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-2022-01488

January 24, 2023

Todd Tillinger
Chief, Regulatory Division
U.S. Army Corps of Engineers, Seattle District
4735 E. Marginal Way South, Bldg. 1202
Seattle, Washington 98134-2388

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Kitsap County Stormwater Treatment Facility, NWS-2018-1040

Dear Mr. Tillinger:

Thank you for your letter of March 28, 2022, 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 issuance of permits for the construction of the Kitsap Regional Stormwater Treatment Facility.

The enclosed document contains the biological opinion (opinion) prepared by the NMFS pursuant to section 7 of the ESA on the effects of the proposed action. In this opinion, the NMFS concludes that the proposed action would adversely affect but is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon, PS steelhead, PS/Georgia Basin (GB) bocaccio rockfish, PS/GB yelloweye rockfish, and Southern Resident killer whales (SRKWs). The NMFS also concludes that the proposed action is likely to adversely affect designated critical habitat for PS Chinook salmon, PS/GB bocaccio rockfish, PS/GB yelloweye rockfish, and SRKWs, but is not likely to result in the destruction or adverse modification of that designated critical habitat.

We also determined the proposed action is not likely to adversely affect either DPS of humpback whales, or their designated critical habitat.

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. We determined the proposed action would adversely affect EFH, and provide our EFH consultation, along with 2 conservation recommendations in Section 3 of this document.

Please contact Bonnie Shorin in the Central Puget Sound Branch, at (360) 995-2750, or 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: Danette L. Guy, USACE

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

Kitsap Regional Stormwater Treatment Facility

NMFS Consultation Number: WCRO-2022-01488

Action Agency: United States Corps of Engineers, Seattle District

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?
Puget Sound Steelhead (*Oncorhynchus mykiss*)	Threatened	Y	N	N	N/A
Puget Sound Chinook salmon (*O. tshawytscha*)	Threatened	Y	N	Y	N
Bocaccio Rockfish (*Sebastes paucispinus*) (Puget Sound/Georgia Basin DPS)	Endangered	Y	N	Y	N
Yelloweye Rockfish *Sebastes rubberimus*) (Puget Sound/Georgia Basin DPS)	Threatened	Y	N	Y	N
Southern Resident Killer Whale (*Orcinus Orca*)	Endangered	Y	N	Y	N
Humpback Whale (*Megaptera novaeangliae*) (Central America DPS and Mexico DPS)	CAM (Endangered) MEX (Threatened)	N	N	N/A	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: January 24, 2023

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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 the Central Puget Sound Branch in Lacey, Washington.

1.2. Consultation History

On June 16, 2022, the USACE provided NMFS with a request for informal consultation for the proposed Kitsap Regional Stormwater Treatment Facility, based on its determination that the proposed action was not likely to adversely affect (NLAA) ESA-listed species or designated critical habitat.

On June 22, 2022, NMFS replied that stormwater is known to have contaminants in effluent, even after treatment, that are detrimental to the quality of receiving water bodies, and to fish exposed to such contaminants. NMFS provided a non-concurrence, and indicated formal consultation was required.

On June, 23, 2022, the USACE provided its modified request, seeking formal consultation.

On July 5, 2022, the United States District Court for the Northern District of California issued an order vacating the 2019 regulations adopting changes to 50 CFR part 402 (84 FR 44976, August 27, 2019). As reflected in this document, we are now applying the section 7 regulations that governed prior to adoption of the 2019 regulations. For purposes of this consultation, we considered whether the substantive analysis and its conclusions articulated in the biological opinion and incidental take statement would be any different under the 2019 regulations. We have determined that our analysis and conclusions would not be any different.

On September 12, 2022, NMFS initiated the formal consultation, but also requested additional information on treatment methods to be utilized at the proposed facility.

On September 26, 2022, the USACE provided, by email, additional details regarding water quality treatment methods at the proposed facility. The consultation package included this additional information, as well as documents provided by the USACE, including a project biological evaluation (BE); a Habitat Management Plan and No Net Loss Report; a Revised Project Description; project drawings; a General Use Level Designation for Basic (TSS), Dissolved Metals (Enhanced), and Phosphorus Treatment for Oldcastle Infrastructure, Inc.'s The BioPod Biofilter; and a Memorandum for the Services letter.

On January 17, 2023, the USACE indicated by email that they would revise their consultation request to include a request for formal consultation on critical habitats for rockfish and SRKW, and an NLAA determination for humpback whales.

