish species have reduced the availability and quality of forage resources for SR killer whales.

In the future, non-federal land and water use practices and climate change are likely to increase. The intensity of those influences on SR killer whale critical habitat is uncertain, as is the degree to which those impacts may be tempered by adoption of more environmentally acceptable land use practices, by the implementation of non-federal plans that are intended to benefit SR killer whales and their primary prey species (Chinook salmon), and by efforts to address the effects of climate change.

The PBF for SR killer whale critical habitat that exists at and adjacent to the project site is that of inland waters of Puget Sound deeper than 20 feet at extreme high water. The attributes of that PBF that would be affected by the proposed action include water quality to support growth and development, and prey species of sufficient quantity, quality, and availability. As described in the effects section, the proposed action would cause short- and long-term minor adverse effects on both of these attributes.

Based on the best available information, the scale of the proposed action's effects, when considered in combination with the degraded baseline, cumulative effects, and the impacts of climate change, would be too small to cause any detectable long-term negative changes in the quality or functionality of the Inland Waters of Puget Sound PBF. Therefore, this critical habitat will maintain its current level of functionality, and retain its current ability for PBFs to become functionally established, to serve the intended conservation role for SR killer whales.

## 2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitats, 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, PS/GB bocaccio, and PS/GB yelloweye rockfish, nor is it likely to destroy or adversely modify designated critical habitat for PS Chinook salmon, PS/GB bocaccio, and SR killer whales.

## 2.9 Incidental Take Statement

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

### 2.9.1 Amount or Extent of Take

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

Harm of PS Chinook salmon from exposure to:

- Work-related Noise,
- Work-related Water Contamination,
- Work-related Propeller Wash,
- Work-related Forage Diminishment,
- Altered Benthic Habitat, and
- Effluent-related Impacts.

Harm of PS/GB bocaccio from exposure to:

- Work-related Forage Diminishment,
- Altered Benthic Habitat, and
- Effluent-related Impacts.

Harm of PS/GB yelloweye rockfish from exposure to:

- Effluent-related Impacts.

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

The timing and duration of in-water work is applicable for work-related noise, water contamination, and propeller wash because the proposed August 1 to February 15 in-water work window avoids the period of time when juvenile Chinook salmon would be most numerous and vulnerable to the effects of the planned in-water work. Therefore, working outside of the proposed work window would likely increase the number of juvenile PS Chinook salmon that would be exposed to work-related stressors, and also likely increase the intensity of the effects that exposed individuals would experience. Similarly, working more than the proposed 14 weeks of in-water work would expose more Chinook salmon than was considered in this opinion.

The size (length and width) of the in-water trench is the best available surrogate for the extent of take of juvenile PS Chinook salmon and juvenile PS/GB bocaccio from exposure to work-related forage diminishment. The size of the in-water trench is appropriate because the the amount of benthic organisms that would be lost due to dredging would increase as the size the dredged area increases. Also, as the size of the dredged area increases, the amount of biologically available contaminants would increase, as would the size of the contaminated area, both of which would increase the number of exposed individuals and or the intensity of the effects from exposure to the contaminats.

The size of the in-water trench is the best available surrogate for the extent of take of juvenile PS Chinook salmon and juvenile PS/GB bocaccio from exposure to altered benthic habitat. The length and width of the in-water trench is the best available surrogate for the extent of take of juvenile PS Chinook salmon from exposure to altered benthic habitat. As the size of the dredged area increases, the larger the area where SAV-related cover would be diminished. Increasing the size, especially the width, of the area with diminished SAV-related cover would increase the size of the area juvenile Chinook salmon would need to cross where their risk of predation would be increased. Also, as the length of the trench decreases, the closer to shore that unburied pipe that would provide shelter for piscivorous predators would be to the nearshore habitat that juvenile Chinook salmon are most likley to utilize, which would increase their risk of predation. Similarly, as the length of unburied pipe increases, the greater the likelihood that juvenile that PS/GB bocaccio would utilize the pipeline for shelter, and the greater the chance that they would exposed to the effluent as they move to deeper water along the pipeline.

