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-2023-00672

March 20, 2024

Kristine Gilson
United States Maritime Administration (MARAD)
Senior Environmental Specialist
505 S. 336th St.
Federal Way, Washington 98422

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project

Dear Ms. Gilson:

Thank you for your letter of August 11, 2023, 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 Port of Port Angeles Intermodal Handling and Transfer Facility Improvements project. Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson–Stevens Fishery Conservation and Management Act [16 U.S.C. 1855(b)] for this action.

In this opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence or result in adverse modification of designated critical habitat for the following species:

- *Oncorhynchus keta*: Hood Canal summer-run (HCSR) chum
- *O. mykiss:* Puget Sound (PS) steelhead
- *O. tshawytscha:* PS Chinook salmon and their critical habitat

We also conclude that the proposed action is not likely to adversely affect the following species and critical habitat:

- *Acipenser mediostris*: Southern distinct population of North American green sturgeon
- *Thaleichthys pacificus*: Southern distinct population of eulachon
- *Megaptera novaeangliae*: Central America distinct population and Mexico distinct population of humpback whale
- *Orcinus orca: Southern Resident Killer Whale (*SRKW) or its designated critical habitat

As required by Section 7 of the Endangered Species Act, the NMFS provided an incidental take statement with the biological opinion. The incidental take statement describes reasonable and prudent measures the NMFS considers necessary or appropriate to minimize incidental take associated with this action. The take statement sets forth nondiscretionary terms and conditions. Incidental take from actions that meet the term and condition will be exempt from the Endangered Species Act take prohibition.

NMFS also reviewed the likely effects of the proposed action on essential fish habitat (EFH), pursuant to section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (16 U.S.C. 1855(b)), and concluded that the action would adversely affect the EFH of Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. Therefore, we have included the results of that review in Section 3 of this document.

Please contact Bonnie Shorin, of the Oregon Washington Coastal Office in Lacey, Washington, at bonnie.shorin@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: Jesse Waknitz, Port of Port Angeles

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

Port of Port Angeles Intermodal Handling and Transfer Facility Improvement Project

NMFS Consultation Number: WCRO-2023-00672

Action Agency: USDOT - MARAD

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?
North American green sturgeon, southern DPS (*Acipenser mediostris)*	Threatened	No	N/A	No	N/A
Hood Canal summer-run (HCSR) chum (*Oncorhynchus keta*)	Threatened	Yes	No	No	N/A
PS steelhead (*O. mykiss*)	Threatened	Yes	No	No	N/A
PS Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	Yes	No
Eulachon, Southern DPS *(Thaleichthys pacificus)*	Threatened	No	N/A	No	N/A
Southern Resident Killer Whale (SRKW) (*Orcinus orca*)	Endangered	No	N/A	No	N/A
Humpback Whale (*Megaptera novaeangliae*) (Central America DPS/Mexico DPS)	CAM (Endangered) MEX (Threatened)	No	N/A	No	N/A

Fishery Management Plan That Identifies 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: March 20, 2024

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1. INTRODUCTION

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

1.1 Background

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

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

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

1.2 Consultation History

On May 27, 2021, the U.S. Army Corps of Engineers (USACE) submitted a request for consultation to NMFS for repair of the Port of Port Angeles Cofferdam Dock Facility. On June 1, 2021, the NMFS responded that the Project was potentially suitable for the Salish Sea Nearshore Programmatic (SSNP).

In December, 2022, the Port of Port Angeles (Port) received grant funding for this Project from the U.S. Department of Transportation (USDOT) Maritime Administration (MARAD). MARAD subsequently became the new lead federal action agency for the Port's Cofferdam Dock Facility Project and the USACE withdrew its request for consultation on December 7, 2022.

On May 15, 2023, MARAD submitted a request for informal consultation to NMFS for the proposed action, which includes the Project activities described in the original consultation request in addition to upland facility improvements.

On August 11, 2023, MARAD revised their consultation request to a request for formal consultation on Puget Sound (PS) Chinook salmon and their designated critical habitat, PS steelhead, HCSR chum, the southern DPS of North American green sturgeon, and the designated critical habitat for Southern Resident Killer Whale (SRKW). On August 14, 2023, NMFS initiated the formal consultation, concurring with the "likely to adversely affect" determinations for all but the North American green sturgeon and SRKW critical habitat. NMFS' analyses are included in Section 2.11 of this document.

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.

1.3 Proposed Federal Action

Under the ESA, "action" means all activities or programs of any kind authorized, funded, or carried out, in whole or in part, by Federal agencies (see 50 CFR 402.02). Under MSA, federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded or undertaken by a federal agency (50 CFR 600.910).

MARAD has awarded federal funding to the Port of Port Angeles (Port) to perform upgrades to its Cofferdam Dock Facility and install stormwater treatment on the adjacent Intermodal Handling and Transfer Facility (IHTF) located along the Port Angeles Waterfront in Port Angeles, Washington. The Port's Cofferdam Dock Facility was constructed in 2004 by the Washington State Department of Transportation (WSDOT) to support its Graving Dock Project. The Graving Dock Project was subsequently abandoned and ownership of the IHTF and Cofferdam Dock Facility were transferred to the Port in 2006. This cofferdam dock has since served as a temporary barge moorage for the loading and unloading of timber products. The sheetpile retaining wall along the shoreline margin of the cofferdam is currently corroding due to years of heavy industrial use and saltwater exposure. The Port of Port Angeles Intermodal Handling and Transfer Facility Improvement Project (Project) proposes to conduct maintenance and repair activities to the cofferdam structure, install a three-stage biofiltration facility to treat stormwater from the IHTF structure, and raise the surface elevation and repave 14.4 acres of the IHTF to improve operational efficiency and stormwater conveyance.

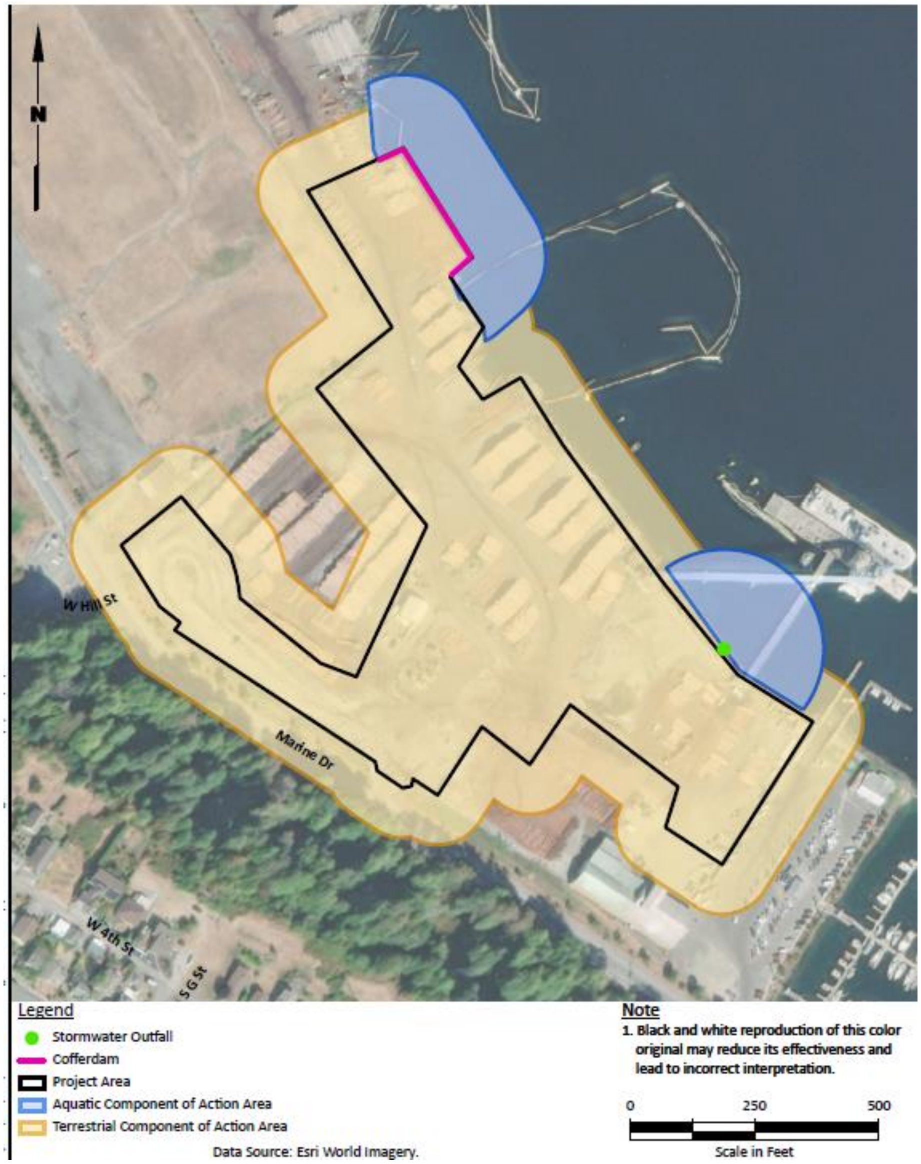

Figure 1. Image of map from BE showing upland and in-water components of Project

The existing Cofferdam Dock Facility is composed of a steel sheetpile wall running approximately 335 linear feet (LF) along the shoreline of Port Angeles Harbor. This sheetpile wall is tied back to a second, parallel sheetpile wall located approximately 30 feet (ft.) landward. These sheetpile walls are connected by tie rods attached to a double channel waler beam above the Highest Astronomical Tide (HAT) and backfill between these walls consists of loose dirt fill and wood debris. Repairs to the Cofferdam Dock Facility will include the following components: constructing a mechanically stabilized earth (MSE) wall and backfilling the area with more structurally sound material, installing a 1.25-inch thick fiberglass encasement against the waterward sheetpile wall to address corrosion, and repairing the waler beams and tie rods connecting these walls to provide structural support.

The existing IHTF site is composed of 30 acres of upland structure used for cargo handling, sorting, and staging. The current surface is a mixture of gravel and deteriorated asphalt and concrete, which has proven insufficient at addressing stormwater management, grounds maintenance, and equipment upkeep. The proposed upland repairs include the regrading and resurfacing of 14.4 acres of the IHTF with high-load capacity asphalt concrete. A three-stage biofiltration stormwater treatment facility will be constructed in this area to bring the Port into compliance with its National Pollutant Discharge Elimination System (NPDES) Industrial Stormwater General Permit. Stage 1 of the treatment facility will consist of a pea gravel filter medium that will be installed in three 18,000-gallon steel tanks. Stage 2 will filter stormwater through a biofiltration soil mix that will be placed in an aboveground, cast-in-place concrete retaining wall structure. Finally, stage 3 will include a polishing medium. Once this system has been installed, surface runoff from the IHTF will drain or sheet-flow into a pump station conveying flows into the biofiltration system and once treated, will discharge into Port Angeles Harbor through an existing outfall pipe.

The current adverse sub-lethal effect threshold in salmonids for dissolved zinc is 5.6 micrograms per liter (µg/L) over background zinc concentrations between 3.0 µg/L and 13 µg/L, and the adverse sub-lethal effect threshold in salmonids for dissolved copper is 2.0 µg/L over background levels of 3.0 µg/L or less. The biofiltration facility is designed to treat total suspended solids, turbidity, zinc, copper, and chemical oxygen demand. Pilot testing of a similar facility at the Port found that a similar three-stage stormwater treatment system provided approximately 90 percent reduction in total copper and zinc concentrations in runoff. These stormwater treatment upgrades will reduce the suspension of sediment and woody debris in runoff and improve the water quality of discharges into Port Angeles Harbor within the Strait of Juan de Fuca.

<u>Construction Methods</u>
Cofferdam Dock Facility upgrades will be performed utilizing excavators, dump trucks, and similar construction equipment. The Port or its contractor will excavate approximately 16,000square feet (SF) of existing backfill material to a depth of 12 ft. below ground surface. The removed material will be stockpiled onsite for future use or transported offsite to an approved upland disposal facility if it is unsuitable for reuse. Once excavation is complete, in-water work will begin by removing the existing waler beam and installing the fiberglass encasement using land-based excavators. Once the encasement has been installed, the gap between the encasement and the existing sheetpile wall will be dewatered and divers will connect the structures using grout. Once the fiberglass encasement has been secured, the replacement waler beams and endcaps will be installed, backfill material will be placed to an elevation of +9 ft. mean lower low water (MLLW), and the MSE wall will be constructed. The MSE wall will be constructed using layers of compacted gravel (WSDOT standard) with sheets of geogrid reinforcement, quarry spalls, crushed surface base coarse rock, ecology blocks, and a 1-foot wide section of free draining rock to allow for stormwater infiltration and drainage.

The upland IHTF work will be performed utilizing excavators, dump trucks, graders, and other construction equipment. 14.4 acres of the Log Yard will be regraded and resurfaced with a high-load capacity asphalt concrete and the construction of the stormwater biofiltration system. Ground disturbance will be minimized by raising the ground elevation with the placement of crushed rock, installation of geogrid reinforcement, and asphalt concrete pavement. The clean fill material and pavement capping will encapsulate existing contaminated soil and groundwater, and mitigate contaminant mobilization risk from runoff. The stormwater biofiltration system will be constructed above grade and any excavations will be limited to maximum depths of 12 inches below ground surface. The existing storage warehouse and electrical building will be demolished and removed.

Project Timing

The applicant estimates that construction will begin in the summer of 2025 pending receipt of all necessary permits. In-water work will be performed consistent with allowable windows established by regulatory agencies to minimize potential disturbance of sensitive fish and wildlife species. Within Port Angeles Harbor, these work windows are expected to occur between July 15 and February 15. Upland improvements to the IHTF are expected to continue after February 15 into the Spring of 2026.

Best Management Practices

Best management practices (BMPs) have been incorporated into the Project design to avoid or minimize environmental effects and the exposure of sensitive species to potential effects from the proposed Project activities. The following BMPs would be implemented to avoid or minimize environmental impacts during the Project:

1. In-water work*:*
    - To minimize the presence of ESA-listed species, all in-water work would be conducted between July 15 and February 15 (when outmigrating juvenile salmonids are less likely to be present).
    - Placement of the fiberglass encasement will be completed during this in-water window. Once the encasement is installed, the small gap between it and the sheetpile wall will be dewatered using a sump pump and transported upland. The water will not be discharged directly back to the harbor, and instead will either be infiltrated on-site, beneficially reused, or hauled off-site, per the decision of the Port and its contractor.
    - Any shifting of riprap necessitated by the installation of the encasement will occur in the dry.

2. Equipment and fueling:
   All equipment will be cleaned and inspected prior to arriving at the Project site to ensure no potentially hazardous materials are introduced, no leaks are present, and the equipment is functioning properly.

3. Debris containment:
   A temporary floating debris boom will be deployed waterward of the loading structure to capture potential debris during Project construction; the debris boom will be anchored to the shore above the HAT.

4. Stockpiling:
   Stockpiles will be mounded in a way to prevent runoff and covered in reinforced plastic sheeting.

5. Erosion Control:
   A Project-specific Temporary Erosion and Sediment Control plan will be developed and implemented. Examples of applicable BMPs include, but are not limited to, the following: maintain the existing plugged catch basin, comply with measures from a Project-specific stormwater pollution prevention plan, and establish a filter fabric construction fence around the site with a 4-inch by 4-inch trench and stabilized construction entrances.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that repairs to the Cofferdam Dock Facility would cause the enduring presence of cargo vessel use at this berth that would not occur but for the proposed action.