1.3. Proposed Federal Action

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

The USACE proposes to permit Kitsap County Public Works (County) to construct a regional stormwater treatment facility that would treat stormwater from four drainage basins covering approximately 184 acres in Suquamish, Washington (Figure 1). The Kitsap County Suquamish Regional Stormwater Treatment Facility Project (Project) area is located at the Northeast Parkway Street right-of-way parking lot and extends west along Augusta Avenue NE (Figure 2). The four basins that would connect to the Project currently drain to existing outfalls connected to the Suquamish Way NE Basin that drain to Puget Sound at the bluffs near the Suquamish House of Awakened Culture and the Suquamish Dock. The Project would provide an end-of-pipe solution that would collect and enhance regional runoff and treat it to current standards.

The purpose of the Project is to retrofit and construct facilities to provide enhanced runoff treatment to current standards for the entire approximately 184-acre drainage area. A new outfall to Port Madison would be installed on the beach. Stormwater controls and management would be implemented during construction according to the Temporary Erosion and Sediment Control plan prepared for the Project. The Project is funded in part by a Washington State Department of Ecology (Ecology) Water Quality Combined Financial Assistance grant intended to treat stormwater from the Suquamish region prior to discharge to Puget Sound. The Project includes the following actions to accomplish these goals:

- Help protect and restore water quality in Puget Sound by reducing stormwater impacts from existing infrastructure and development.
- Provide a safe long-term solution for treating stormwater runoff to a County-owned and County maintained stormwater outfall.

- Install a stormwater treatment facility consisting of two pretreatment vaults and one treatment vault.
- Construct a new outfall structure and dissipation pad to convey treated stormwater to Port Madison.
- Provide Americans with Disabilities Act (ADA)-compliant curb ramp upgrades, relocation of landmarks, removal of shoreline concrete and riprap debris, and planting and top-of-bluff restoration with native plants.

The Project is expected to be completed in approximately 6 months. While no in-water work is proposed (work waterward of the bluff would occur "in the dry"), construction activities include work below the marine shoreline ordinary high water mark (OHWM) of Port Madison (Figure 2). The new stormwater outfall structure and energy dissipation pad would be installed in the dry during low tides. The footprints below the OHWM of the outfall structure and dissipation pad would be approximately 55 square feet (sf) and 75 sf, respectively. All construction below the marine OHWM would be performed consistent with allowable in-water work windows established by regulatory agencies to minimize potential disturbance of sensitive fish and wildlife species. Within Port Madison, this work window occurs between July 16 and February 15.