The length, location, and diameter of the marine outfall pipeline are the best available surrogates for the extent of take of PS Chinook salmon and PS/GB bocaccio from exposure to effluent-related impacts. The length and location of the marine outfall pipeline are appropriate because the shorter the distance from shore that the diffuser is located, the more frequently detectible WWTP effluent would be present, and the higher the effluent concentration would be along the shoreline area where juvenile Chinook salmon and bocaccio are most likley to be present. Increasing either of those conditons would increase the number of exposed individuals and or increase the intensity of the effects of the exposure. The diameter of the outfall pipeline is appropriate because, as the diameter of the pipe increases, the maximum flow volume through it would increase. As flow volume increases, the amount of pollutants discharged to Guemes Channel would increase. As the amount of discharged pollutants increases, the number of exposed Chinook salmon and bocaccio and or the intensity of fitness and behavioral effects that exposed fish would experience would also increase.

In summary, the extent of PS Chinook salmon, PS/GB bocaccio, and PS/GB yelloweye rockfish take for this action is defined as:

- 14 weeks of in-water work to be completed between August 1 and February 15;
- An excavated and backfilled in-water trench about 420 feet long, with the shoreward 45 feet no wider than about 86 feet, and the remaining 375 feet no wider than about 55 feet, as described in the proposed action section of this biological opinion;

- A marine outfall pipeline about 1,097 feet long, with the end of the diffuser located at a depth of about 69 feet below MLLW, as described in the proposed action section of this biological opinion; and
- A marine outfall pipeline with an outer diameter of 42 inches as described in the proposed action section of this biological opinion.

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

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

### 2.9.2 Effect of the Take

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

### 2.9.3 Reasonable and Prudent Measures

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

The FEMA and the USACE shall require the applicant to:

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

### 2.9.4 Terms and Conditions

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

1. The following terms and conditions implement reasonable and prudent measure 1:

    a. The FEMA and the USACE shall require the applicant to develop and implement plans to collect and report details about the take of listed fish. That plan shall:
        i. Require the applicant and or their contractor to maintain and submit records to

verify that all take indicators are monitored and reported. Minimally, the records should include:

1. Documentation of the timing and duration of in-water work to ensure that all in-water work is completed within 14 weeks, between August 1 and February 15;
2. Documentation of the dimensions of the in-water trench to confirm that the dredged and backfilled area is about 420 feet long, with the shoreward 45 feet no wider than about 86 feet, and the remaining 375 feet no wider than about 55 feet;
3. Documentation of the material used to backfill the trench to confirm that it complies with the proposed action section of this biological opinion; and
4. Documentation of the length and location of the marine outfall pipeline to confirm that the pipeline is about 1,097 feet long, with the end of the diffuser located at a depth of about 69 feet below MLLW.

ii. Require the applicant to establish procedures for the submission of the construction records and other materials to the appropriate FEMA office, and to submit an electronic post-construction report to the NMFS within six months of project completion. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2021-01875 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).

To reduce adverse impacts on water quality that the project would cause in Guemes Channel through continued discharge of WWTP effluent:

1. The City of Anacortes should partner with the Washington Department of Ecology to explore development of a Habitat Conservation Plan and apply for an Incidental Take Permit pursuant to section 10(a)(1)(B) of the ESA for their state-issued NPDES permit, in order to obtain incidental take authorization for unavoidable take of listed species that is anticipated to occur as a result of these permit issuances.

2. The City of Anacortes should more completely identify the pollutant load in the effluent discharged from their WWTP, and as part of future NPDES permit applications, to commit to incrementally apply new technologies to reduce pollutant concentrations in the effluent.

3. The FEMA, the USACE, and the U. S. Environmental Protection Agency (USEPA) should approach the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to develop a programmatic biological opinion for the authorization of infrastructure projects that would result in the continued discharge of wastewater and or stormwater to the waters of the Puget Sound Basin, including those that would be discharged under state-issued NPDES

permits. The project description for that programmatic consultation should include clear conservation measures intended to avoid and minimize the effects of NPDES permit actions on species and critical habitats listed under the ESA, as well as on essential fish habitat identified under the MSA, and should provide a mechanism for compensatory mitigation for unavoidable adverse effects, including take.