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 NMFS, and section 7(b)(3) requires that, at the conclusion of consultation, NMFS provide an opinion stating how the agency's actions would affect listed species and their critical habitats. If incidental take is reasonably certain to occur, section 7(b)(4) requires NMFS to provide an ITS that specifies the impact of any incidental taking and includes reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

MARAD determined the proposed action is not likely to adversely affect either DPS of humpback whales, SRKW, or the southern DPS of eulachon. Our concurrence, as well as our determinations for North American green sturgeon and the designated critical habitat for SRKW, is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.11).

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 designation of critical habitat for PS Chinook salmon use the term 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 rangewide 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.

As the proposed action is within the Salish Sea, NMFS considered evaluating the Project using a Habitat Equivalency Analysis (HEA)[1] and the Puget Sound Nearshore Habitat Values Model

[1] A common "habitat currency" to quantify habitat impacts or gains can be calculated using Habitat Equivalency Analysis (HEA) methodology when used with a tool to consistently determine the habitat value of the affected area before and after impact. NMFS selected HEA as a means to identify section 7 project related habitat losses, gains, and quantify appropriate mitigation because of its long use by NOAA in natural resource damage assessment to scale compensatory restoration (Dunford et al. 2004; Thur 2006) and extensive independent literature on the model (Milon and Dodge 2001; Cacela et al. 2005; Strange et al. 2002). In Washington State, NMFS has also expanded the use of HEA to calculate conservation credits available from fish conservation banks (NMFS 2008, NMFS 2015),

(NHVM) adapted from Ehinger et al. 2015. Ecological equivalency that forms the basis of HEA is a concept that uses a common currency to express and assign a value to functional habitat loss and gain. Ecological equivalency is traditionally a service-to-service approach where the ecological functions and services for a species or group of species lost from an impacting activity are fully offset by the services gained from a conservation activity.

When analyzing the Project activities, NMFS determined that the NHVM in its current version was not the best tool to evaluate the site conditions and potential habitat loss associated with the proposed action. This is due to a variety of factors, including the Project setting estuarine system) and the Project elements (stormwater treatment upgrades and the Cofferdam Dock sheetpile encasement) that cannot be easily assessed within the current model. There is no current mechanism to analyze the benefits of stormwater treatment upgrades within the NHVM. Therefore, NMFS evaluated the long-term effects from the Project activities qualitatively in Section 2.5 (Effects of the Action) below. NMFS determined that the functional lift provided by upgraded stormwater treatment to 14.4 acres of the IHTF would sufficiently offset the Project impacts, resulting in no-net-loss of ecological functions.

2.2 Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that conservation value.

One factor affecting the status of ESA-listed species considered in this opinion, and aquatic habitat at large, is climate change. Climate change is likely to play an increasingly important role in determining the abundance and distribution of ESA-listed species, and the conservation value of designated critical habitats, in the Pacific Northwest. These changes will not be spatially homogeneous across the Pacific Northwest. Major ecological realignments are already occurring in response to climate change (IPCC WGII, 2022). Long-term trends in warming have continued at global, national and regional scales. Global surface temperatures in the last decade (2010s) were estimated to be 1.09 °C higher than the 1850-1900 baseline period, with larger increases over land ~1.6 °C compared to oceans ~0.88 (IPCC WGI, 2021). The vast majority of this warming has been attributed to anthropogenic releases of greenhouse gases (IPCC WGI, 2021). Globally, 2014-2018 were the 5 warmest years on record both on land and in the ocean (2018 was the 4th warmest) (NOAA NCEI 2022). Events such as the 2013-2016 marine heatwave (Jacox et al. 2018) have been attributed directly to anthropogenic warming in the annual special issue of Bulletin of the American Meteorological Society on extreme events (Herring et al.

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from which "withdrawals" can be made to address mitigation for adverse impacts to ESA species and their designated CH.

2018). Global warming and anthropogenic loss of biodiversity represent profound threats to ecosystem functionality (IPCC WGII 2022). These two factors are often examined in isolation, but likely have interacting effects on ecosystem function.

Updated projections of climate change are similar to or greater than previous projections (IPCC WGI, 2021). NMFS is increasingly confident in our projections of changes to freshwater and marine systems because every year brings stronger validation of previous predictions in both physical and biological realms. Retaining and restoring habitat complexity, access to climate refuges (both flow and temperature) and improving growth opportunity in both freshwater and marine environments are strongly advocated in the recent literature (Siegel and Crozier 2020).

Climate change is systemic, influencing freshwater, estuarine, and marine conditions. Other systems are also being influenced by changing climatic conditions. Literature reviews on the impacts of climate change on Pacific salmon (Crozier 2015, 2016, 2017, Crozier and Siegel 2018, Siegel and Crozier 2019, 2020) have collected hundreds of papers documenting the major themes relevant for salmon. Here we describe habitat changes relevant to Pacific salmon and steelhead, prior to describing how these changes result in the varied specific mechanisms impacting these species in subsequent sections.

Forests

Climate change will impact forests of the western U.S., which dominate the landscape of many watersheds in the region. Forests are already showing evidence of increased drought severity, forest fire, and insect outbreak (Halofsky et al. 2020). Additionally, climate change will affect tree reproduction, growth, and phenology, which will lead to spatial shifts in vegetation. Halofsky et al. (2018) projected that the largest changes will occur at low- and high-elevation forests, with expansion of low-elevation dry forests and diminishing high-elevation cold forests and subalpine habitats.

Forest fires affect salmon streams by altering sediment load, channel structure, and stream temperature through the removal of canopy. Holden et al. (2018) examined environmental factors contributing to observed increases in the extent of forest fires throughout the western U.S. They found strong correlations between the number of dry-season rainy days and the annual extent of forest fires, as well as a significant decline in the number of dry-season rainy days over the study period (1984-2015). Consequently, predicted decreases in dry-season precipitation, combined with increases in air temperature, will likely contribute to the existing trend toward more extensive and severe forest fires and the continued expansion of fires into higher elevation and wetter forests (Alizedeh 2021).

Agne et al. (2018) reviewed literature on insect outbreaks and other pathogens affecting coastal Douglas-fir forests in the Pacific Northwest and examined how future climate change may influence disturbance ecology. They suggest that Douglas-fir beetle and black stain root disease could become more prevalent with climate change, while other pathogens will be more affected by management practices. Agne et al. (2018) also suggested that due to complex interacting effects of disturbance and disease, climate impacts will differ by region and forest type.

Freshwater Environments

The following is excerpted from Siegel and Crozier (2019), who present a review of recent scientific literature evaluating effects of climate change, describing the projected impacts of climate change on instream flows:

Cooper et al. (2018) examined whether the magnitude of low river flows in the western U.S., which generally occur in September or October, are driven more by summer conditions or the prior winter's precipitation. They found that while low flows were more sensitive to summer evaporative demand than to winter precipitation, interannual variability in winter precipitation was greater. Malek et al. (2018), predicted that summer evapotranspiration is likely to increase in conjunction with declines in snowpack and increased variability in winter precipitation. Their results suggest that low summer flows are likely to become lower, more variable, and less predictable.

The effect of climate change on ground water availability is likely to be uneven. Sridhar et al. (2018) coupled a surface-flow model with a ground-flow model to improve predictions of surface water availability with climate change in the Snake River Basin. Projections using RCP 4.5 and 8.5 emission scenarios suggested an increase in water table heights in downstream areas of the basin and a decrease in upstream areas.

As cited in Siegel and Crozier (2019), Isaak et al. (2018), examined recent trends in stream temperature across the Western U.S. using a large regional dataset. Stream warming trends paralleled changes in air temperature and were pervasive during the low-water warm seasons of 1996-2015 (0.18-0.35°C/decade) and 1976-2015 (0.14-0.27°C/decade). Their results show how continued warming will likely affect the cumulative temperature exposure of migrating sockeye salmon *O. nerka* and the availability of suitable habitat for brown trout *Salmo trutta* and rainbow trout *O. mykiss*. Isaak et al. (2018) concluded that most stream habitats will likely remain suitable for salmonids in the near future, with some becoming too warm. However, in cases where habitat access is currently restricted by dams and other barriers salmon and steelhead will be confined to downstream reaches typically most at risk of rising temperatures unless passage is restored (FitzGerald et al. 2020, Myers et al. 2018).

Streams with intact riparian corridors and that lie in mountainous terrain are likely to be more resilient to changes in air temperature. These areas may provide refuge from climate change for a number of species, including Pacific salmon. Krosby et al. (2018), identified potential stream refugia throughout the Pacific Northwest based on a suite of features thought to reflect the ability of streams to serve as such refuges. Analyzed features include large temperature gradients, high canopy cover, large relative stream width, low exposure to solar radiation, and low levels of human modification. They created an index of refuge potential for all streams in the region, with mountain area streams scoring highest. Flat lowland areas, which commonly contain migration corridors, were generally scored lowest, and thus were prioritized for conservation and restoration. However, forest fires can increase stream temperatures dramatically in short time-spans by removing riparian cover (Koontz et al. 2018), and streams that lose their snowpack with climate change may see the largest increases in stream temperature due to the removal of temperature buffering (Yan et al. 2021). These processes may threaten some habitats that are currently considered refugia.

Marine and Estuarine Environments

Along with warming stream temperatures and concerns about sufficient groundwater to recharge streams, a recent study projects nearly complete loss of existing tidal wetlands along the U.S. West Coast, due to sea level rise (Thorne et al. 2018). California and Oregon showed the greatest threat to tidal wetlands (100%), while 68% of Washington tidal wetlands are expected to be submerged. Coastal development and steep topography prevent horizontal migration of most wetlands, causing the net contraction of this crucial habitat.

Rising ocean temperatures, stratification, ocean acidity, hypoxia, algal toxins, and other oceanographic processes will alter the composition and abundance of a vast array of oceanic species. In particular, there will be dramatic changes in both predators and prey of Pacific salmon, salmon life history traits and relative abundance. Siegel and Crozier (2019) observe that changes in marine temperature are likely to have a number of physiological consequences on fishes themselves. For example, in a study of small planktivorous fish, Gliwicz et al. (2018) found that higher ambient temperatures increased the distance at which fish reacted to prey. Numerous fish species (including many tuna and sharks) demonstrate regional endothermy, which in many cases augments eyesight by warming the retinas. However, Gliwicz et al. (2018) suggest that ambient temperatures can have a similar effect on fish that do not demonstrate this trait. Climate change is likely to reduce the availability of biologically essential omega-3 fatty acids produced by phytoplankton in marine ecosystems. Loss of these lipids may induce cascading trophic effects, with distinct impacts on different species depending on compensatory mechanisms (Gourtay et al. 2018). Reproduction rates of many marine fish species are also likely to be altered with temperature (Veilleux et al. 2018). The ecological consequences of these effects and their interactions add complexity to predictions of climate change impacts in marine ecosystems.

Perhaps the most dramatic change in physical ocean conditions will occur through ocean acidification and deoxygenation. It is unclear how sensitive salmon and steelhead might be to the direct effects of ocean acidification because of their tolerance of a wide pH range in freshwater (although see Ou et al. 2015 and Williams et al. 2019), however, impacts of ocean acidification and hypoxia on sensitive species (e.g., plankton, crabs, rockfish, groundfish) will likely affect salmon indirectly through their interactions as predators and prey. Similarly, increasing frequency and duration of harmful algal blooms may affect salmon directly, depending on the toxin (e.g., saxitoxin vs domoic acid), but will also affect their predators (seabirds and mammals). The full effects of these ecosystem dynamics are not known but will be complex. Within the historical range of climate variability, less suitable conditions for salmonids (e.g., warmer temperatures, lower streamflows) have been associated with detectable declines in many of these listed units, highlighting how sensitive they are to climate drivers (Ford 2022, Lindley et al. 2009, Williams et al. 2016, Ward et al. 2015). In some cases, the combined and potentially additive effects of poorer climate conditions for fish and intense anthropogenic impacts caused the population declines that led to these population groups being listed under the ESA (Crozier et al. 2019).

Climate change effects on salmon and steelhead

In freshwater, year-round increases in stream temperature and changes in flow will affect physiological, behavioral, and demographic processes in salmon, and change the species with which they interact. For example, as stream temperatures increase, many native salmonids face increased competition with more warm-water tolerant invasive species. Changing freshwater temperatures are likely to affect incubation and emergence timing for eggs, and in locations where the greatest warming occurs may affect egg survival, although several factors impact intergravel temperature and oxygen (e.g., groundwater influence) as well as sensitivity of eggs to thermal stress (Crozier et al. 2020). Changes in temperature and flow regimes may alter the amount of habitat and food available for juvenile rearing, and this in turn could lead to a restriction in the distribution of juveniles, further decreasing productivity through density dependence. For migrating adults, predicted changes in freshwater flows and temperatures will likely increase exposure to stressful temperatures for many salmon and steelhead populations, and alter migration travel times and increase thermal stress accumulation for ESUs or DPSs with early-returning (i.e. spring- and summer-run) phenotypes associated with longer freshwater holding times (Crozier et al. 2020, FitzGerald et al. 2020). Rising river temperatures increase the energetic cost of migration and the risk of *en route* or pre-spawning mortality of adults with long freshwater migrations, although populations of some ESA-listed salmon and steelhead may be able to make use of cool-water refuges and run-timing plasticity to reduce thermal exposure (Keefer et al. 2018, Barnett et al. 2020).

Marine survival of salmonids is affected by a complex array of factors including prey abundance, predator interactions, the physical condition of salmon within the marine environment, and carryover effects from the freshwater experience (Holsman et al. 2012, Burke et al. 2013). It is generally accepted that salmon marine survival is size-dependent, and thus larger and faster growing fish are more likely to survive (Gosselin et al. 2021). Furthermore, early arrival timing in the marine environment is generally considered advantageous for populations migrating through the Columbia River. However, the optimal day of arrival varies across years, depending on the seasonal development of productivity in the California Current, which affects prey available to salmon and the risk of predation (Chasco et al. 2021). Siegel and Crozier (2019) point out the concern that for some salmon populations, climate change may drive mismatches between juvenile arrival timing and prey availability in the marine environment. However, phenological diversity can contribute to metapopulation-level resilience by reducing the risk of a complete mismatch. Carr-Harris et al. (2018), explored phenological diversity of marine migration timing in relation to zooplankton prey for sockeye salmon *O. nerka* from the Skeena River of Canada. They found that sockeye migrated over a period of more than 50 days, and populations from higher elevation and further inland streams arrived in the estuary later, with different populations encountering distinct prey fields. Carr-Harris et al. (2018) recommended that managers maintain and augment such life-history diversity.

Synchrony between terrestrial and marine environmental conditions (e.g., coastal upwelling, precipitation and river discharge) has increased in spatial scale causing the highest levels of synchrony in the last 250 years (Black et al. 2018). A more synchronized climate combined with simplified habitats and reduced genetic diversity may be leading to more synchrony in the productivity of populations across the range of salmon (Braun et al. 2016). For example, salmon productivity (recruits/spawner) has also become more synchronized across Chinook populations from Oregon to the Yukon (Dorner et al. 2018, Kilduff et al. 2014). In addition, Chinook salmon have become smaller and younger at maturation across their range (Ohlberger 2018). Other Pacific salmon species (Stachura el al. 2014) and Atlantic salmon (Olmos et al. 2020) also have demonstrated synchrony in productivity across a broad latitudinal range.