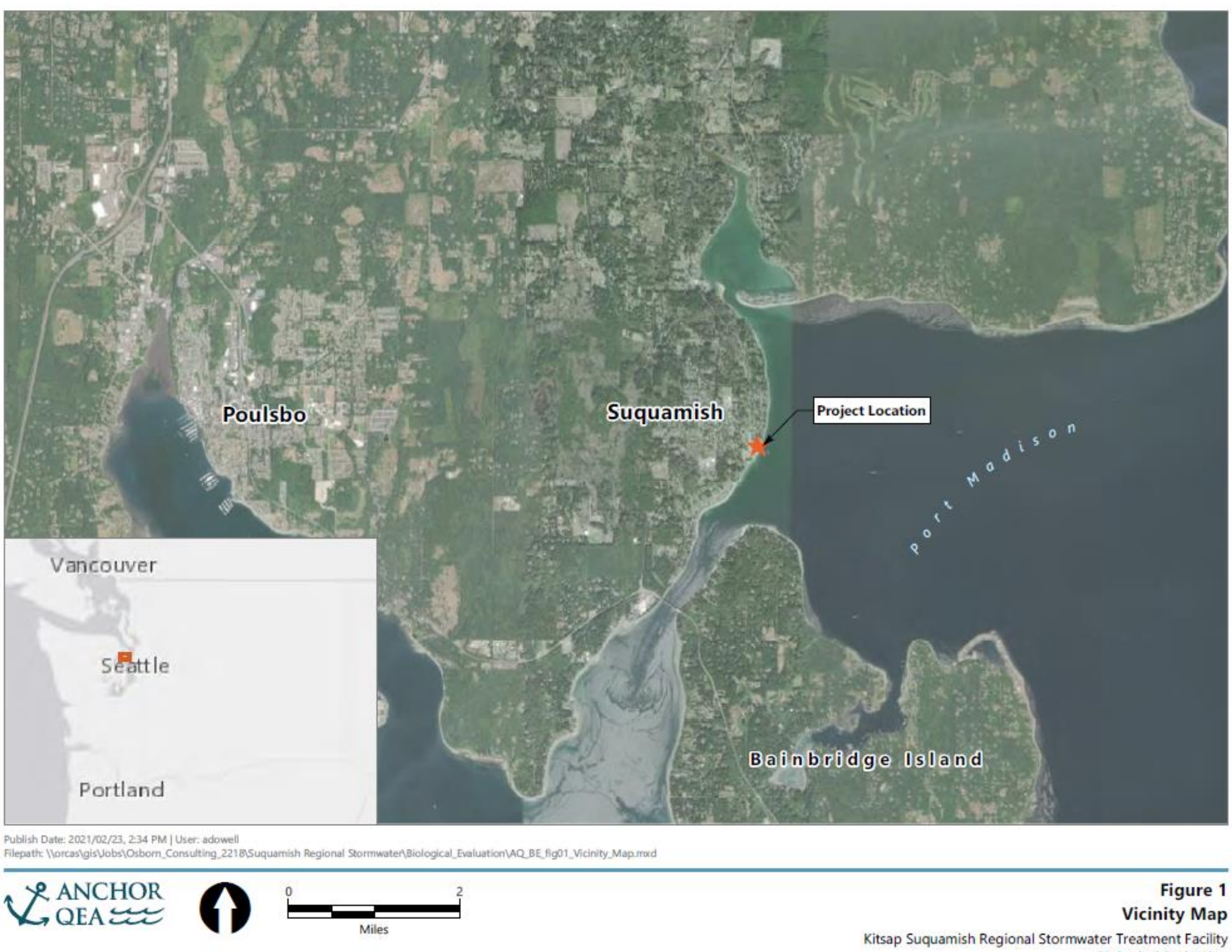

Figure 1. Image of map from BE showing project location (red star).

Figure 2. Image from BE showing existing site conditions at project site.

Best Management Practices

Best management practices (BMPs) are those project elements incorporated to reduce the likelihood of, or severity of adverse effects. This project includes the following BMPS:

1. Work window:
To minimize the presence of ESA-listed species the work would be conducted between July 16 and February 15 (when salmonids are less likely to be present).

2. Special condition protective of forage fish:
Forage fish may be spawning in the project area during the allowed work window. For the protection of Pacific herring, sand lance, and surf smelt, prior to construction, the applicant or its contractor must have an approved biologist conduct a forage fish spawning survey consistent

with WDFW forage fish survey guidelines to confirm that no forage fish are spawning in the project area.

3. Soil stabilization needs/techniques:
Appropriate BMPs would be installed according to the Temporary Erosion and Sediment Control Plan prior to soil disturbance to minimize the potential for erosion and sediment-laden water leaving the Project area. BMPs may include but are not limited to silt fence, straw wattles, and marking of clearing limits.

4. Clean-up and re-vegetation:
Any vegetated surface areas impacted by construction would be replaced in-kind and replanted. To install the proposed outfall, approximately 360 sf of existing vegetated area at the top of the bluff would be temporarily cleared and subsequently replanted with native species. Approximately six trees would be removed for construction and would be replaced by approximately eight trees, including seven trees in the Northeast Parkway median and one tree in the southwest corner of the Project area. The other areas to be planted include an approximately 55 sf area at the corner of Augusta Avenue Northeast where it intersects with Northeast Parkway Street, approximately 130 sf at the southeast corner of Angeline Avenue Northeast and Northeast Parkway Street, approximately 880 sf of the Northeast Parkway Street parking lot divider, and an approximately 3,340 sf area on the southwest corner of the Project area. All planting areas would receive a 2.5-inch compost layer, mixed to a depth of at least 8 inches. The bluff restoration area would be planted with native plants including Nootka rose (*Rosa Nutkana*), Oregon grape (*Mahonia nervosa*), Isanti dogwood (*Cornus sericea* 'Isanti'), Pacific ninebark (*Physocarpus capitatus*), and a native, salt-tolerant wildflower/grass mix. The planted areas will provide habitat or a variety of birds, amphibians, reptiles, and mammals typically associated with residential and commercial development and parks in Kitsap County.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would cause the discharge of treated stormwater into Port Madison, Puget Sound.

The discharged stormwater would be directed from the outfall structure toward the dissipation pad consisting of a mix of beach cobble, using streambed cobbles, up to 12-inch diameter. The concrete outfall structure and dissipation pad would be installed using a crane from the top of the bluff or small excavation equipment if access to the shoreline is available during construction. The outfall structure and dissipation pad would be protected by large wood pieces between 24 and 36 inches in diameter installed along its north and south sides. Each of the large wood pieces would be anchored and supported by approximately four large boulders on each side (for a total of eight 3-man boulders). The large woody debris and boulders would be field-located, as available, pending the final orientation of the outfall structure and dissipation pad.