## 2.11 Reinitiation of Consultation

This concludes formal consultation for the Federal Emergency Management Agency's funding, and the U.S. Army Corps of Engineers' authorization, of the City of Anacortes's Wastewater Treatment Plant Outfall Relocation Project in Guemes Channel, Anacortes, Washington.

Under 50 CFR 402.16(a): "Reinitiation of consultation is required and shall be requested by the Federal agency or by the Service where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and: (1) If the amount or extent of taking specified in the incidental take statement is exceeded; (2) If new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not previously considered; (3) If the identified action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in the biological opinion or written concurrence; or (4) If a new species is listed or critical habitat designated that may be affected by the identified action."

## 2.12 "Not Likely to Adversely Affect" Determinations

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

As described in Section 2 and below, the NMFS has concluded that the proposed action is not likely to adversely affect PS steelhead, southern eulachon, humpback whales of the Central America and Mexico DPSs, SR killer whales, and designated critical habitat for PS/GB yelloweye rockfish. Detailed information about the biology, habitat, and conservation status and trends of these fish and whale species 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, which are incorporated here by reference.

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the listed species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action (50 CFR 402.02). 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 that are extremely unlikely to occur.

### 2.12.1 Effects on Listed Species

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 analyses of effects presented in Section 2.5. As described in Section 2.5, action-related stressors expected to cause adverse effects include work-related noise, water contamination, propeller wash, and forage diminishment; altered benthic habitat; and effluent-related impacts. The extent of work-related effects and altered benthic habitat would be limited to the marine waters and substrates within about 300 feet either side of the proposed marine pipeline route, and detectable effluent would be limited to the area within about 700 feet around the new outfall diffuser.

PS steelhead, southern eulachon

It is extremely unlikely that PS steelhead and or southern eulachon would approach close enough to the project area (i.e. 700 feet) to be meaningfully affected by the proposed action.

Juvenile steelhead are generally independent of shallow nearshore areas soon after entering marine water (Bax et al. 1978, Brennan et al. 2004, Schreiner et al. 1977), and are not commonly caught in beach seine surveys. Recent acoustic tagging studies (Moore et al. 2010) have shown that smolts migrate from rivers to the Strait of Juan de Fuca within one to three weeks. Returning adults typically migrate in relatively deep water well away from shore until they near the entrance of their natal streams. Based on the best available information concerning PS steelhead distribution, habitat availability, and life history characteristics combined with the relatively small area of effect, it is extremely unlikely that any individuals of this species would approach close enough to be measurably affected by the proposed action. Therefore, the proposed action is not likely to adversely affect PS steelhead.

The best available information concerning the distribution, habitat preferences, and life history characteristics of southern eulachon support the understanding that no life stage of this species utilize Guemes Channel. Therefore, it is extremely unlikely that any individuals of this species would approach close enough to the project area to be measurably affected by the proposed action. As such, the proposed action is not likely to adversely affect southern eulachon.

Humpback whales and SR killer whales

Both whale species are very uncommon in Guemes Channel. Although unlikely, it is possible that individuals of either species could be present during the 14 weeks of in-water work, during the 5 weeks of upland blasting, and or later, after effluent discharge through the new outfall has begun. Of the stressors identified at the start of this section, exposure to work-related noise, water contamination, forage diminishment, and effluent-related impacts are the stressors with the most potential to affect humpback and killer whales. Because effluent impacts may also include trophic impacts, the following assessment considers work-related forage diminishment and effluent-related trophic impacts together. Consequently, the following assessment is arranged as work-related noise, work-related water contamination, effluent exposure, and action-attributable trophic impacts.

Work-related noise: Work-related noise is extremely unlikely to cause more than minor effects on either whale species. As discussed in greater detail in section 2.5, upland blasting and barge spud deployments would cause the loudest impulsive noise, and vibratory driving the sheet pile shoring would be the loudest source of non-impulsive noise. The best available information about the expected noise characteristics of project-related activities, and the effects thresholds for low- and mid-frequency hearing whales (NMFS 2018d) is summarized in Tables 6 and 7.