At the individual scale, climate impacts on salmon in one life stage generally affect body size or timing in the next life stage and negative impacts can accumulate across multiple life stages (Healey 2011; Wainwright and Weitkamp 2013, Gosselin et al. 2021). Changes in winter precipitation will likely affect incubation and/or rearing stages of most populations. Changes in the intensity of cool season precipitation, snow accumulation, and runoff could influence migration cues for fall, winter and spring adult migrants, such as coho and steelhead. Egg survival rates may suffer from more intense flooding that scours or buries redds. Changes in hydrological regime, such as a shift from mostly snow to more rain, could drive changes in life history, potentially threatening diversity within an ESU (Beechie et al. 2006). Changes in summer temperature and flow will affect both juvenile and adult stages in some populations, especially those with yearling life histories and summer migration patterns (Crozier and Zabel 2006; Crozier et al. 2010, Crozier et al. 2019).

At the population level, the ability of organisms to genetically adapt to climate change depends on how much genetic variation currently exists within salmon populations, as well as how selection on multiple traits interact, and whether those traits are linked genetically. While genetic diversity may help populations respond to climate change, the remaining genetic diversity of many populations is highly reduced compared to historic levels. For example, Johnson et al. (2018), compared genetic variation in Chinook salmon from the Columbia River Basin between contemporary and ancient samples. A total of 84 samples determined to be Chinook salmon were collected from vertebrae found in ancient middens and compared to 379 contemporary samples. Results suggest a decline in genetic diversity, as demonstrated by a loss of mitochondrial haplotypes as well as reductions in haplotype and nucleotide diversity. Genetic losses in this comparison appeared larger for Chinook from the mid-Columbia than those from the Snake River Basin. In addition to other stressors, modified habitats and flow regimes may create unnatural selection pressures that reduce the diversity of functional behaviors (Sturrock et al. 2020). Managing to conserve and augment existing genetic diversity may be increasingly important with more extreme environmental change (Anderson et al. 2015), though the low levels of remaining diversity present challenges to this effort (Freshwater 2019). Salmon historically maintained relatively consistent returns across variation in annual weather through the portfolio effect (Schindler et al. 2015), in which different populations are sensitive to different climate drivers. Applying this concept to climate change, Anderson et al. (2015) emphasized the additional need for populations with different physiological tolerances. Loss of the portfolio increases volatility in fisheries, as well as ecological systems, as demonstrated for Fraser River and Sacramento River stock complexes (Freshwater et al. 2019, Munsch et al. 2022).

2.2.1 Status of the Species

Table 1, below provides a summary of listing and recovery plan information, status summaries and limiting factors for the species addressed in this opinion. More information can be found in recovery plans and status reviews for these species. Acronyms appearing in the table include DPS (Distinct Population Segment), ESU (Evolutionarily Significant Unit), ICTRT (Interior Columbia Technical Recovery Team), MPG (Multiple Population Grouping), NWFSC (Northwest Fisheries Science Center), TRT (Technical Recovery Team), and VSP (Viable Salmonid Population).

Table 1. Listing classification and date, recovery plan reference, most recent status review, status summary, and limiting factors for each species considered in this opinion.

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound Chinook salmon	Threatened 6/28/05 (70 FR 37159)	Shared Strategy for Puget Sound 2007 NMFS 2006	NMFS 2016; Ford 2022	This ESU comprises 22 populations distributed over five geographic areas. All Puget Sound Chinook salmon populations continue to remain well below the TRT planning ranges for recovery escapement levels. Most populations also remain consistently below the spawner–recruit levels identified by the TRT as necessary for recovery. Across the ESU, most populations have increased somewhat in abundance since the last status review in 2016, but have small negative trends over the past 15 years. Productivity remains low in most populations. Overall, the Puget Sound Chinook salmon ESU remains at "moderate" risk of extinction.	• Degraded floodplain and in-river channel structure • Degraded estuarine conditions and loss of estuarine habitat • Degraded riparian areas 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
Hood Canal summer-run chum	Threatened 6/28/05	Hood Canal Coordinating Council 2005 NMFS 2007	NMFS 2016; Ford 2022	The Puget Sound Technical Recovery Team identified two independent populations for Hood Canal summer chum, one which includes the spawning aggregations from rivers and creeks draining into the Strait of Juan de Fuca, and one which includes spawning aggregations within Hood Canal proper. Natural-origin spawner abundance has increased since ESA listing, and spawning abundance targets in both populations have been met in some years. Productivity had increased at the time of the last review (NWFSC 2015), but has been down for the last three years for the Hood Canal population, and for the last four years for the Strait of Juan de Fuca population. Productivity of individual spawning aggregates shows that only two of eight aggregates have viable performance.	• Reduced floodplain connectivity and function • Poor riparian condition • Loss of channel complexity Sediment accumulation • Altered flows and water quality

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
				Spatial structure and diversity viability parameters, as originally determined by the TRT, have improved, and nearly meet the viability criteria for both populations. Despite substantive gains toward meeting viability criteria in the Strait of Juan de Fuca and Hood Canal summer chum salmon populations, the ESU still does not meet all of the recovery criteria for population viability at this time. Overall, the Hood Canal summer-run chum salmon ESU therefore remains at "moderate" risk of extinction..	
Puget Sound steelhead	Threatened 5/11/07	NMFS 2019	NMFS 2016; Ford 2022	This DPS comprises 32 populations. Viability of has improved somewhat since the PSTRT concluded that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 DIPs (Hard et al. 2015). Increases in spawner abundance were observed in a number of populations over the last five years within the Central & South Puget Sound and the Hood Canal & Strait of Juan de Fuca MPGs, primarily among smaller populations. There were also declines for summer- and winter-run populations in the Snohomish River basin. In fact, all summer-run steelhead populations in the Northern Cascades MPG are likely at a very high demographic risk.	• Continued destruction and modification of habitat • Widespread declines in adult abundance despite significant reductions in harvest • Threats to diversity posed by use of two hatchery steelhead stocks • Declining diversity in the DPS, including the uncertain but weak status of summer-run fish • A reduction in spatial structure • Reduced habitat quality • Urbanization • Dikes, hardening of banks with riprap, and channelization

2.2.2 Status of the Critical Habitat

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

For most salmon and steelhead, NMFS's critical habitat analytical review teams (CHARTs) ranked watersheds within designated critical habitat at the scale of the fifth-field hydrologic unit code (HUC5) in terms of the conservation value they provide to each ESA-listed species that they support (NMFS 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 2, below.

Table 2. Critical habitat, designation date, federal register citation, and status summary for critical habitat considered in this opinion

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
Puget Sound Chinook salmon	9/02/05 70 FR 52630	Critical habitat for Puget Sound Chinook salmon includes 1,683 miles of streams, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sounds. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated high conservation value, 12 low conservation value, and eight received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.

2.3 Action Area

Under the ESA, "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). Under the MSA, "Federal action" means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal agency (see 50 CFR 600.910).

The in-water work necessary for placement of the fiberglass encasement is likely to generate some minor turbidity within Port Angeles Harbor. In Washington, water quality standards (Washington Administrative Code (WAC) 173-201A-210) specify a mixing zone in which visible turbidity must not extend more than 150 ft. from the Cofferdam Dock Facility. Mixing zones will likewise extend 200 ft. from the stormwater outfall per WAC 173-201A-400. However, water quality contaminants in stormwater, even post treatment, are likely to persist without settling out in the manner that suspended sediment does, and for these reasons, we consider the action area to extend well beyond the turbidity mixing zone. Based on water and sediments (Zhang et al. 2016) to be affected by certain likely contaminants (PAHs and 6-PPD-q, for example), we estimate that the action area is 1 kilometer (km) radially from the outfall (Law et al. 1997).

Species present in the action area that are likely to be adversely affected by the proposed action are PS Chinook salmon, PS steelhead, and HCSR chum. Critical habitat for PS Chinook salmon is also present within the action area and likely to be adversely affected by the proposed action.

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).

Port Angeles is located on a natural harbor that is protected by the long sand spit of Ediz Hook curing east into the Strait of Juan de Fuca. The Port of Port Angeles owns approximately 35 acres of property in Port Angeles Harbor and manages the property for industrial, commercial, and recreational uses. Historically, the Port terminals, including the IHTF, have primarily operated for log transport from the Olympic Peninsula to Pacific Rim Countries. In recent years, the Port has modernized its facilities and expanded its marine terminal services the accommodate bulk and break-bulk cargoes (Port of Port Angeles 2023).

The Port's Cofferdam Dock Facility was constructed in 2004 by WSDOT in support of the Graving Dock Project, which was abandoned in December 2004 due to the discovery of historically significant archaeological resources and human remains at the site. Ownership of the cofferdam was transferred to the Port in 2006 and it has since become a critical piece of transportation infrastructure to allow for the transportation of logs on and off the North Olympic Peninsula by barge.

As mitigation for the Graving Project, WSDOT and the Port performed several shoreline restoration activities along Ediz Hook, including the removal of creosote piles and derelict concrete rubble, restoration of 1,500 linear feet (LF) of beach surface material, and the placement of large woody debris and planting of native vegetation. Several additional restoration projects have been conducted along Ediz Hook by the Lower Elwha Klallam Tribe, the Salmon Recovery Funding Board, and other governmental and non-profit organizations. As a result of these efforts, Ediz Hook provides functional nearshore habitat including eelgrass beds and forage fish spawning.

Forage fish are an important group of fish in the marine waters of Washington. Forage fish serve as prey for a variety of marine animals, including birds, fish, and marine mammals. Pacific herring (*Clupea pallasii*), surf smelt (*Hypomesus pretiosus*), and Pacific sand lance (*Ammodytes hexapterus*) are the most common forage fish in Puget Sound. All three species are known to occur in Port Angeles Harbor.

Herring typically spawn in northern Puget Sound and the Strait of Juan de Fuca between late January and early April (Bargmann 1998). Herring deposit their transparent eggs on intertidal and shallow subtidal eelgrass and marine algae. Although no herring spawning locations have been documented in the harbor (WDFW 2023), juvenile herring have been caught during seining just off Ediz Hook (Shaffer et al. 2008). No appropriate spawning habitat exists within the action area.

Surf smelt are most abundant in the Port Angeles Harbor in late spring through summer but spawn throughout the year, with the heaviest spawn occurring from mid-October through December. The closest documented surf smelt spawning area is a 1,000 foot long area on the south side of Ediz Hook, at the furthest extent of the action area.

Sand lance spawning typically occurs from early November through mid-February. They deposit eggs on a range of nearshore substrates, from soft, pure, fine sand beaches to beaches armored with gravel (Bargmann 1998). Barmgann (1998) indicates that sand lance comprise 35 percent of all juvenile salmon diets and 60 percent of the juvenile Chinook diet, in particular. The closest documented sand lance spawning area is a 1,000 foot long area on the south side of Ediz Hook, at the furthest extent of the action area. Adult, juvenile, and larval sand lance are expected to be present within Port Angeles Harbor throughout the year.

Port Angeles Harbor is listed on the State of Washington’s 303(d) list of impaired waterbodies for bacteria exceedances. It has also been designated as impaired due to exceedances of several contaminants including mercury, polychlorinated biphenyls (PCBs), and polycyclic aromatic hydrocarbons (PAHs) (Ecology 2023a). The Project action area lies within the limits of the Washington State Department of Ecology’s Western Port Angeles Harbor Study Area, which is currently undergoing a Remedial Investigation/Feasibility Study to explore cleanup options

(Ecology 2023b). The site lacks natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, or side channels.

Water quality in the harbor is strongly tied to water quality in the Strait of Juan de Fuca. A monthly comparison of water quality parameters (temperature, salinity, DO) indicate that conditions in the harbor closely match conditions of the waters of the greater Strait of Juan de Fuca. Temperatures were slightly higher in the harbor in late summer and salinity inside the harbor was higher during the winter but lower during the fall (Ebbesmeyer et al. 1979). Given the proximity to the open ocean and the opportunity for thorough mixing, water quality in the Strait of Juan de Fuca is considered naturally pristine. The difference in temperature between the harbor and the Strait of Juan de Fuca can be attributed to the protection from currents afforded by Ediz Hood, which increases the residence time of water in the harbor. Differences in salinity can be attributed to increased freshwater run-off in the fall due to increased precipitation.

Use of the action area by listed species

PS Chinook salmon:

Chinook salmon presence is documented within Port Angeles Harbor, and juveniles and adults migrate within the action area. None of the freshwater streams within the Port Angeles urban drainages (Ennis Creek, Peabody Creek, Valley Creek, Tumwater Creek, and Dry Creek) currently support or historically supported Chinook salmon spawning and rearing; however, the nearby Dungeness River to the east and Elwha River to the west of the action area support large spawning and rearing populations (Elwha-Dungeness Planning Unit 2005, WDFW 2013). The Elwha estuary has been assessed as one of the highest functioning areas for ESA salmonid use within the central Strait of Juan de Fuca, particularly after the removal of two large dams in the Elwha River between 2011 and 2014. In a 2015 study, Chinook salmon was the dominant species in the Elwha nearshore and annually ranged from 20 to 90 percent of the salmon present, though these results were largely influenced by WDFW Chinook hatchery releases (Shaffer et al. 2008, Shaffer et al. 2017). During nearshore surveys conducted from 2006 through 2014 near the action area, Chinook salmon were recorded from April to September (Fresh 2015), which overlaps with roughly half of the in-water work window. Adult PS Chinook may migrate near the action area between April and October which overlaps with a substantial portion of the work window. Yearling PS Chinook may occur anywhere in the Puget Sound at any time of year, though not in concentrated numbers. Within the Puget Sound and Strait of Juan de Fuca, resident Chinook salmon are found in highest numbers between the months of November through July (Quinn and Losee 2021).

HCSR chum:

The HCSR chum ESU includes all naturally spawned populations of summer-run chum salmon in Hood Canal and its tributaries, as well as populations in Olympic Peninsula rivers between Hood Canal and Dungeness Bay, Washington. Eight artificial propagation programs are also considered to be part of this ESU (NMFS 2005a).

There are two designated independent populations of HCSR chum ESU: one that includes spawning aggregations in Hood Canal and one that includes the spawning aggregations from rivers and creeks draining into the Strait of Juan de Fuca (Ford 2022). The Strait of Juan de Fuca summer chum population is composed of five spawning aggregations (Dungeness River, Jimmycomelately Creek, Salmon Creek, Snow Creek, and Chimacum Creek). Summer chum enter the Dungeness River in late August through late October and spawn in the main channel through September. Eggs incubate in redds for 5 to 6 months and fry emerge between January and May. Typical of chum salmon, fry migrate rapidly downstream and out to the estuary and nearshore areas (NMFS 2005a).

During nearshore surveys conducted from 2006 to 2014, juvenile chum salmon were recorded from April through September, with higher abundances during the spring months (April through June) (Fresh 2015). Nearshore surveys conducted within the Elwha estuary before, during, and after dam removal found that chum size and abundance declined after the removal of the Elwha dams. The study also determined that chum fry abundance was significantly negatively correlated to Chinook salmon catches, indicating that continued hatchery releases of Chinook salmon may be contributing to increased chum predation around the action area (Shaffer et al. 2017). Adult summer-run chum may migrate near the action area between August through October, which occurs fully within the work window.