The water quality system for the Regional Stormwater Treatment facility would use BioPod treatment systems media manufactured by Oldcastle. These systems have been approved for enhanced treatment by Ecology[1].

1.4. Action Area

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

The action area for the Project includes the geographic area potentially affected by the Project construction activities. Potential impacts from construction activities include in-air noise and potential turbidity and changes to prey distribution and abundance. For the purposes of NMFS' analysis, we review the physical, chemical, and biological effects to aquatic features.

While no in-water work is proposed, and construction below the marine OHWM would occur during low tide in the dry, some minor turbidity could occur when the work area below OHWM is inundated during rising tides. In Washington, water quality standards (WAC 173-201A) specify a mixing zone in which visible turbidity must not extend more than 150 feet from the construction location. 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 6PPD-Q for example), we estimate that the action area is 1 kilometer (km) radially from the outfall (Laws et al 1997).

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.

The USACE determined the proposed action is not likely to adversely affect either DPS of humpback whales or their critical habitat. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.12).

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[1] General Use Level Designation for Basic (TSS), Dissolved Metals (Enhanced), and Phosphorus Treatment for Oldcastle Infrastructure, Inc.'s The BioPod Biofilter. Ecology, March 2022. Provided by USACE in their response to NMFS request for additional information for this consultation.

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 relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a 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" (81 FR 7214, February 11, 2016).

The designation(s) of critical habitat for [*list species*] use(s) 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.

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 for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

NMFS relied on the best available science on stormwater contaminants, stormwater treatment methods, the dispersal of contaminants in marine water, the associated contamination of marine sediments from certain stormwater contaminants, and the responses of fishes to exposed to stormwater contaminants. Where data was not specific to Puget Sound, NMFS relied on studies on the stormwater contaminants in other nearshore and deep marine waters. NMFS has based its action area on the effects of stormwater, rather than on the mixing zone for turbidity which was the metric used by the proponent and the USACE.

2.2. Rangewide Status of the Species and Critical Habitat

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

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 to 2018 were the 5 warmest years on record both on land and in the ocean (2018 was the fourth 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. 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 salmon 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
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
Puget Sound/ Georgia Basin DPS of yelloweye Rockfish	Threatened 04/28/10	NMFS 2017d	NMFS 2016d	Yelloweye rockfish within the Puget Sound/Georgia Basin (in U.S. waters) are very likely the most abundant within the San Juan Basin of the DPS. Yelloweye rockfish spatial structure and connectivity is threatened by the apparent reduction of fish within each of the basins of the DPS. This reduction is probably most acute within the basins of Puget Sound proper. The severe reduction of fish in these basins may eventually result in a contraction of the DPS' range.	• Over harvest • Water pollution • Climate-induced changes to rockfish habitat • Small population dynamics

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound/ Georgia Basin DPS of Bocaccio	Endangered 04/28/10	NMFS 2017d	NMFS 2016d	Though bocaccio were never a predominant segment of the multi-species rockfish population within the Puget Sound/Georgia Basin, their present-day abundance is likely a fraction of their pre-contemporary fishery abundance. Most bocaccio within the DPS may have been historically spatially limited to several basins within the DPS. They were apparently historically most abundant in the Central and South Sound with no documented occurrences in the San Juan Basin until 2008. The apparent reduction of populations of bocaccio in the Main Basin and South Sound represents a further reduction in the historically spatially limited distribution of bocaccio, and adds significant risk to the viability of the DPS.	• Over harvest • Water pollution • Climate-induced changes to rockfish habitat • Small population dynamics
Southern resident killer whale	Endangered 11/18/05	NMFS 2008	NMFS 2022	The Southern Resident killer whale DPS is composed of a single population that ranges as far south as central California and as far north as southeast Alaska. While some of the downlisting and delisting criteria have been met, the biological downlisting and delisting 63 criteria, including sustained growth over 14 and 28 years, respectively, have not been met. The SRKW DPS has not grown; the overall status of the population is not consistent with a healthy, recovered population. Considering the status and continuing threats, the Southern Resident killer whales remain in danger of extinction.	• Quantity and quality of prey • Exposure to toxic chemicals • Disturbance from sound and vessels • Risk from oil spills

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.

For southern DPS green sturgeon, a team similar to the CHARTs — a critical habitat review team (CHRT) — identified and analyzed the conservation value of particular areas occupied by southern green sturgeon, and unoccupied areas necessary to ensure the conservation of the species (USDC 2009). The CHRT did not identify those particular areas using HUC nomenclature, but did provide geographic place names for those areas, including the names of freshwater rivers, the bypasses, the Sacramento-San Joaquin Delta, coastal bays and estuaries, and coastal marine areas (within 110 m depth) extending from the California/Mexico border north to Monterey Bay, California, and from the Alaska/Canada border northwest to the Bering Strait; and certain coastal bays and estuaries in California, Oregon, and Washington.