**Table 6.** Estimated in-water source levels for the loudest expected project-related sound sources, with the estimated ranges to the source-specific effects thresholds for humpback whales and other low-frequency hearing whales.

| Source | Acoustic Signature | Source Level | Threshold Range |
|---|---|---|---|
| Upland Blasting | < 1,600 Hz Impulsive | 203 $dB_{peak}$ | 219 $dB_{peak}$ @ N/A |
| 3 blast events per day over a 5-week period | | 180 $dB_{SEL}$ | 183 $SEL_{CUM}$ @ 2 m |
| | | 191 $dB_{RMS}$ | 160 $dB_{RMS}$ @ 117 m |
| Spuds | < 1,600 Hz Impulsive | 201 $dB_{peak}$ | 219 $dB_{peak}$ @ N/A |
| Sporadic episodes of 2 to 4 impulses anytime a barge is positioned | | 176 $dB_{SEL}$ | 183 $SEL_{CUM}$ @ 3 m |
| | | 186 $dB_{RMS}$ | 160 $dB_{RMS}$ @ 54 m |
| Vibrate 24-inch Steel Sheet Piles | < 2.5 kHz Non-Impulsive | 190 $dB_{peak}$ | 219 $dB_{peak}$ @ N/A |
| Periodic over 4 weeks of 8-hour days | | 175 $dB_{SEL}$ | 199 dB $SEL_{CUM}$ @ 110 m |
| | | 175 $dB_{RMS}$ | 120 $dB_{RMS}$ @ 4,642 m |

**Table 7.** Estimated in-water source levels for the loudest expected project-related sound sources, with the estimated ranges to the source-specific effects thresholds for SR killer whales and other mid-frequency hearing whales.

| Source | Acoustic Signature | Source Level | Threshold Range |
|---|---|---|---|
| Upland Blasting | < 1,600 Hz Impulsive | 203 $dB_{peak}$ | 230 $dB_{peak}$ @ N/A |
| 3 blast events per day over a 5-week period | | 180 $dB_{SEL}$ | 185 $SEL_{CUM}$ @ N/A |
| | | 191 $dB_{RMS}$ | 160 $dB_{RMS}$ @ 117 m |
| Spuds | < 1,600 Hz Impulsive | 201 $dB_{peak}$ | 230 $dB_{peak}$ @ N/A |
| Sporadic episodes of 2 to 4 impulses anytime a barge is positioned | | 176 $dB_{SEL}$ | 185 $SEL_{CUM}$ @ 1 m |
| | | 186 $dB_{RMS}$ | 160 $dB_{RMS}$ @ 54 m |
| Vibrate 24-inch Steel Sheet Piles | < 2.5 kHz Non-Impulsive | 190 $dB_{peak}$ | 230 $dB_{peak}$ @ N/A |
| Periodic over 4 weeks of 8-hour days | | 175 $dB_{SEL}$ | 198 dB $SEL_{CUM}$ @ 10 m |
| | | 175 $dB_{RMS}$ | 120 $dB_{RMS}$ @ 4,642 m |

Based on the best available information, at the farthest, a humpback whale could experience hearing impairment in the form of permanent threshold shift (PTS) if it were to remain within 361 feet (110 m) of vibratory pile driving for an entire 8-hour work day. For the same exposure, killer whales must remain within 33 feet (10 m) to experience PTS. However, the project's MMMP requires that pile driving be postponed or halted when marine mammals are within 3,281 feet (1,000 m) of the pile driving site (Widener 2022q). The in-water area ensonified by the upland blasting and spuds would be much smaller, especially for the blasting that would occur no closer than 180 feet from the shoreline.

The best available information supports the understanding that at its maximum, the onset of behavioral disturbance for both species could occur up to 15,230 feet (4,642 m) away from vibratory pile driving, but given the expectation that in-water ambient noise in the area can approach 130 $dB_{RMS}$, the area of effect would likely be closer to 3,281 feet (1,000 m). In the unlikely event that any whales approach close enough to hear and respond to project-related noise, they most likely would experience no more than infrequent and brief periods of low-level acoustic masking and temporary minor avoidance of the area within no more than 15,230 feet around the vibratory pile driving site, which would cause no impacts on their fitness, and no meaningful impacts on their normal behaviors.