PS steelhead:
Of the 32 independent populations of the PS steelhead DPS, three may occur in the vicinity of the action area. These include the Dungeness River summer/winter run, Strait of Juan de Fuca Independent Tributaries winter run, and the Elwha River winter run (Myers et al. 2015). The Dungeness River summer/winter-run population spawns in the mainstem of the Dungeness and Grey Wolf Rivers. Within the Dungeness River, spawning typically occurs from mid-March to early June. Genetically, the Dungeness River steelhead most closely cluster with other collections from the Strait of Juan de Fuca and Elwha River populations (Myers et al. 2015).

There are two steelhead natal rivers near the action area, Valley Creek and Tumwater Creek. Valley Creek is known as supporting steelhead but it is not specifically noted in the Salmon and Steelhead Stock Inventory (SASSI) (WDF et al. 1993). Tumwater Creek is known as supporting steelhead but is not specifically noted in SASSI (WDF et al. 1993). Prior to the removal of the Elwha Dams, fewer than 500 wild salmon were utilizing the Elwha River annually. The Washington State Conservation Commission estimated that removal of the dams would result in returns of 10,100 steelhead per year and projected that the river system would recover within 15-18 years (Haring 1999). Surveys within the Elwha River between 2016 and 2021 have shown general increases in steelhead abundance, though in a less consistent trend than Chinook and coho salmon (Munsch et al. 2023).

Adult PS steelhead may migrate near the action area between November and April, which overlaps with a substantial portion of the work window.

2.5 Effects of the Action

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

The assessment below considers the intensity of expected effects in terms of the change they would cause on habitat features 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 are likely last for weeks, and long-term effects are likely to last for months, years, or decades.

Effects of the proposed action include:

- Water quality diminishment – from suspended sediment associated with construction (temporary) and from discharge of effluent into the Puget Sound (long-term);
- Disturbance of bottom sediments of benthic communities (forage – short-term);
- Loss of nearshore habitat caused by retrofitting the Cofferdam Dock with the fiberglass encasement (long-term);
- Vessel traffic and use of the Cofferdam Dock Facility during construction and post construction (noise, shade, sediment disturbance, and water pollution – long-term);

2.5.1 Effects on Critical Habitat

As mentioned in Section 2.3, designated critical habitat for PS Chinook salmon and SRKW occurs within the action area. There is no designated critical habitat for PS steelhead or HCSR chum within the action area, and effects to SRKW critical habitat are discussed in the "Not Likely to Adversely Affect" Section of this opinion (Section 2.11). Critical habitat includes Physical and Biological Features (PBFs) necessary to support various life stages of salmonid and non-salmonid listed species (i.e. rearing, migration). The NMFS reviews effects on critical habitat affected by a proposed action by examining how the PBFs of critical habitat would be altered, and the duration of such changes.

Three of the six PBFs established for PS Chinook salmon critical habitat are likely to be present in the action area. Those PBFs are:

1. Estuarine areas free of obstruction with water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation,

2. Nearshore marine areas free of obstruction with water quality and quantity conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation; and natural cover such as submerged and overhanging large wood, aquatic vegetation, large rocks and boulders, and side channels, and

3. Offshore marine areas with water quality conditions and forage, including aquatic invertebrates and fishes, supporting growth and maturation.

Effects to habitat features include temporary and permanent impacts to water quality, temporary diminishment of forage opportunities, and temporary and permanent impediments to migration. Timing, duration, and intensity of the effects on critical habitat are considered in the analysis, and we also consider them as the pathways of exposure creating effects to the species, as discussed below.

Water Quality –

Water quality is an essential element of the PBFs of PS Chinook salmon critical habitat. The in-water component of the Cofferdam Dock facility improvements would be completed using land-based excavators to remove the existing waler beam and install the fiberglass encasement and divers and a skiff to secure the fiberglass encasement and install the new waler beams and end caps. The fiberglass encasement would be pressed six inches into the mudline, which could affect water quality due to increased turbidity, decreased dissolved oxygen (DO), or resuspended contaminants. Stormwater discharge would also contribute to water quality impairments due to the discharge of effluent from the 14.4 acres of pollution-generating impervious surface (PGIS) at the IHTF.

Turbidity – Temporary and localized increases in turbidity are expected in the immediate vicinity of the fiberglass encasement as it is pressed into the mudline. The contractor would be responsible for ensuring that turbidity does not extend beyond the 150-ft. point of compliance under the Washington State Surface Water Quality Standards (Washington Administrative Code (WAC) 173-201A); however, the turbidity generated from this action is expected to be far more localized due to the method of placement. Turbidity resulting from in-water work would temporarily impact the nearshore water quality PBF for Chinook salmon. For the period of time that placement of the fiberglass encasement occurs, the value of the critical habitat would be diminished such that fish within the immediate vicinity of the Project would be likely to avoid the turbidity plume. The effects of turbidity are significant in proportion to the ratio of the size of the disturbed area to the size of the bottom area and water volume (Morton 1977). Given the relatively small size of the area in which the fiberglass encasement will be placed in relation to the designated Chinook salmon critical habitat within the Strait of Juan de Fuca, it is likely that the turbidity generated from this action would only marginally reduce the value of this habitat for a very limited amount of time. Once in-water work has ceased, the turbidity generated by the fiberglass encasement placement would be expected to disperse within a few tidal cycles (Hitchcock and Bell 2004).

Dissolved Oxygen – Suspension of anoxic sediment compounds during in-water construction activities can result in reduced DO in the water column as the sediments oxidize. Sub-lethal effects of DO levels below saturation can include metabolic, feeding, growth, behavioral, and productivity effects. Behavior responses can include avoidance and migration disruption (NMFS 2005c).

The western portion of Port Angeles Harbor, including the Project area, has historically been classified as a Category 5 impaired water due to low DO levels from legacy wood pulp contamination (Ecology 2023b). Water quality in Port Angeles Harbor is strongly tied to water quality in the Strait of Juan de Fuca. A monthly comparison of water quality parameters performed by Ebbesmeyer et al. (1979) concluded that oxygen concentrations are generally higher inside the harbor during June through September and lower during the rest of the year, meaning that a risk of low dissolved oxygen would overlap with a portion of the in-water work window between July 15 and February 15. A model created by LaSalle (1988) demonstrated that, even in a situation where the upper limit of expected suspended sediment is reached during dredging operations, DO depletion of no more than 0.1 mg/L would occur at depth. As the suspended sediment generated from the proposed in-water construction is likely to be much smaller in quantity and duration than a dredging operation, it is highly unlikely that DO depletion within the Project area would rise to this upper limit. Any reduction in DO beyond background should be limited in extent and temporary in nature. For these reasons, this proposed action is not likely to result in the sub-lethal effects outlined above. Additionally, the short duration of the Project further reduces the potential for effects of low DO due to turbidity and suspended sediment.

Resuspended Contaminants – Several Remedial Investigations and sediment cleanup actions are currently underway within Western Port Angeles Harbor due to exceedances in metals (mercury, cadmium, zinc), dioxins/furans, PCBs, and carcinogenic PAHs (Ecology 2020). In-water construction efforts have the potential to resuspend these contaminants within the water column, impacting the water quality PBFs for PS Chinook salmon. The probability of exposure of individuals to water quality effects is generally low given the highly localized nature of sediment resuspension, the work windows designed to avoid peak presence of juvenile salmonids, and BMPs implemented to minimize sediment mobilization (See Section 1.3). Short-term and intermittent exposure to reduced water quality could result in minor reductions in foraging success, gill damage, and/or sublethal toxicity within the 150 ft. mixing zone surrounding the fiberglass encasement installation. As a result, the designated critical habitat of PS Chinook salmon is expected to be somewhat impaired during in-water construction. In a high energy environment like Port Angeles Harbor, the contaminants are expected to disperse very rapidly once in-water work is complete, at which point the water quality conditions would return to their prior condition.

Discharge of Effluent – The impervious surfaces of the IHTF alter the natural infiltration of vegetation and natural soil and accumulate several pollutants associated with the heavy machinery utilizing the facility. During heavy rainfall, accumulated pollutants are mobilized and transported via runoff and conveyed into adjacent surface waters. The Project proposes to raise the surface elevation and construct high-load capacity asphalt concrete surface covering 14.4 acres of the IHTF in order to construct an upgraded stormwater treatment facility for the area (Landau 2023). The IHTF is currently unpaved and the proposed upgrades are intended to better facilitate the stormwater treatment goals outlined in the Port's NPDES permit by capping and containing existing contaminated soil and groundwater and by treating site runoff that would otherwise discharge directly into the harbor. The proposed biofiltration facility would treat total suspended solids, turbidity, zinc, copper, and chemical oxygen demand in runoff before it discharges into the harbor. The proposed upgrades are intended to lower the level of dissolved zinc and copper in stormwater discharge to below the adverse acute sub-lethal effect threshold in salmonids (5.6 micrograms per liter (μg/L) over background zinc concentrations of between 3.0 μg/L and 13 μg/L, and 2.0 μg/L over background copper levels of 3.0 μg/L or less, respectively) (WSDOT 2022 in Landau 2023). Pilot testing of a similar facility at the Port revealed that a similar three-stage stormwater treatment system reduced total copper and zinc concentrations in runoff by approximately 90 percent (Kennedy/Jenks 2022 in Landau 2023).

Recent research by a NMFS' science team (Northwest Fisheries Science Center, Ecotoxicology and Environmental Chemistry Programs) has shown that untreated stormwater is highly toxic to aquatic species, including Pacific salmon and marine forage fish (French et al. 2022). Conversely, parallel studies have shown that clean water/green infrastructure treatment methods can remove pollutants from stormwater (McIntyre et al. 2015). We expect that despite the improved stormwater treatment provided by the proposed three-stage biofiltration system, effluent would still contain some contaminants, such as PAHs and 6PPD/6PPD-quinone (6-PPD-q) that would adversely affect the physical, biological, and chemical dimensions of habitat quality supporting PS Chinook within the action area. The stormwater treatment upgrades would diminish the quantity and concentration of effluent discharging into Port Angeles Harbor, resulting in a long-term improvement in water quality; however, discharges would still adversely affect water quality due to uncaptured contaminants. Stormwater may also include an array of contaminants depending on the surrounding land use and proximity to industrial facilities (Table 3). At this Project location, the most likely contaminants are microplastics from tires, petroleum products from vehicles and vessels on the dock, metals from the newly paved facilities, and wood debris and dust.

Stormwater can discharge at any time of year; however, first-flush rain events after long dry periods typically occur in September in western Washington. As with stormwater runoff globally, the leading edge of hydrographs (the first flush) in urban watersheds have proportionally higher concentrations of contaminants, including those long known to resource managers (as evidenced by existing aquatic life criteria under the Clean Water Act), as well as many chemicals of emerging concern, so-called because they were largely unknown a decade ago (Maniquiz-Redillas et al. 2022 and Peter et al. 2020). Higher concentrations of pollutants occur less frequently between March and October as longer dry periods exist between storm events. In western Washington, most stormwater discharge occurs between October and March, when the region receives the most rain.

We estimate that the area of effect from stormwater discharge is 1 km radially from the outfall (Law et al. 1997) based on the assumption that water and sediment would be affected by certain likely contaminants, including those listed in Table 3 (Zhang et al. 2016). Stormwater negatively impacts critical habitat of PS Chinook salmon by degrading water quality (water quality is also a feature of EFH, see the analysis in Section 3). Aquatic organisms including ESA-listed fish and marine mammals may take up contaminants from their surrounding environments by direct contact with water and sediments, or via ingestion of contaminated plankton, invertebrates, detritus, or sediment, indicating that prey and substrate are also adversely affected features of critical habitat.

Table 3. Pollutants commonly found in stormwater runoff in Washington State.

Pollutant Class	Examples	Urban Sources
Petroleum hydrocarbons	PAHs (poly aromatic hydrocarbons)	Roads (vehicles, tires), industrial, consumer products
Metals	Mercury, copper, chromium, nickel, titanium, zinc, arsenic, lead	Roads, electronics, pesticides, paint, waste treatment
Microplastics	6PPD/6PPD-q	Vehicle tires
Common use pesticides, surfactants	Herbicides (glyphosate, diquat), insecticides, fungicides, adjuvants, surfactants (detergents, soaps)	Fertilizer, soil erosion
Persistent bio-accumulative toxicants (PBT)	POPs (persistent organic pollutants), PCBs (polychlorinated diphenyl ethers), PFCs (poly- and per-fluorinated compounds), pharmaceuticals (estrogen, antidepressant)	Eroding soils, solids, development, redevelopment, vehicles, emissions, industrial, consumer products
Temperature and dissolved oxygen	Warm water, unvegetated exposed surfaces (soil, water, sediments)	Impervious surfaces, rock, soils (roads, parking lots, railways, roofs)
Bacteria	*Escherichia coli*	Livestock waste, organic solids, pet waste, septic tanks

The water quality impacts from this Project would cause temporary and localized impacts to the PBFs of critical habitat for PS Chinook salmon via placement of the fiberglass encasement, and long-term impacts to these same PBFs via stormwater discharge into Port Angeles Harbor. In-water construction would degrade quality in the harbor up to 150 ft. from placement of the fiberglass encasement (though the area of impact is expected to be much smaller) during the in-water work window. The water quality conditions would return to baseline levels within hours after work ceases. Conditions for juvenile maturation and adult fitness during migration would be disrupted by the water quality degradation, though in a very small area. In-water construction would cause no measurable changes in water temperature and salinity, but mobilized contaminants and suspended sediments in the water column could temporarily impair the value of critical habitat for growth and maturation of juvenile salmon by exposing them to pollutants with both immediate and latent health effects. Increased levels of contaminants could also incrementally impair forage/prey communities that are exposed to the contaminants, delaying the speed that these communities re-establish after being physically disrupted by in-water work.

We anticipate water quality to be degraded by the discharge of stormwater effluent despite the addition of upgraded treatment. The proposed three-stage biofiltration treatment system would provide a significant reduction of pollutants in stormwater effluent, but the discharge itself would still result in some degradation of the water quality PBF of critical habitat for PS Chinook salmon. However, given that discharged effluent from this upgraded stormwater treatment system would contain *less* contaminant than currently occurs with the limited existing treatment on site, we believe that this action would decrease the quantity and concentration of contaminants entering the action area. Therefore, water quality, sediment quality, and prey communities would continue to support the conservation role (e.g., growth, maturation, survival) for PS Chinook salmon.

Disturbed Bottom Sediment and Benthic Communities – The placement of the fiberglass encasement at the Cofferdam Dock is likely to result in sediment disturbance that would temporarily reduce benthic prey. This, in turn, would result in minor, localized impacts to juvenile forage opportunities for the duration of the in-water fiberglass placement. The substrate within the harbor is primarily silty sand and would be expected to disperse very quickly upon completion of in-water work (within a few tide cycles). The speed of recovery by benthic communities is affected by several factors, including the intensity of disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Given the limited duration of in-water activities, the BMPs measures implemented to reduce turbidity, and the high-energy environment, benthic species would likely recolonize the area very quickly. The fiberglass encasement would also result in a small area of permanent loss to benthic communities where it is placed into the mudline. However, given the width of the encasement being installed (approximately 1.25 inches over a 335 LF area), this permanent disturbance would have a minimal impact on forage opportunities. The temporary and permanent disruptions to this localized area of benthic habitat would not preclude juvenile salmon from foraging along the adjacent Ediz Hook, which provides much higher quality habitat and forage opportunities. Based on these factors, the Project would result in a very small impairment of the forage PBFs for PS Chinook salmon.

Loss of Nearshore Habitat – The proposed action would not alter existing natural cover but would prevent the development of natural cover in the future. As mentioned in Section 2.4, the Cofferdam Dock Facility and surrounding areas have very little shoreline vegetation and contain little to no aquatic vegetation. However, the placement of the fiberglass encasement onto the Cofferdam Dock would extend the duration of the degraded condition of this habitat and prevent the formation of natural cover from undercut banks, side channels, or aquatic vegetation. The use of Port Angeles Harbor for industrial activities for decades has severely degraded the quality of this PBF for PS Chinook salmon. The new area of impact associated with the 1.25-inch fiberglass encasement is extremely small and unlikely to meaningfully further degrade this habitat; however, the proposed action would perpetuate the degraded condition and function of this habitat within the Project footprint.

Vessels – The presence of vessels for construction, or during regular operation of the Cofferdam Dock, produce a variety of habitat effects consistent with those described above: noise, shade, sediment disturbance, and water quality diminishments. Each of these pathways is well described for the short-term use of boats for construction, and we refer to those sections for a more detailed presentation of these effects, to which vessels would contribute. The ongoing use of the Cofferdam Dock by vessels would create temporary but periodic impacts to the water quality, migratory, and forage PBFs for PS Chinook salmon. Studies have shown that boat noise can induce stress responses in a variety of fish (including salmon) that trigger predator avoidance behavior such as schooling (van der Knaap 2022). While this response is beneficial against actual predators, van der Knaap theorized that it has become maladaptive as a response to vessel noise due to the high energy cost required. Shade cast from berthing vessels would also temporarily diminish the PS Chinook migration PBF, as it could result in juvenile salmonids swimming around the structure or risking predation from larger fish utilizing the overwater cover (Nightingale and Simenstad 2001; Shipman et al. 2010; Dethier et al. 2016). Finally, the continued use of the area by cargo vessels increases the chance that pollutants such as PAHs will enter the waterway, diminishing the water quality PBF. We cannot predict the frequency of commercial vessel use, but can conclude that the value of this critical habitat will be slightly diminished for the duration of time that a vessel occupies the area. However, given that the impact is spatially and temporally limited, the proposed action would not preclude the use of this habitat by PS Chinook salmon or meaningfully reduce the value of the habitat.

Project Impact Offsets

As stated above in Section 2.1, NMFS has decided to analyze the positive and detrimental effects of the Project on nearshore habitat qualitatively, as the current version of the nearshore calculator lacks a mechanism for addressing the proposed stormwater treatment upgrades and perpetuation of the Cofferdam Dock within this highly modified estuarine environmental setting. When assessing the adverse effects of the proposed action, they are very limited in size and duration with the most significant diminishment of migration and forage PBFs occurring during construction and returning to existing conditions afterward. Moreover, the functional lift provided by installing stormwater treatment at the highest existing standard on 14.4 acres of the IHTF will reduce impacts water quality and prey resource PBFs for PS Chinook salmon and SRKW.

2.5.2 Effects on Listed Species

Effects of the proposed action on species are based, in part, on habitat effects, as described above. The in-water work window has been designed to minimize exposure of juvenile salmonids to short-term habitat effects, but these effects are still possible. Because habitat conditions are generally poor in the action area, we do not expect significant presence (high numbers) of any of these species during construction. Individuals of these species would be exposed to the habitat effects described above – water quality reductions, reduced prey, disruption of habitat-forming processes within the nearshore environment, noise, shade, and increased predation. However, adult and juvenile responses to these effects are very different. Green sturgeon, eulachon, humpback whale, and SRKW are not likely to be adversely affected and our analyses on these species appears in Section 2.11 of this document.

Water Quality – Exposure to diminished water quality is likely to adversely affect juvenile and adult PS Chinook salmon, HCSR chum, and PS steelhead within the Project vicinity during and after the completion of construction. Water quality would be impaired by suspended sediments and contaminants for a period of up to three months.

Turbidity – Temporary and localized increases in turbidity are likely to occur during the placement of the fiberglass encasement onto the face of the Cofferdam Dock. With the successful implementation of the BMPs listed in Section 1.3, the turbidity generated by this action would not extend beyond 150 feet from the encasement. As a result, any fish within the immediate vicinity of the Cofferdam Dock could experience behavioral or physiological changes as a result of the suspended sediment. The effects of suspended sediments on fish increase in severity with sediment concentration and exposure time, and can progressively include behavioral avoidance and/or disorientation, physiological stress, gill abrasion, and, at extremely high concentrations, death. Physical effects are a function of the exposure duration and concentration of the suspended sediment generating the turbidity (Newcombe and Jensen 1996;

Wilber and Clarke 2001). Studies have also shown that salmonids can detect and distinguish turbidity and other water quality gradients (Quinn 2005; Simenstad 1998), and fish will generally move away from areas within higher concentrations of total suspended solids (Kjelland et al. 2015). As a result, fish are more likely to experience sublethal stress (coughing or gill irritation) and behavioral responses rather than lethal effects. The turbidity generated from this work would likely disperse quickly due to the very limited scope of in-water work and the high-energy environment in which it would take place. These conditions also make behavioral responses far more likely than lasting injury to any fish within the area. The in-water work window has been designed to reduce the presence of juvenile salmonids within the action area to the greatest extent, further reducing juvenile salmonid exposure to suspended sediments. Adult PS Chinook salmon, HCSR chum, and PS steelhead are expected to be migrating through the action area during operations but are not expected to remain long enough to be significantly impacted.

Dissolved Oxygen – Habitat and prey resources may be affected through temporary decreases in DO resulting from increased suspended sediment. Kjelland et al. (2015) noted that suspended sediments resulting from in-water construction activities can reduce light transmission decreasing photosynthesis by aquatic plants and absorb heat energy thereby raising water temperatures, both of which can result in decreased DO levels. A literature review of the effects of DO on salmonids has shown that insufficient DO levels can impact fish at every life stage through altered migration behavior, reduced growth, higher likelihood of predation, and potentially lethal outcomes in extreme conditions (Carter 2005). As discussed in Section 2.5.1, there is a risk of low dissolved oxygen within Port Angeles Harbor during the in-water work window that could be exacerbated by construction activities. However, the extremely limited nature and scope of turbidity generated by in-water activities and the high-energy environment within the harbor would likely limit fluctuations in DO within the Project vicinity, and behavioral response (avoidance) would limit exposure. We therefore consider the potential injury of listed species due to decreased DO extremely unlikely.

Resuspended Contaminants – Due to its legacy of heavy industrial use, Port Angeles Harbor currently has high levels of several hazardous substances, including metals (mercury, cadmium, zinc), dioxins/furans, PCBs, and carcinogenic PAHs, within its sediment (Ecology 2020). Some of the effects of these contaminants to salmonids include:

- Wide-ranging sub-lethal outcomes including impaired growth and reproduction, hormonal alterations, enzyme induction, alterations to behavior patterns, and mutagenicity for juvenile salmon exposed to dioxins (Meador 2002).
- Developmental or reproductive toxicity resulting in decreased food intake, wasting syndrome, and delayed mortality for fish exposed to dioxins/furans (Peterson et al. 1993). Adult fish are less susceptible to dioxin-induced toxicity compared to earlier life stages, requiring considerably higher body burdens to elicit adverse effects (Lanham et al. 2011; Peterson et al. 1993; Walker and Peterson 1992; Walker et al. 1994).
- Lethal and sub-lethal effects of mercury and methylmercury bioaccumulation, including latent effects on the feeding behavior and predator avoidance of hatchlings, necrotic injury, developmental impacts, and additional neurological and behavioral effects (Berntssen et al. 2003;

- Peterson et al. 2007). Predatory fishes such as salmon are particularly susceptible to mercury bioaccumulation.
- Physical or developmental abnormalities, reduced disease resistance, reproductive disfunction, malformations and growth inhibition for salmon exposed to PAHs (Baali and Yahyaoui 2016; Estuary Partnership 2014). Chronic exposure to PAHs such as crude oil during early development in pink salmon has been linked to juvenile mortality and reduced survival outcomes in adulthood (Heintz et al. 2010).

Resuspension of contaminated sediments is proportional to the amount of disturbance and the local levels of contamination. Disturbance of the substrate would increase contaminant concentrations by resuspending particulates, thereby allowing more contaminants to transport into the water column. Contaminant concentration rates would be increased for the duration of the in-water construction (approximately 3 months), with potentially harmful acute increases contained within the 150-foot compliance boundary. Research has established that PAH exposure primarily affects larval and juvenile fish that have not developed the metabolic protections available to older fish with a fully developed hepatic function (Incardona 2017; Incardona and Scholz 2016, 2017, 2018; Incardona et al. 2011). A majority of the juvenile and adult salmonids migrating through the action area are likely to avoid the immediate vicinity of Project activities and will therefore experience very low (though significant) levels of exposure. As a result, we expect that one cohort of each of these age classes of PS Chinook salmon, HCSR chum, and PS steelhead would experience sub-lethal physiological effects leading to reduced fitness and potential mortality.

Discharge of Effluent – The Project would not result in any new pollution generating impervious surface (PGIS), but it would replace approximately half of the existing impervious surface of the IHTF, comprised of a mixture of gravel and deteriorated asphalt, with high-load capacity asphalt-concrete. 14.4 acres of the IHTF would be regraded and repaved to better accommodate the treatment of stormwater conveyed from the facility into the Puget Sound. The IHTF is a working Port berth and is frequently used for the transport of wood fiber (whole logs and wood chips) from Jefferson and Clallam Counties to international ports. As a result, the stormwater runoff from the IHTF is likely to contain several contaminants that have proven damaging to fish, including wood waste leachate, PAHs, and microplastics such as 6PPD-6PPD-q from the vehicles regularly operating on the deck. As these contaminants are of particular concern for salmonids, their effects are discussed in greater detail below.

Wood waste leachate: Wood waste and the material it generates when it degrades can have a profound impact on aquatic ecosystems and organisms. Contaminated stormwater runoff from log yards is of particular concern, as high volumes of organic material in runoff will result in a biological oxygen demand, creating an aerobic zone as it degrades (Hedmark and Scholz 2008). This lack of oxygen can limit the survival of benthic organisms, change the assemblages of benthic communities, and in turn, diminish the prey base and fitness of juvenile salmonids (Kendall and Michelsen 1997). The make-up and concentrations of pollutants from wood waste varies based on the tree species, amount of water it is exposed to, and the receiving waterbody (sulfides tend to form primarily in marine waters). However, the compounds that are generally found in runoff are methylated phenols, benzoic acid and benzyl alcohol, terpenes, and tropolones (Kendall and Michelsen 1997). Exposure to high levels of phenols for even short durations of time can cause hemorrhaging at the base of fins, disruption of blood vessel walls and gill epithelium, edema and blood infiltration in major tissues, and disruptions to feeding and oxygen consumption rates (Buikema et al 1979). The concentrations of these organic materials in stormwater runoff from log yards tends to be quite high, creating a significant risk to the species occupying the receiving waterbody. Treatment approaches involving wetland treatment and bioinfiltration are particularly effective at filtering these organic materials from runoff (Hedmark and Scholz 2008).

PAHs: A large and growing body of environmental monitoring data (analytical chemistry) has established PAHs as a ubiquitous component of stormwater-driven runoff into the Puget Sound. Whether originating from oils spills or stormwater, PAH toxicity to fish can be framed as a bottom-up approach to understanding the impacts of complex mixtures, where one or more PAH compound may share a common mechanism of action, interact with other chemicals in mixtures, and/or interact with non-chemical variables such as the thermal stress anticipated with a changing regional climate. The historical NOAA research on oils spill and urban stormwater are increasingly converging on a risk framework where certain PAHs (Figure 2) cause a well-described syndrome of involving the abnormal development of the heart, eye and jaw structure, and energy reserves of larval fish (Harding et al. 2020). Over the ensuing 30 years, combined research from NOAA's Alaska Fisheries Science Center (AFSC) and the Northwest Fisheries Science Center (NWFSC) clearly established the developing fish heart as the primary biological target organ for the toxic impacts of water-soluble chemical mixtures derived from petroleum (Incardona 2017; Incardona and Scholz 2016, 2017, 2018; Incardona et al. 2011). At the egg (developing embryo, pre-hatch) and larval stages, organ-specific detoxification pathways (e.g., cytochrome P450 enzymes in the liver) are not yet in place, and therefore do no offer the same intrinsic metabolic protections available to older fish with a fully developed hepatic function. Absent this protective metabolism in larval fish, petroleum-derived hydrophobic compounds such as PAHs bioconcentrate to high tissue levels in fertilized eggs, resulting in more severe corresponding toxicity.

Numerous controlled laboratory exposure-response studies have elucidated a toxicity syndrome with a distinctive and characteristic suite of developmental abnormalities. Severe PAH toxicity is characterized by complete heart failure, with ensuing extra-cardiac defects (secondary to loss of circulation) and mortality at or soon after hatching. More moderate forms of PAH toxicity, such as might be expected for untreated/unfiltered roadway runoff, include acute and latent alterations in subtle aspects of cardiac structure, reduced cardiorespiratory performance and latent mortality in surviving larvae and juveniles. These effects have been studied extensively and characterized in over 20 species of fish at the organismal, tissue and cellular levels (Marty et al., 1997; Carls et al., 1999; Heintz et al., 1999; Hatlen et al., 2010; Hicken et al., 2011; Incardona et al., 2013; Jung et al., 2013; Esbaugh et al., 2016; Morris et al., 2018). Unlike 6PPD-quinone, which varies in hazard across closely related salmonids (e.g., high acute toxicity to coho, low toxicity to chum; McIntyre et al., 2018, 2021), 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 (Figure 2).

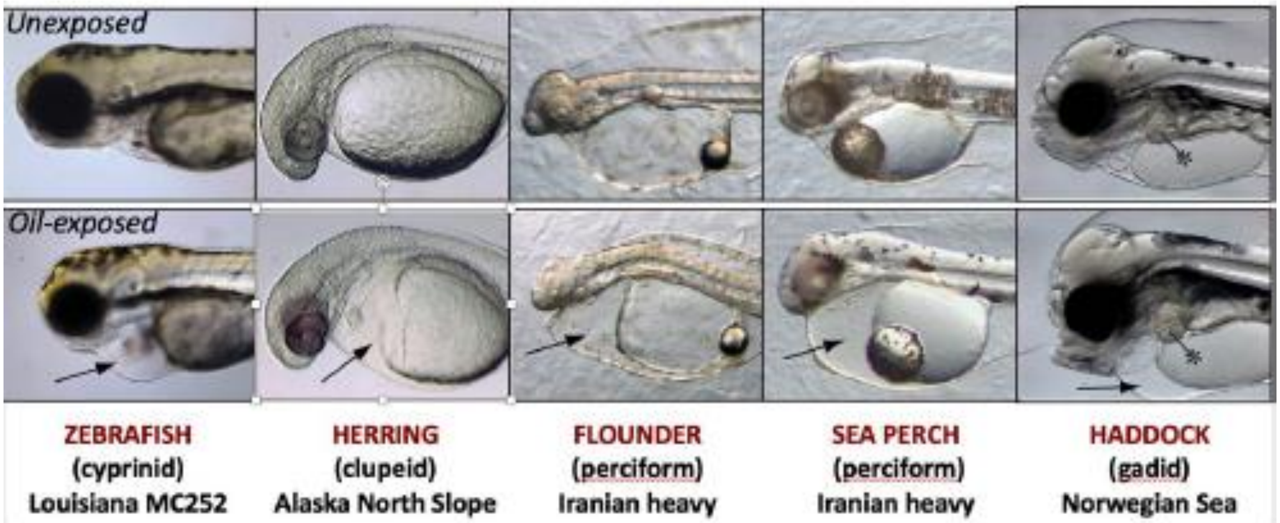

Figure 2. Examples of PAH-induced developmental abnormalities in a wide range of fish species (freshwater to marine, tropical to temperate). Our current understanding of PAH toxicity to fish embryos and larvae is drawn from several NOAA-F studies, representing major lessons learned from the Exxon Valdez and Deepwater Horizon disasters, and has been widely confirmed by independent research groups around the world (Scholz and Incardona 2015). The primary form of toxicity is a loss of cardiac function, as exemplified by circulatory failure and accumulation of fluid in the pericardial space around the heart (arrows). The pattern of excess fluid (edema) varies according to the anatomy of each species. Related abnormalities include small eyes, jaw deformities, and a dysregulation of the lipid stores, or yolk, the animal needs to survive to first feeding. This suite of defects, while sublethal, will almost invariably lead to ecological death. Consequently, "delayed-in-time" toxicity is a common risk concern for fish that spawn in PAH-contaminated habitats.