Work-related water contamination: Work-related water contamination is extremely unlikely to cause more than minor effects on either whale species either whale species. As discussed in greater detail in section 2.5, work-related water contamination is unlikely to be detectable beyond 300 feet around on-going in-water work. Given that whales are unlikely to be present in Guemes Channel, and that any that may enter the channel are likely to avoid the area during ongoing work, it is extremely unlikely that any whales would approach close enough to the project area to be exposed to detectable levels of work-related contaminants that would be attributable to the proposed action.

Effluent exposure: Effluent exposure is extremely unlikely to cause more than minor effects on either whale species. As described in Section 2.5.1, the proposed outfall would cause several decades of continued discharge of WWTP effluent to Guemes Channel, and that effluent contains substances that are known to be harmful to fish, especially to small and or developing juvenile fish. Some of those substances are also known or expected to be harmful to marine mammals (NMFS 2018c). The NMFS biological opinion for the reissuance of the NPDES permit for the Hyperion WWTP in Los Angeles, CA (NMFS 2018c) concluded that the effluent from that WWTP would adversely affect numerous whale species. However, the volume of action-attributable effluent considered in this opinion is very small, especially when compared to large WWTPs like Hyperion, which is permitted to discharge a maximum of 850 MGD. The proposed action's maximum effluent flow of about 10.1 MGD, is about 1.2 percent as large as the maximum Hyperion discharge.

In Section 2.5.1 of this biological opinion, we determined that fish would be adversely affected by direct exposure to action-attributable effluent. However, due to the much larger mass of the whales considered here, the whales must absorb much more contamination than would fish to elicit detectable effects, and being air breathers, instead of drawing oxygen from the water through gills like fish, whales likely absorb contaminants directly from the water at lower rates than do fish. Therefore, far more direct exposure to the effluent would be required to elicit detectable effects in whales than would be required for the fish considered in this opinion. Further, both whale species are only infrequently and very briefly observed near Guemes Channel, and they typically range widely during any given day. Based on this, on the relatively small size of the detectable effluent plume, and on the very small volume of action attributable effluent, it is most likely that any individuals of either whale species would be exposed to action-attributable effluent extremely infrequently, and only for very brief periods of time, likely measured in minutes to a low number of hours. Based on the very small action-attributable effluent volume and area of effect, the whales' large size and low expected rates of absorption, and the expectation that exposures would be extremely infrequent and very brief, it is extremely unlikely that any exposed whales would absorb enough contaminants from the discharged effluent to cause any meaningful fitness or behavioral effects, including with multiple exposures to the effluent over any given whale's lifetime.

Action-attributable trophic impacts: Action-attributable trophic impacts are extremely unlikely to cause more than minor effects on either whale species. The routine discharge of the WWTP's effluent to Guemes Channel is likely to expose humpback whale forage resources, such as forage fish and planktonic invertebrate organisms, to harmful pollutants. Similarly, the effluent discharge is likely to expose the prime forage resource for SR killer whales, Chinook salmon, to harmful pollutants. Additionally, as described in Section 2.5.1, work-related impacts are also likely cause low levels of Chinook salmon take.

The uptake of pollutants may cause direct mortality or reduced fecundity in forage organisms that are exposed to the effluent and to contaminated sediments that would be mobilized by the proposed dredging. This, in turn, could reduce the availability of forage resources for the whales considered here. Additionally, the whales may be indirectly exposed to pollutants if they consume contaminated prey organisms.