PAH toxicity in fish is often sublethal and delayed in time. The latent impacts of low-level PAH exposures – i.e., representative of the cardiotoxic PAH concentrations and discharge durations comparable with conventional Puget Sound roadway runoff – have been particularly well studied in salmonids (pink salmon, *Oncorhynchus gorbuscha*). Large-scale tagging (mark-and-recapture) studies dating back to Exxon Valdez were among the first to show that embryonic exposure to oil-derived chemical mixtures with total PAH (ΣPAH) levels in the range of 5 -20 µg/L resulted in cohorts of salmon that survived the exposure (and appeared outwardly normal), but nevertheless displayed reduced growth and reduced survival to reproductive maturity in the marine environment. Follow-up studies at NWFSC have linked this poor survival to reduced individual fitness manifested by reduced swimming performance and subtle changes in cardiac structure. In essence, embryonic exposure to petroleum mixtures leads to juvenile fish that show signs of pathological hypertrophy of the heart (Incardona et al., 2015, 2021; Gardner et al., 2019). The latter is well known to be associated with considerable morbidity and mortality across vertebrate species in general, as evidenced by the downstream consequences of congestive heart failure in humans.

To illustrate how PAHs in runoff from the Puget Sound transportation grid align with historical NOAA research on oil spills, stormwater from Longfellow Creek, an urban roadway in West Seattle, shows considerable overlap with the pattern of PAHs derived from a pure oil spill

(Figure 3). Notably, as an added consequence of the engine internal combustion process, the mixture in stormwater is even more complex due to the appearance of larger numbers of 4-ring and ≥ 5-ring compounds. Much of this higher molecular weight PAH mass is associated with the fine particulate matter from vehicle exhaust. The bioavailability of compounds in waters that receive highway runoff is demonstrated by uptake into passive samplers, which have properties very similar to fish eggs. Passive samples vary in design, but generally consist of a housing for a membrane material that passively accumulates lipophilic compounds such as PAHs, which can subsequently be extracted for chemical analyses. They are particularly useful for profiling patterns of bioavailable PAHs in fish spawning habitats.

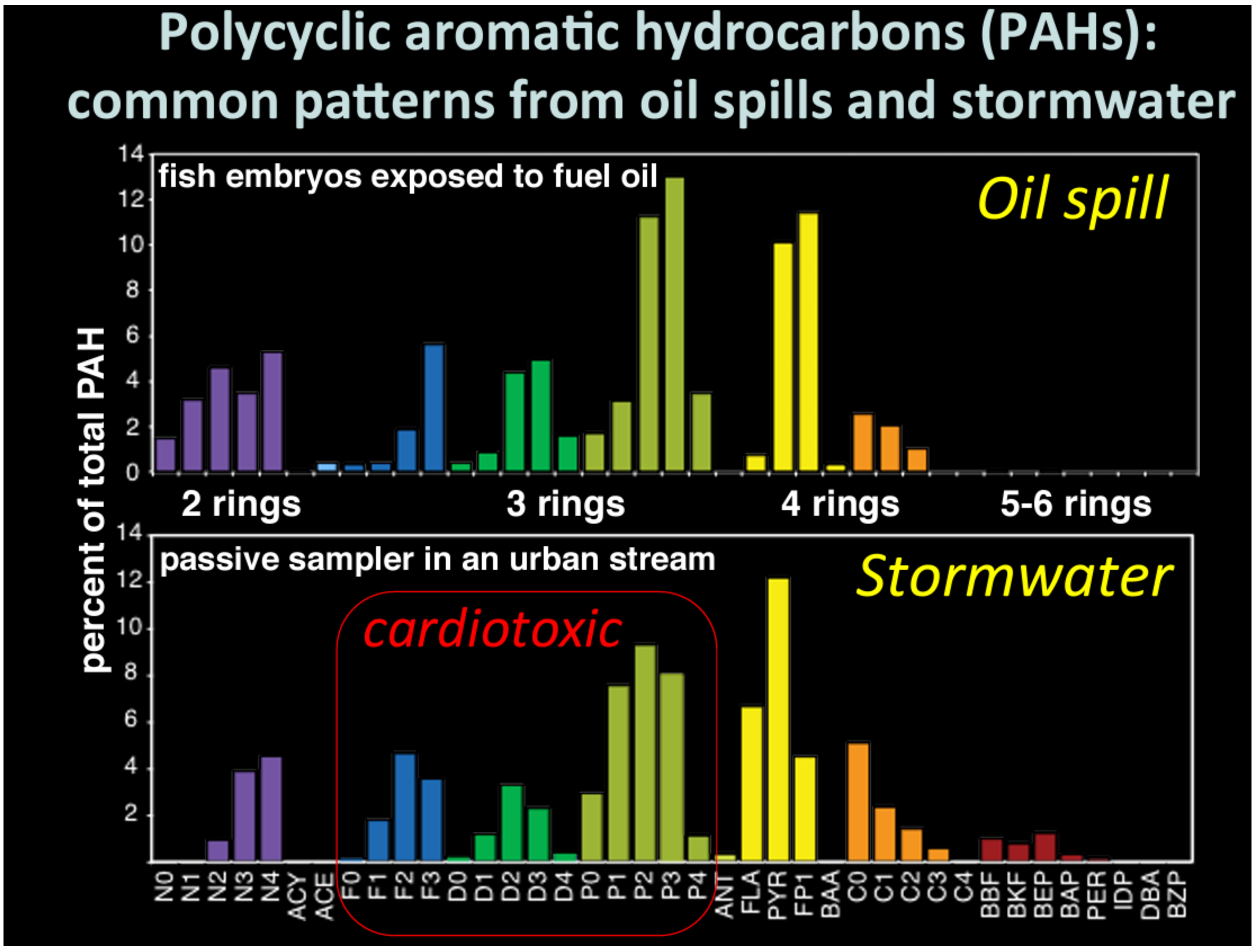

Figure 3. Patterns of PAHs in environmental samples (Scholz 2015). Top, effluent in seawater flowing over gravel coated with Alaskan crude oil (source for Exxon Valdez). Bottom, PAHs extracted from a polyethylene membrane device (PEMD) incubated one week in Longfellow Creek, West Seattle. X-axis shows proportion of total PAH. Abbreviations: N, naphthalenes; BP, biphenyl; AY, acenaphthylene; AE, acenaphthene; F, fluorene; D, dibenzothiophene; P, phenanthrene; ANT, anthracene; FL, fluoranthene; PY, pyrene; FP, fluoranthenes/pyrenes; BAA, benz[a]anthracene; C, chrysene; BBF, benzo[b]fluoranthene; BKF, benzo[j]fluoranthene/ benzo[k]fluoranthene; BEP, benzo[e]pyrene; BAP, benzo[a]pyrene; PER, perylene; IDY, indeno[1,2,3-cd]pyrene; DBA, dibenz[a,h]anthracene/dibenz[a,c]anthracene; BZP, benzo[ghi]perylene. Parent compound is indicated by a 0 (e.g., N0), while numbers of additional carbons (e.g. methyl groups) for alkylated homologs are indicated as N1, N2, etc.

The pattern of bioavailable PAHs in Longfellow Creek depicted above in Figure 3 closely resembles a pure oil spill pattern, with the exception of a larger proportion of combustion-associated 4-ring compounds such as pyrenes and fluoranthenes. Accordingly, urban runoff is a transport pathway for PAHs, and the pattern of bioavailable PAHs closely resembles the relative enrichment of cardiotoxic phenanthrenes. Although more work is needed for Pacific salmonids (e.g., species beyond pink salmon), collected runoff from SR520 containing ΣPAH of 7.5 μg/L produced the stereotypical syndrome of heart failure and associated developmental defects in Pacific herring (Harding et al., 2020). Measured concentrations of PAH runoff from SR520 runoff are often considerably higher than the petroleum toxicity threshold for pink salmon.

6PPD-Quinone: After years of forensic investigation, the urban runoff coho mortality syndrome has now been directly linked to motor vehicle tires, which deposit the compound 6PPD and its abiotic transformation product 6PPD-q onto roads. 6PPD or [(N-(1, 3-dimethylbutyl)-N'-phenyl-p-phenylenediamine] is used to preserve the elasticity of tires. 6PPD can transform in the presence of ozone (O3) to 6PPD-q. 6PPD-q is ubiquitous to roadways (Sutton et al., 2019) and was identified by Tian et al., (2020) as the primary cause of urban runoff coho mortality syndrome described by Scholz et al., (2011). Laboratory studies have demonstrated that juvenile coho salmon (Chow et al., 2019), juvenile steelhead, and juvenile Chinook salmon are also susceptible to varying degrees of mortality when exposed to urban stormwater (French et al., 2022). Fortunately, recent literature has also shown that mortality can be prevented by infiltrating road runoff through soil media containing organic matter, which removes 6PPD-q and other contaminants (Fardel et al., 2020; Spromberg et al., 2016; McIntrye et al., 2015). Research and corresponding adaptive management surrounding 6PPD is rapidly evolving. Nevertheless, key findings to date include:

- 6PPD/6PPD-q has been killing coho in Puget Sound urban streams for decades, dating back to at least the 1980s, likely longer (McCarthy 2008; Scholz 2011)
- Wild coho populations in Puget Sound are at a very high risk of localized extinction, based on field observations of adult spawner mortality in > 50 spawning reach stream segments (Spromberg 2011).
- Source-sink metapopulation dynamics (mediated by straying) are likely to place a significant drag on the future abundances of wild coho salmon in upland forested watersheds (the last best places for coho conservation in Puget Sound). In other words, urban mortality syndrome experienced in one part of the watershed could lead to abundance reductions in other populations because fewer fish are available to stray (Spromberg 2011).
- Coho are extremely sensitive to 6PPD-q, more so than most other known contaminants in stormwater (Scholz 2011; Chow 2019; Tian 2020).
- Coho juveniles appear to be similarly susceptible to the acutely lethal toxicity of 6PPD/6PPD-q (McIntyre 2015; Chow 2021).
- The onset of mortality is very rapid in coho (i.e., within the duration of a typical runoff event) (French et al., 2022).
- Once coho become symptomatic, they do not recover, even when returned to clean water (Chow 2019).

- It does not appear that dilution will be the solution to 6PPD pollution, as diluting Puget Sound roadway runoff in 95% clean water is not sufficient to protect coho from the mortality syndrome (French et al., 2022).
- Preliminary evidence indicates an uneven vulnerability across other species of Puget Sound salmon and steelhead, and a need to further investigate sublethal toxicity to steelhead and Chinook salmon. For example, McIntyre et al., (2018) indicate that chum do not experience the lethal response to stormwater observed in coho salmon.
- Following exposure, the onset of mortality is more delayed in steelhead and Chinook salmon (French et al., 2022).
- The mechanisms underlying mortality in salmonids is under investigation, but are likely to involve cardiorespiratory disruption, consistent with symptomology. Therefore, special consideration should be given to parallel habitat stressors that also affect the salmon gill and heart, and nearly always co-occur with 6PPD such as temperature (as a proxy for climate change impacts at the salmon population-scale) and PAHs.
- Simple and inexpensive green infrastructure mitigation methods are promising in terms of the protections they afford salmon and stream invertebrates, but much more work is needed (McIntyre 2014, 2015, 2016; Spromberg 2016).
- The long-term viability of salmon and other Puget Sound aquatic species is the foremost conservation management concern for NOAA, and thus it will be important to incorporate effectiveness monitoring into future mitigation efforts – i.e., evaluating proposed stormwater treatments not only on chemical loading reductions, but also the environmental health of salmon and other species in receiving waters (Scholz 2011).

The proposed three stage biofiltration system proposed in this Project would not entirely remove the contaminants discussed above from the stormwater discharging from the IHTF into Port Angeles Harbor. However, the proposed action would significantly reduce the risk of delayed mortality in ESA-listed salmonids due to untreated runoff. Furthermore, this enhanced treatment would be particularly beneficial at this location due to the existing Category 5 impairment of the water within Port Angeles Harbor due to low DO levels (Ecology 2023b).

<u>Disturbed Bottom Sediment and Benthic Communities –</u> The Project is expected to result in an extremely localized reduction in benthic prey abundance and diversity within the vicinity of the fiberglass encasement for the duration of in-water construction activities (up to 3 months). The fiberglass encasement will also permanently disrupt approximately 35 square feet of benthic habitat (1.25 inches across 335 LF). Adult PS Chinook salmon, HCSR chum, and PS steelhead migrating through the action area could experience reduced prey availability as a result of Project activities. However, as larger fish they are likely to seek out much larger prey availability than the benthic communities would provide. Therefore, reduced benthic prey availability is unlikely to adversely affect adult salmonids. Likewise, as juvenile PS steelhead are far less nearshore dependent than other salmonids and the proposed action does not preclude the use of much higher quality forage habitat along Ediz Hook, this is not expected to affect PS steelhead in their juvenile life stage.

When juvenile salmonids occupy the nearshore environment, they must have abundant prey to allow for growth, development, maturation, and general fitness. As placement of the fiberglass encasement dislodges bottom sediments, benthic communities are disrupted where the placement occurs and in adjacent areas where sediment falls out of suspension and layers on top of benthic areas. We expect that benthic prey within 150 ft. of the fiberglass encasement would be unavailable to juvenile salmonids for the duration of in-water work (3 months), and the 35 LF of permanent impact would be removed entirely as a prey resource for these species. The speed of recovery by benthic communities is affected by several factors, including the intensity of disturbance, with greater disturbance increasing the time to recovery (Dernie et al. 2003). Given the high energy environment in which the Project is taking place and the limited disturbance of the construction activities, we anticipate a rapid recolonization of the area of temporary impact. The greatest impacts to forage availability will occur during construction activities and will have the greatest impact on juvenile PS Chinook salmon and HCSR chum. Given the much higher quality foraging habitat approximately half a mile east of the Project vicinity, we do not expect that this benthic community disturbance will have a population-level effect on any ESA-listed species.

Natural Cover – The proposed action would have no effect on existing natural cover, as the Cofferdam Dock Facility and surrounding areas have very little shoreline vegetation and contain little to no aquatic vegetation. However, the placement of the fiberglass encasement onto the Cofferdam Dock would extend the duration of the degraded condition of this habitat and prevent the formation of natural cover from undercut banks, side channels, or aquatic vegetation. Armoring of the nearshore can reduce or eliminate shallow water habitats through the disruption of sediment sources and sediment transport, result in a higher rate of beach erosion waterward of the armoring from higher wave energy, and diminish the supply of fine sediment required for forage fish spawning compared to a natural shoreline (Bilkovic and Roggero 2008; Fresh et al. 2011; Morley et al. 2012; Dethier et al. 2016). The effects of the construction and perpetuation of this armoring lead to reductions in primary productivity and invertebrate density within the intertidal and nearshore environment, disrupting prey resources for juvenile salmonids.

When the physical processes are altered, there is also a shift in the biological communities. The number and types of invertebrates, including shellfish, can change; forage fish lose spawning areas; and juvenile salmon and forage fish lose the feeding grounds that they use as they migrate along the shore (Shipman et al. 2010). The enduring loss of nearshore habitat quality within the Project area is expected to contribute to reduced fitness and survival of juvenile PS Chinook salmon, HCSR chum, and, to a lesser degree, PS steelhead. However, the numbers so affected are expected be so low that it will not meaningfully impact any of these listed species on a population level.

Vessels – The presence of vessels for construction, or during regular operation of the Cofferdam Dock, are expected to produce a variety of effects to species, including: water quality reductions, underwater noise, shade, and sediment disturbance from scour. Each are episodic and persistent effects, coextensive with the duration of the Cofferdam Dock once the fiberglass encasement has been installed.

Pollutants: The operation of cargo vessels at the Cofferdam Dock are likely to result in the incidental discharge of small amounts fuels, oils, or lubricants into the Puget Sound. Incidental discharge of PAHs may also result from the exhaust generated by these berthing vessels. Because these materials can disperse quickly, they can become quite widespread at very low concentration. PAHs from the exhaust of these vessels have a similar pattern of dispersal. The environmental fate of each type of PAH depends on its molecular weight. We cannot predict the frequency of such discharges, but can conclude that with each vessel docking, ESA-listed fish within the vicinity have the potential to experience sub-lethal effects.

Noise: Underwater noise associated with vessel traffic along major shipping routes creates a major disruption to species within the aquatic environment. Fish will exhibit a number of behavioral responses to vessel noise, including avoidance of the area (Vabo et al. 2002; Handegard et al. 2003), decreased exploratory activity and reduced home range (Ivanova et al. 2020), increased risk of predation (Simpson et al. 2016), altered migration patterns (van der Knapp 2022), and physiological changes resulting in interrupted courtship (Wysocki et al. 2016). We would expect adult PS Chinook salmon, HCSR chum, and steelhead to remain less affected by predation or altered forage behavior than their juvenile counterparts due to their size and life history at the time of exposure (adults will typically cease prey consumption during upstream migration). Therefore, we expect that underwater noise from vessels is most likely to affect adult salmon and steelhead by altering their migration patterns. We expect that juvenile salmonids would be more vulnerable to the effects of underwater noise due to disrupted forage opportunities, a greater risk of predation, and reduced fitness associated with schooling behavior (van der Knaap 2022). While it is difficult to quantify this effect, it is likely to cause small numbers of persistent juvenile salmonid deaths for the duration of the Cofferdam Dock's operation. We do not expect this small reduction in abundance to be discernible at a population level, and the intermittent nature of vessel traffic will likely not result in a significant reduction in adult salmon or steelhead.

Shade: Berthing vessels have the potential to disrupt the prey base of ESA-listed fish as well as disrupt the migration, and contribute to the predation, of juvenile salmonids. The shade cast from a cargo vessel can inhibit the growth and development of submerged aquatic vegetation (SAV), and lower its overall productivity (Shafer 1999; 2002). As eelgrass is a substrate for herring spawning, this can result in disruptions to the salmon prey base. The shade case from a vessel also has the potential to disrupt the migration of juvenile PS Chinook salmon and HCSR chum, as they are likely to swim around a shaded area rather than pass beneath it (Nightingale and Simenstad 2001; Southard et al. 2006; Celedonia et al. 2008a; Celedonia et al. 2008b; Moore et al. 2013; Munsch et al. 2014). This behavioral modification could cause them to temporarily utilize deeper habitat, thereby exposing them to increased piscivorous predation. This has been shown in the marine environment where juvenile salmonid consumption by piscivorous predators increased fivefold when juvenile pink salmon were forced to leave the shallow nearshore (Willette 2001). We cannot predict with any level of certainty the number of juvenile salmonids that will experience mortality due to the shade cast from berthing vessels. While it is likely that this ongoing occurrence will disrupt the migration and reduce the fitness of a small number of juvenile PS Chinook and HCSR chum, these effects would be mitigated by the very limited amount of time in which vessels typically berth at the dock. As we would not expect this to occur longer than a few days at a time, we do not anticipate that the shade cast from berthing vessels will impact these species on a population level.

Sediment Disturbance: Associated commercial vessel use adversely affects SAV where it is present, and inhibits its recruitment where not present, by frequently churning water and sediment in the shallow water environment. Additionally, the turbidity from boat propeller wash decreases light levels (Eriksson et al. 2004). Shafer (1999; 2002) provides background information on the light requirements of seagrasses and documents the effects of reduced light availability on seagrass biomass and density, growth, and morphology. Decreased ambient light typically results in lower overall productivity, which is ultimately reflected in lower shoot density and biomass (Shafer 1999; 2002). Areas where sediment is routinely disturbed by prop wash will also experience repeated disruption of benthic prey communities, suppressing this forage source. We cannot predict the frequency of such discharges, but can conclude that each vessel docking could hinder habitat-forming processes and reduce forage opportunities for juvenile salmonids.

Summary of Project Effects on Listed Species

Some fish from each of the listed species discussed above are expected to be present during project construction either as juveniles or as adults. Most juvenile salmonids present will be migrating juveniles with limited exposure to the effects of the proposed action, with PS Chinook salmon and HCSR chum likely to have greater exposure than PS steelhead based on their greater degree of nearshore dependence. Adult PS Chinook salmon, HCSR chum, and PS steelhead are all likely to be present for a limited duration during Project activities but are not expected to be as adversely impacted as juveniles within the action area.

Most of the fish present would incur short-term stress or other sublethal responses due to interaction with construction equipment, noise, increased energetic costs, and reduced water quality and foraging ability. This stress and other sublethal responses are likely to reduce long-term fitness for some of these fish. A few other fish may die due to the combination of multiple factors, such as the stresses caused by the proposed action combined with other stressors within the environmental baseline but unrelated to the proposed action (e.g., the significant shoreline armoring, legacy contamination, and vessel use within Port Angeles Harbor). Death and reduced fitness are most likely to cause minimal, reduced abundance in one cohort of PS Chinook salmon, HCSR chum, and PS steelhead and the remaining effects would be indiscernible against other factors affecting abundance. Therefore, effects of Project activities on ESA-listed species are unlikely to result in population-level consequences for exposed populations.

We have analyzed the permanent effects to the aquatic habitat resulting from this project and have determined that the functional lift provided by the implementation of the three stage biofiltration stormwater treatment facility at the IHTF would offset the loss of ecosystem functions due to the modification of habitat. This Project is expected to achieve no-net-loss of habitat function as a result of the proposed activities, which is needed to help ensure that populations of PS Chinook salmon do not drop below the existing 1-2 percent juvenile survival rates (Kilduff et al. 2014; Campbell et al. 2017). PS Chinook salmon juvenile survival is directly linked to the quality and quantity of nearshore habitat. The significant reductions in levels of contaminants in stormwater effluent will vastly increase the water quality within the action area and ensure that long-term impacts to PS Chinook salmon and its critical habitat, HCSR chum, and PS steelhead are completely offset.

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 earlier in the discussion of environmental baseline (Section 2.4). Because Port Angeles Harbor and its nearshore environment are expected to remain highly industrialized and utilized for several decades to come, we do expect climate change conditions to become more pronounced over that time period. As a result, we anticipate that these changes may disrupt important habitat features and ecosystem functions that are critical to the survival and recovery of the species discussed in Section 2.5.

Other than commercial and recreational use of the waters, NMFS does not expect any non-Federal activities within the action area, as work within the water would fall under federal authorities such as the Clean Water Act. However, at the watershed scale, future upland development activities lacking a federal nexus would continue and are expected to lead to increased impervious surface, surface runoff, and non-point discharges. NMFS expects that these activities will continue in perpetuity, degrading water quality and exerting a negative influence on ESA-listed species. Any future federal actions would be subject to a Section 7(a)(2) consultation under the ESA.

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.

The species considered in this opinion are listed as threatened or endangered with extinction due to declines in abundance, poor productivity, reduced spatial structure, diminished diversity. Factors contributing to this status includes reduced quantity and/or quality of habitat, including reduced prey availability. Systemic anthropogenic detriments in estuarine and marine habitats are impairing populations of PS Chinook salmon, HCSR chum, and PS steelhead within Port Angeles Harbor, and these are often described as limiting factors.

The environmental baseline in the action area is primarily composed of vessel infrastructure as well as commercial development landward of the HAT that degrades nearshore habitat conditions for listed species. Within the action area there are sources of noise and shade (vessels and wharfs), water quality impairments (effluent in stormwater runoff and contaminants within the sediment), and artificial light (marinas, piers, and Coast Guard operations along Ediz Hook).

To this context of species status and baseline conditions, we add the effects of the proposed action, together with cumulative effects (future water quality impairment and stressors associated with climate change), in order to determine the effect of the project on the likelihood of species' survival and recovery. We also evaluate if the project's habitat effects would appreciably diminish the value of designated critical habitat for the conservation of the listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features.

2.7.1 ESA Listed Species

Because the work window is timed to avoid juvenile salmon peak migration, we expect that the number of juvenile PS Chinook salmon, HCSR chum, and PS steelhead exposed to construction effects will be low, and that the responses of the exposed fish will largely be behavioral, with very little reduction in fitness, injury, or mortality. Adult PS Chinook, HCSR chum, and PS steelhead are expected to be present in greater numbers during in-water construction; however, we expect that these species would not experience impacts from these activities to the degree of severity that they would in their juvenile life stage. We likewise anticipate that the responses of the exposed adult fish will largely be behavioral, with very little reduction in fitness, injury, or mortality (though greater numbers of adults would experience these conditions). Ultimately, the limited size and duration of Project activities are unlikely to cause disruptions to these species on a population level.

The most chronic of the temporary effects – reduced benthic prey around the fiberglass encasement for several months to a year – should not affect fitness, growth, or survival of enough fish to discernably reduce abundance of any cohort of any population within this timeframe. As described earlier in this document, long-term habitat effects are expected to be offset and the amount of habitat affected adversely is very small. The reduction in water quality contaminants likely produces exposure at lower concentration to many contaminants and response could include fewer fish with reduced fitness in the successive cohorts. Therefore, we do not expect the habitat loss to have negatively alter the viability parameters of these species.

Accordingly, when NMFS adds the very small reduction in numbers of PS Chinook salmon, HCSR chum, and PS steelhead as a consequence of their exposure to the temporary effects, to the baseline, even when considered with cumulative effects, the reduced abundance is insufficient to alter the productivity, spatial structure, or genetic diversity of any of the species.

2.7.2 Critical Habitat

The temporary effects on features of designated critical habitat for PS Chinook salmon would be water quality, benthic disturbance, natural cover, and noise. We expect diminishment of water quality based on turbidity, resuspension of contaminants, and discharge of effluent. Turbidity and resuspension of contaminants within the water column would diminish water quality for up to 3 months in the work window within 150 ft. of the fiberglass encasement. Because the duration is brief and primarily occurs when juveniles are not relying on the habitat in high numbers for growth or development, the impaired water quality PBF does not diminish conservation values of the action area. Furthermore, the installation of stormwater treatment for 14.4 acres of the IHTF would result in an improvement of the water quality PBF in the long term by significantly reducing the proportion of contaminants being discharged into the Puget Sound. These positive effects would be incremental but permanent within the action area.

The effects on benthic communities is also temporary and highly localized. The area of disruption to benthic communities would take up to a year to fully recover from the sediment falling out of suspension and burying these communities. Despite the duration of this effect, the forage PBF diminishment is not sufficient to reduce conservation values of the action area and the reduced forage base would be most noticeable in the first year.

The installation of the fiberglass encasement on the Cofferdam Dock would perpetuate a long-term effect on features of designated critical habitat for PS Chinook salmon through increased predation and reduction in benthic communities. Likewise, the continued operation of vessels utilizing the Cofferdam Dock would perpetuate an enduring though intermittent effect on features of designated critical habitat for PS Chinook salmon through increased predation and barriers to migration. The significant water quality benefits provided by the three-stage biofiltration stormwater treatment system is reasonably certain to offset the long-term loss of habitat function from the rehabilitation of the Cofferdam Dock. The temporary impacts that disrupt benthic environments would diminish juvenile fish rearing habitats and food sources in the action area; however, when scaled up to the designation scale, the effects are not expected to impact the designated critical habitat.

Accordingly, when NMFS considers the temporary diminishment to the critical habitat of PS Chinook to the baseline, even when considered with cumulative effects, this degradation of essential habitat features is insufficient impact the designated critical habitat. Therefore, the action does not appreciably reduce the value of this habitat or preclude its use by ESA-listed species within the action area.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and the cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook salmon, HCSR chum, or PS steelhead, and is not likely to destroy or adversely modify the designated critical habitat of PS Chinook salmon.

2.9 Incidental Take Statement

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of endangered and threatened species, respectively, without a special exemption. "Take" is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or to attempt to engage in any such conduct. "Harm" is further defined by regulation to include significant habitat modification or degradation that actually kills or injures fish or wildlife by significantly impairing essential behavioral patterns, including breeding, spawning, rearing, migrating, feeding, or sheltering (50 CFR 222.102). "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 ITS.

2.9.1 Amount or Extent of Take

Take in the form of harm is often impossible to quantify as a number of individuals, because the presence of the individuals (exposure to the harmful conditions) is highly variable over time, and is influenced by factors that cannot be easily predicted. Additionally, the duration of exposure is highly variable based on species behavior patterns, and the wide variability in numbers exposed and duration of exposure creates a range of responses, many of which cannot be observed without research and rigorous monitoring. In these circumstances, we described an "extent" of take which is a measure of the harming condition spatially, temporally, or both. The extent of take is causally related to the amount of harm that would result, and each extent of take provided below is an observable metric for monitoring, compliance, and re-initiation purposes.

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

1. Take in the form of harm to juvenile and adult PS Chinook, HCSR chum, and PS steelhead from turbidity/contaminated sediment, and from reduced prey availability. The extent of take is the area of in-water construction activities plus the 150 ft. turbidity mixing zone from the point of work. This metric is easily observed, and is causally related because generating turbidity in a larger area will increase the amount of suspended sediment and the area of impaired benthic communities.