Action-attributable loss of humpback forage organisms, and any trophic link to action-attributable contaminants would be too small to cause any meaningful effects on the fitness and or normal behaviors of humpback whales. As described in Section 2.5.1 and above, the volume of action-attributable effluent and the size of the affected area in Guemes Channel are both very small. Therefore, only an extremely small proportion of the humpback whale forage organisms in Guemes Channel and the adjacent parts of Puget Sound are likely to be exposed to action-attributable contaminants; exposures are likely to be very brief as the prey organisms swim or are carried by the prevailing currents through the small affected area; and in most instances of exposure, the concentrations of action-attributable pollutants would be very low. Based on the best available information, as described below in the discussion about Chinook salmon smolt to adult ratios, the subset of forage organisms that may be lost or experience reduced fecundity due to the proposed action would be too small to cause any population-level effects in the affected forage species, and therefor too small to cause any detectable reduction in forage availability for humpback whales that forage in Guemes Channel and or the adjacent parts of Puget Sound. Similarly, it is extremely unlikely that the numbers of action-attributable contaminated forage organisms that the whales may consume, and or the contaminant concentrations in those forage organisms would be high enough to cause any meaningful effect on the humpback whales that consume them.

Action-attributable loss of SR killer whale forage and any trophic link to action-attributable contaminants would be too small to cause any meaningful effects on the fitness and or normal behaviors of SR killer whales. As described in Section 2.5.1, work-related impacts would annually affect an extremely low number of juvenile Chinook salmon. At the project site, the construction's detectable effects on fish would be limited to an area about 300 feet around the proposed outfall pipe, where an extremely small proportion of each year's juvenile PS Chinook salmon cohort could be exposed to work-related impacts, and only very small subsets of the individuals that pass through the affected area are likely to be detectably affected by the exposure.

As described in Section 2.5.1 and above, the volume of action-attributable effluent and the size of the affected area in Guemes Channel are both very small. Extremely small proportions of each year's juvenile and adult PS Chinook salmon cohorts would pass through the effluent plume from the new outfall. Again, only very small subsets of the individuals that pass through the affected area are likely to be detectably affected by the exposure. Therefore, only extremely small proportions of each year's juvenile and adult PS Chinook salmon cohorts are likely to be exposed to work-related impacts and or action-attributable contaminants; exposures are likely to be very brief as the salmon swim through the small affected area; and in most instances of exposure, the concentrations of action-attributable pollutants would be very low.

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

It is extremely unlikely that the numbers of Chinook salmon that may be contaminated by action-attributable pollutants, and or that the attributable pollutant concentrations would be high enough to cause any meaningful effect on SR killer whales. The adult Chinook salmon that would be exposed to action-attributable effluent would mostly likely be an extremely small subset of any year's cohort of returning adults. Additionally, those adults would most likely be exposed to the effluent plume and effluent-contaminated forage when they would mostly be in the terminal phase of their oceanic life stage, and in route to their natal streams.

The duration of exposure to the effluent that adult Chinook salmon may experience, and or the amount of action-attributable contaminated forage that any adult Chinook salmon may consume before entering their natal stream would be highly variable over time, but both are expected to be very low. Therefore, very few adult Chinook salmon are likely to be contaminated with action-attributable pollutants, and the concentrations of action-attributable pollutants in specific adult Chinook salmon would be extremely low. Based on this, over the life of any specific SR killer whale, it is extremely unlikely that it would consume enough action-attributable contaminated Chinook salmon to cause any detectable effects of its long-term fitness and normal behaviors.

### 2.12.2 Effects on Critical Habitat

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 analyses of effects presented in Section 2.5. As described in Section 2.5, the extent of work-related effects and altered benthic habitat would be limited to within about 300 feet either side of the proposed marine pipeline route, and detectable effluent is expected to be largely limited to the area within about 700 feet around the new outfall diffuser.

PS/GB yelloweye rockfish designated critical habitat
The closest PS/GB yelloweye rockfish designated critical habitat is located over 3,000 feet east from the proposed location of the new outfall (NOAA 2022b). Because detectable effects from the proposed action are not expected to extend past about 700 feet from the new outfall, it is extremely unlikely that the proposed action would cause any detectable effects on any physical or biological features (PBFs) of PS/GB yelloweye rockfish designated critical habitat.

In summary, based on the best available information, as described above, the proposed action is not likely to adversely affect humpback whales of the Central America and Mexico DPSs, SR killer whales, or designated critical habitat for PS/GB yelloweye rockfish.

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

This analysis is based, in part, on the EFH assessment provided by the FEMA and the descriptions of EFH for Pacific Coast Salmon (Pacific Fishery Management Council [PFMC] 2014), Pacific Coast Groundfish (PFMC 2005), and Coastal Pelagic Species (PFMC 1998) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce.