2. Take in the form of injury or death of juvenile and adult PS Chinook salmon, HCSR chum, and PS steelhead from exposure to toxic chemicals in stormwater effluent discharged from the outfall. The surrogate indicator for the extent of take for discharge of stormwater effluent is the area of PGIS which would be regraded and repaved to accommodate the stormwater treatment upgrades at the IHTF. This area is estimated to be 14.4 acres. This take indicator is causal and proportional to the take identified in this Opinion as it directly affects the amount of stormwater pollution that would be directed to the new treatment. Take would be exceeded if the amount of replaced PGIS is more than 14.4 acres and/or any area that is not currently pollution-generating is converted to PGIS.

3. Take in the form of injury or death of PS Chinook, HCSR chum, and PS steelhead from vessels utilizing the Cofferdam Dock or predacious fish utilizing shade cast from these

berthing vessels. The installation of the fiberglass encasement will extend the life of the Cofferdam Dock, resulting in delayed migration, altered behavior, and increase in risk of predation of juvenile and adult salmonids. The surrogate indicator for the extent of take is the area of the fiberglass encasement (1.25 inches by 335 LF). If the area of the fiberglass encasement is greater than the dimensions analyzed in this Opinion, the take limit is exceeded and consultation must be reinitiated.

2.9.2 Effect of the Take

In the biological opinion, 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).

1. Minimize take associated with turbidity and the resuspension of contaminated sediments.

2. Minimize take associated with stormwater pollution discharging from the site.

3. Ensure the completion of a monitoring and reporting program to confirm the take exemption for the proposed action is not exceeded, and that the terms and conditions in this incidental take statement are met.

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

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

   a. The Port or its contractor shall make visual observations for turbid conditions while conducting in-water work activities. If turbidity creates a visible plume extending beyond the 150-ft. point of compliance, the Port or its contractor shall cease work until the plume no longer extends beyond 150 ft. from the area of work. If another exceedance occurs once work has resumed, the Port or its contractor shall modify their operations to ensure that turbidity remains below the established threshold. Examples of such modifications include working more slowly to reduce turbidity, utilizing different machinery for in-water work, or employing a turbidity boom.

2. The following terms and conditions implement reasonable and prudent measure 2:

a. The Port shall develop a preventative maintenance program that includes sweeping paved areas where loading and unloading occur and that are temporarily covered after removal of the containers, logs, or other material covering the ground to remove loose material that could be washed off by stormwater.

3. The following terms and conditions implement reasonable and prudent measure 3:

a. The Port shall provide a post-project "as built" report that indicates:
    i. The dimensions of the fiberglass encasement and dates of initiation and completion of the in-water fiberglass placement.
    ii. The total area of replaced PGIS in the upland of the IHTF to accommodate the stormwater treatment upgrades.
    iii. Pictures of the fiberglass encasement and stormwater treatment system once they have been installed.
    iv. Provide a preventative maintenance plan outlining the frequency with which the IHTF will be swept.

b. Fish Impacts Monitoring. While in-water work occurs, make regular visual survey for distressed, injured, or dead fish. Collect dead specimens and have them identified by species. Include results in the post-project reporting.

c. The Port of its contractor must submit this as-built report within 60 days of the completion of the Project to:
projectreports.wcr@noaa.gov
Reference Project #: WCRO-2023-00672
CC: sara.m.tilley@noaa.gov

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).

Continue to support the recovery of ESA-listed species and critical habitat in the Puget Sound through restoration efforts such as removal of derelict overwater structures, replacement of creosote, routine maintenance and cleanup of existing overwater facilities, and applicable upgrades to stormwater facilities with future advances in stormwater science and treatment wherever feasible at the port facilities and adjacent areas in Port Angeles Harbor.

2.11 "Not Likely to Adversely Affect" Determinations

North American green sturgeon:
NMFS has determined that the proposed action may affect, but is not likely to adversely affect the southern distinct population segment (DPS) of North American green sturgeon because species presence within Port Angeles Harbor has never been documented and would be exceedingly rare. Sturgeon have been observed on a southward migration within the Strait of Juan de Fuca waters during summer, however fewer than two dozen observations of this species have been made in the Salish Sea since 1900 (Lindley et al. 2008). There are no records of green sturgeon within Port Angeles Harbor, and the closest observation of green sturgeon to the action area was inside Dungeness Spit (approximately 10 miles west of the action area) in the 1970s (Pietsch and Orr 2015). As a result, we expect exposure of this green sturgeon to be discountable. Critical habitat has not been designated for this species within the action area.

Eulachon:
The Pacific eulachon southern DPS was listed as threatened under the ESA in 2010 (75 FR 13012). This DPS includes all eulachon that range from northern California to southwest and southcentral Alaska and into the southeastern Bering Sea. The Strait of Juan de Fuca lies between two of the larger eulachon spawning rivers (the Columbia and the Fraser rivers). Although Puget Sound and the Strait of Juan de Fuca lack a major eulachon run (Gustafson et al. 2010), there has been a gradual increase in returns to the Elwha River, which likely reflects changes in biological status as well as improved monitoring (Gustafson et al. 2016). Prior to dam removal, eulachon were rare in the Elwha River system (and absent in other Olympic peninsula rivers) and only occasional spawning had been reported from February to May (Gustafson et al. 2010; Shaffer 2009; Shaffer et al. 2009). In January 2015, seining surveys in the lower Elwha River estuary collected hundreds of egg-bearing and spent eulachon, indicating that local spawning was occurring (Coastal Watershed Institute 2015). Larvae and young juveniles become widely distributed in coastal waters once they enter the ocean. Little is known about the present status, timing, and migration routes of eulachon that spawn in the Elwha River and there have been no recent or historical sightings of eulachon within Port Angeles Harbor. We have therefore determined that eulachon exposure to this project's effects is discountable. Critical habitat has not been designated for this species within the action area.

SRKW:
The Southern Resident killer whale Distinct Population Segment (DPS), composed of J, K, and L pods, was listed as endangered under the ESA on November 18, 2005 (70 FR 69903). SRKW spend considerable time in the Georgia Basin from late spring to early autumn, with concentrated activity in the inland waters of Washington State around the San Juan Islands, and then move south into Puget Sound in early autumn. While these are seasonal patterns, SRKW have the potential to occur throughout their range (from central California north to the Queen Charlotte Islands) at any time during the year. The Whale Museum's Orca Master Dataset has 23 records of SRKW sightings within or immediately adjacent to Port Angeles Harbor between 1990 and 2018 during the in-water work window (Olson 2019). The Orca Network also has several records of SRKW sightings off of Ediz Hook, the most recent of which occurred in February of 2023 (Orca Network 2023). However, presence of SRKW within Port Angeles Harbor is extremely rare, making exposure to project effects unlikely. If present, SRKW could be briefly exposed to stormwater. Exposure to residual contaminants in the effluent post-treatment is not expected to

occur at an intensity or duration sufficient to cause adverse response in any individual SRKW. Response would be insignificant.

Critical habitat for the SRKW includes approximately 2,560 square miles of Puget Sound, excluding areas with water less than 20 feet deep relative to extreme high water. The three specific areas designated as critical habitat are (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. All three of the PBFs established for SRKW (water quality, prey species, and migration) are likely to be present in the action area.

The area surrounding the Cofferdam Dock is too shallow for SRKW; however, SRKW critical habitat does fall within the extent of the action area due to the discharge of stormwater from the outfall. As the project proposes to upgrade the stormwater treatment system at the IHTF, which will meaningfully reduce (though not completely remove) contaminants from the water, we consider exposure, if it does occur, will be at a lower concentration of contaminants than is currently found at the baseline level, reducing, but not fully avoiding water quality contamination. This effect preserves the conservation role of the habitat, should SRKW be present, for survival, growth, and fitness of individuals. And, as stated above in Section 2.5, the effects on PS Chinook, a prey species of SR killer whales, will cause a negligible annual reduction in the population, so that prey quantity as a habitat feature is only insignificantly affected. Finally, the proposed action would not create a barrier to migration.

Based on this analysis, NMFS concludes that the proposed action's effects on SRKW critical habitat are insignificant.

Humpback Whale:
On September 8, 2016, NMFS published a final rule to divide the globally listed endangered humpback whale into 14 DPSs and place four DPSs (Western North Pacific, Arabian Sea, Cape Verde/Northwest Africa, and Central America) as endangered and one (the Mexico DPS) as threatened (81 FR 62259). Only Central America and Mexico DPSs occur within the waters of the Pacific Northwest.

Since 2000, humpback whales have been sighted with increasing frequency in the inside waters of Washington (Falcone et. al. 2005). In 2014 and 2015 sightings sharply increased to around 500 each year. The Orca Network has several records of humpback sightings off of Ediz Hook, the most recent of which occurred in May of 2023 (Orca Network 2023). Humpback whales pass by the outlet of the Port of Port Angeles while transiting the Juan de Fuca; however, humpback presence within the action area is exceedingly rare. As such, Humpback whales are not expected to be near the area during in-water construction, nor are they expected to utilize the action area thereafter. Therefore, because the likelihood of exposure is extremely low, effects on humpback whale are considered discountable. Critical habitat is not designated for these two species within the action area.

2.12 Reinitiation of Consultation

This concludes ESA consultation for the Port of Port Angeles Intermodal Handling and Transfer Facility Improvements Project.

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.”

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species’ contribution to a healthy ecosystem. For the purposes of the MSA, EFH means “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity”, and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires 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 MARAD and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council (PFMC 2022), coastal pelagic species (CPS) (PFMC 2023), Pacific Coast salmon (PFMC 2022); and highly migratory species (HMS) (PFMC 2023)] 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 entire action area fully overlaps with identified EFH for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species. Designated EFH for groundfish and coastal pelagic species encompasses all waters along the coasts of Washington, Oregon, and California that are seaward from the mean high water line, including the upriver extent of saltwater intrusion in river mouths to the boundary of the U. S. economic zone, approximately 230 miles (370.4 km) offshore (PFMC 1998a,b). Designated EFH for salmonid species within marine water extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent of the exclusive economic zone offshore of Washington, Oregon, and California, north of Point Conception to the Canadian border (PFMC 1999). Groundfish, coastal pelagic, and salmonid fish species that could have designated EFH in the action area are listed in Table 4.

Table 4. EFH species in action area

Groundfish			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
arrowtooth flounder	Atheresthes stomias	rosy rockfish	Sebastes rosaceus
big skate	Raja binoculata	rougheye rockfish	Sebastes aleutianus
black rockfish	Sebastes melanops	sablefish	Anoplopoma fimbria
bocaccio	Sebastes paucispinis	sand sole	Psettichthys melanostictus
brown rockfish	Sebastes auriculatus	sharpchin rockfish	Sebastes zacentrus
butter sole	Isopsetta isolepis	English sole	Parophrys vetulus
cabezon	Scorpaenichthys marmoratus	flathead sole	Hippoglossoides elassodon
California skate	Raja inornata	greenstriped rockfish	Sebastes elongatus
canary rockfish	Sebastes pinniger	hake	Merluccius productus
China rockfish	Sebastes nebulosus	kelp greenling	Hexagrammos decagrammus
copper rockfish	Sebastes caurinus	lingcod	Ophiodon elongatus
curlfin sole	Pleuronichthys decurrens	longnose skate	Raja rhina
darkblotch rockfish	Sebastes crameri	Pacific cod	Gadus macrocephalus
Dover sole	Microstomus pacificus	Pacific ocean perch	Sebastes alutus
Pacific sanddab	Ctlharichthys sordidus	shortspine thornyhe	Sebastolobus alascanus
petrale sole	E opsetta jordani	spiny dogfish	Squalus acanthias
quillback rockfish	Sebastes maliger	splitnose rockfish	Sebastes diploproa
ratfish	Hydrolagus colliei	starry flounder	Platichthys stellatus
redbanded rockfish	Sebastes babcocki	stripetail rockfish	Sebastes saxicola
redstripe rockfish	Sebastes proriger	tiger rockfish	Sebastes nigrocinctus
rex sole	Glyptocephalus zachirus	vermilion rockfish	Sebastes miniatus
rock sole	Lepidopsetta bilineata	yelloweye rockfish	Sebastes ruberrimus
rosethorn rockfish	Sebastes helvomaculatus	yellowtail rockfish	Sebastes flavidus

Coastal Pelagic	
Common Name	**Scientific Name**
market squid	Latigo opalescens
northern anchovy	Engraulis mordax
jack mackerel	Trachurus symmetricus
Pacific mackerel	Scomber japonicus
Pacific sardine	Sardinops sagax

Salmonid Species	
Common Name	**Scientific Name**
Chinook salmon	Oncorhynchus tshawytscha
coho salmon	Oncorhynchus kisutch
pink salmon	Oncorhynchus gorbuscha

3.2 Adverse Effects on Essential Fish Habitat

The proposed actions would cause negative impacts on the quality of habitat by increasing suspended sediment, disturbing benthic communities, increasing concentrations of waterborne contaminants, altering intertidal habitat function by prolonging the life of an overwater structure, and creating noise and shade impacts through the continued vessel use of the dock. The project's adverse effects are described more fully in Section 2 of this document.

All of the Project activities mentioned above have the potential to adversely affect EFH for Pacific Coast groundfish, Pacific Coast salmon, and coastal pelagic species. However, the effects associated with turbidity, resuspension of contaminants, and disruptions to benthic communities are expected to be temporary in nature and return to baseline conditions upon completion of the project. The enduring effects of the Cofferdam Dock and the installation of a three stage stormwater biofiltration system would have the longest enduring impacts on EFH. The installation of the fiberglass encasement would perpetuate the disruption of intertidal habitat for the life of the structure. The significant reductions of contaminants in stormwater effluent would improve habitat quality and ecological function over the long term.

Offsetting Actions

The proposed project would have temporary and enduring effects on EFH water bottoms and water columns. These effects culminate in short-term (construction-related) and long-term adverse effects on Pacific Coast groundfish, Pacific Coast salmon EFH, and coastal pelagic species. The proposed action incorporates a number of minimization measures to avoid, reduce, and minimize the adverse effects of the action on EFH. Additionally, NMFS has determined that the water quality benefits provided by the stormwater treatment would sufficiently offset the enduring habitat effects caused by the installation of the fiberglass encasement on the Cofferdam Dock.

3.3 Essential Fish Habitat Conservation Recommendations

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

1. Take care when repositioning the riprap at the base of the Cofferdam Dock when installing the fiberglass encasement to minimize bed disturbance and suspended sediments. Perform this activity in the dry, if at all possible.
2. Do not allow work barges or work boats to ground out in the mudline.
3. Monitor turbidity and other water quality parameters to ensure that construction activities are compliant with Washington State Surface Water Quality Standards per WAC 173--201A.
4. Develop a Spill Prevention and Control Countermeasures Plan to address how fuels and hazardous materials onsite shall be stored, used, and cleaned up in the event of a spill.
5. Develop and implement an adaptive management plan for stormwater treatment, which actively pursues and applies upgrades to its treatment methods with future developments in stormwater science and treatment.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, for Pacific Coast salmon, Pacific Coast groundfish, and coastal pelagic species.

3.5 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, MARAD must provide a detailed response in writing to 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 NMFS' EFH Conservation Recommendations unless 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 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, 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.

3.6 Supplemental Consultation

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

4. DATA QUALITY ACT

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

4.1 Utility

Utility principally refers to ensuring that the information contained in this consultation is helpful, serviceable, and beneficial to the intended users. The intended users of this opinion are the MARAD and the Port of Port Angeles. Individual copies of this opinion were provided to the MARAD. 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 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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