### 3.1 Essential Fish Habitat Affected By the Project

The project site is located on the northern shoreline of Fidalgo Island and in Guemes Channel, Puget Sound, near the northeast corner of the City of Anacortes, Washington (Figures 1 and 10).

The marine waters and substrates of Guemes Channel and the surrounding area are designated as marine EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species.

Marine EFH for Pacific salmon is identified and described in Appendix A to the Pacific Coast salmon fishery management plan (PFMC 1998). The major components of marine EFH for Pacific Coast Salmon are: Estuarine rearing; Ocean rearing; and juvenile and adult migration. The important habitat features of this EFH are: 1) good water quality; 2) cool water temperatures; 3) abundant prey species and forage base; 4) connectivity with terrestrial ecosystems; and 5) adequate depth and habitat complexity including marine vegetation and algae in estuarine and near-shore habitats.

Pacific Coast Groundfish EFH is identified as: All marine waters and substrate from mean higher high water (MHHW) or the upriver extent of saltwater intrusion out to depths less than or equal to 11,484 feet (3,500 m); Certain specifically identified seamounts in depths greater than 11,484 feet; and Areas designated as HAPCs not already identified by the above criteria (PFMC 2005). Pacific Coast Groundfish HAPC includes: Estuaries; Canopy Kelp; Seagrass; Rocky Reefs; and Areas of interest.

For Coastal Pelagic Species, EFH is identified as all marine and estuarine waters from the shoreline to the offshore limits of the exclusive economic zone (EEZ) and above the thermocline where sea surface temperatures range between 10°C to 26°C (PFMC 1998).

Succinct identification of specific habitat features that are necessary to support the full life cycles of Groundfish and Pelagic Species are absent from their respective EFH descriptions. However, the important features identified for Salmon EFH effectively address the habitat features that are necessary to support the full life cycle for all three species groups that may be affected by the proposed action. Therefore, the important features of marine Salmon EFH are used below to assess the impacts on EFH for all three species groups.

As part of Pacific Coast Salmon EFH, five Habitat Areas of Particular Concern (HAPCs) have been defined as: 1) complex channels and floodplain habitats; 2) thermal refugia; 3) spawning habitat; 4) estuaries; and 5) marine and estuarine submerged aquatic vegetation. The project area provides the estuaries and marine and estuarine submerged aquatic vegetation HAPCs.

### 3.2 Adverse Effects on Essential Fish Habitat

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

1. <u>Good water quality:</u> The proposed action would cause minor long-term adverse effects on this attribute. The project would relocate an existing WWTP outfall from about 400 feet offshore to 1,097 feet offshore where dilution would be much higher due to increased water

depth and higher current flows. Project work would cause brief increases in suspended contaminated sediments and low levels of work-related contaminants within about 300 feet of ongoing work. Additionally, the proposed action would facilitate the decades-long continuation of an average daily discharge of about 2.1 MGD of WWTP effluent flow to Guemes Channel. As described in section 2.5, the effluent would contain organic material that would affect dissolved oxygen levels and elevate in-water nutrient loads, as well as introduce low levels of numerous contaminants that are known to be harmful to fish and other aquatic organisms. Additionally, although not specifically addressed in the NPDES permit, the effluent would likely be of a lower salinity and a higher temperature than the receiving waters. The exact extent of the detectable effluent plume is unknown. The NPDES permit for the outfall allows for a 231-foot radius chronic mixing zone around the outfall diffuser. However, due to variability in discharge volumes, and the lack of real-time control over the size of the mixing zones, this assessment assumes that detectable effluent-borne contaminants could extend about three times the width of the chronic mixing zone, about 700 feet, around the new diffuser.

2. <u>Cool water temperatures:</u> The proposed action would cause minor long-term adverse effects on this attribute. As discussed above the proposed action would result in the decades-long continuation of effluent discharge from the WWTP to Guemes Channel. Although not specifically addressed in the NPDES permit for the outfall, the effluent would likely be of a higher temperature than the receiving waters, but undetectable beyond the 231-foot radius chronic mixing zone around the new outfall diffuser.

3. <u>Abundant prey species and forage base:</u> The proposed action would cause minor long-term adverse effects on this attribute. As described in section 2.5, action-attributable exposure to contaminated sediments and effluent discharge is likely to slightly reduce the numbers of available prey organisms in the waters surrounding the outfall, through the direct mortality of very low numbers of planktonic organisms and small fish that enter the acute mixing zone, and through reduced long-term fitness and or reduced fecundity in some of the individuals that experience non-lethal exposures.

4. <u>Connectivity with terrestrial ecosystems:</u> No changes expected.

5. <u>Adequate depth and habitat complexity including marine vegetation and algae in estuarine and near-shore habitats:</u> The proposed action would cause minor, temporary adverse effects on this attribute. As described in section 2.5, the planned dredging would remove and or cover all benthic organisms, including SAV, that are within the 420-foor long by 86- to 55-foot wide planned marine trench. That SAV would likely recover to pre-construction levels within a season or two after the completion of project construction.

<u>Habitat Areas of Particular Concern (HAPCs)</u>

Estuaries and marine and estuarine submerged aquatic vegetation are the only HAPCs likely to be affected by the proposed action. All effects on these HAPCs are identified above at 1 - 3, and 5 under Marine EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species.

## 3.3 Essential Fish Habitat Conservation Recommendations

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

The NMFS knows of no reasonable measures, beyond the planned design features and construction BMPs, that the applicant could include to further reduce or offset the project's construction-related effects on the attributes of marine EFH for Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species.

To reduce adverse impacts on water quality that the project would cause in Guemes Channel through continued discharge of WWTP effluent:

4. The City of Anacortes should partner with the Washington Department of Ecology to develop a Habitat Conservation Plan and apply for an Incidental Take Permit pursuant to section 10(a)(1)(B) of the ESA for their state-issued NPDES permit, in order to obtain incidental take authorization for unavoidable take of listed species that is anticipated to occur as a result of these permit issuances.

5. The City of Anacortes should more completely identify the pollutant load in the effluent discharged from their WWTP, and as part of future NPDES permit applications, to commit to incrementally apply new technologies to reduce pollutant concentrations in the effluent.

6. The FEMA, the USACE, and the U. S. Environmental Protection Agency (USEPA) should approach the National Marine Fisheries Service and the U.S. Fish and Wildlife Service to develop a programmatic biological opinion for the authorization of infrastructure projects that would result in the continued discharge of wastewater and or stormwater to the waters of the Puget Sound Basin, including those that would be discharged under state-issued NPDES permits. The project description for that programmatic consultation should include clear conservation measures intended to avoid and minimize the effects of NPDES permit actions on species and critical habitats listed under the ESA, as well as on essential fish habitat identified under the MSA, and should provide a mechanism for compensatory mitigation for unavoidable adverse effects, including take.

## 3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the FEMA and the USACE must provide a detailed written response to the NMFS within 30 days after receiving an EFH Conservation Recommendation. Such a response must be provided at least 10 days prior to final approval of the action if the response is inconsistent with any of the NMFS' EFH Conservation Recommendations unless the NMFS and the Federal agency have agreed to use alternative time frames for the Federal agency response. The response must include a description of the measures proposed by the agency for avoiding, minimizing, mitigating, or otherwise offsetting the impact of the activity on EFH. In the case of a response that is inconsistent with the Conservation Recommendations, the Federal agency must explain its reasons for not following the recommendations, including the scientific justification for any disagreements with the NMFS over the anticipated effects of the action and the measures needed to avoid, minimize, mitigate, or offset such effects [50 CFR 600.920(k)(1)].

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

### 3.5 Supplemental Consultation

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

## 4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

### 4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended user of this opinion is the FEMA and the USACE. Other interested users could include the applicant, the WDFW, the governments and citizens of Skagit County and the City of Anacortes, and Native American tribes. Individual copies of this opinion were provided to the FEMA and the USACE. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

### 4.2 Integrity

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

### 4.3 Objectivity

**Information Product Category:** Natural Resource Plan

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