For southern DPS eulachon, critical habitat includes portions of 16 rivers and streams in California, Oregon, and Washington (USDC 2011). We designated all of these areas as migration and spawning habitat for this species.

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.
Puget Sound steelhead	2/24/16 81 FR 9252	Critical habitat for Puget Sound steelhead includes 2,031 stream miles. Nearshore and offshore marine waters were not designated for this species. There are 66 watersheds within the range of this DPS. Nine watersheds received a low conservation value rating, 16 received a medium rating, and 41 received a high rating to the DPS.
Puget Sound/Georgia Basin DPS of yelloweye rockfish	11/13/2014 79 FR68042	Critical habitat for yelloweye rockfish includes 414.1 square miles of deepwater marine habitat in Puget Sound, all of which overlaps with areas designated for canary rockfish and bocaccio. No nearshore component was included in the CH listing for juvenile yelloweye rockfish as they, different from bocaccio and canary rockfish, typically are not found in intertidal waters (Love et al., 1991). Yelloweye rockfish are most frequently observed in waters deeper than 30 meters (98 ft) near the upper depth range of adults (Yamanaka et al., 2006). Habitat threats include degradation of rocky habitat, loss of eelgrass and kelp, introduction of non-native species that modify habitat, and degradation of water quality as specific threats to rockfish habitat in the Georgia Basin.
Puget Sound/Georgia Basin DPS of bocaccio	11/13/2014 79 FR68042	Critical habitat for bocaccio includes 590.4 square miles of nearshore habitat and 414.1 square miles of deepwater habitat. Critical habitat is not designated in areas outside of United States jurisdiction; therefore, although waters in Canada are part of the DPSs' ranges for all three species, critical habitat was not designated in that area. Based on the natural history of bocaccio and their habitat needs, NMFS identified two physical or biological features, essential for their conservation: 1) Deepwater sites (>30 meters) that support growth, survival, reproduction, and feeding opportunities; 2) Nearshore juvenile rearing sites with sand, rock and/or cobbles to support forage and refuge. Habitat threats include degradation of rocky habitat, loss of eelgrass and kelp, introduction of non-native species that modify habitat, and degradation of water quality as specific threats to rockfish habitat in the Georgia Basin.
Southern resident killer whale	08/02/21 86 FR 41668	Critical habitat includes approximately 2,560 square miles of marine inland waters of Washington: 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. Six additional areas include 15,910 square miles of marine waters between the 20-feet (ft) (6.1-meter (m)) depth contour and the 656.2-ft (200-m) depth contour from the U.S. international border with Canada south to Point Sur, California. We have excluded the Quinault Range Site. Based on the natural history of the Southern Residents and their habitat needs, NMFS identified three PCEs, or physical or biological features, essential for the conservation of Southern Residents: 1)

Species	Designation Date and Federal Register Citation	Critical Habitat Status Summary
		Water quality to support growth and development; 2) prey species of sufficient quantity, quality, and availability to support individual growth, reproduction and development, as well as overall population growth; and 3) passage conditions to allow for migration, resting, and foraging Water quality in Puget Sound, in general, is degraded. Some pollutants in Puget Sound persist and build up in marine organisms including Southern Residents and their prey resources, despite bans in the 1970s of some harmful substances and cleanup efforts. The primary concern for direct effects on whales from water quality is oil spills, although oil spills can also have long-lasting impacts on other habitat features In regards to passage, human activities can interfere with movements of the whales and impact their passage. In particular, vessels may present obstacles to whales' passage, causing the whales to swim further and change direction more often, which can increase energy expenditure for whales and impacts foraging behavior. Reduced prey abundance, particularly Chinook salmon, is also a concern for critical habitat.

2.3. 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).

<u>Bank Condition</u>: Riprap and concrete debris are currently present on the beach in the location of the proposed outfall. A variety of common native and non-native tree, shrub, grass, and herbaceous plants are present in the action area. Non-native invasive plant species are the dominant vegetation on the shoreline of Port Madison, including Himalayan blackberry (*Rubus armeniacus*), Scotch broom (*Cytisus scoparius*), English ivy (*Hedera helix*), and orchard morning glory (*Convolvulvus arvensis*). Native vegetation includes red alder (*Alnus rubra*), Scouler willow (*Salix scouleriana*), and Nootka rose.

<u>Aquatic Conditions:</u>
Forage Fish: According to the WDFW Forage Fish Spawning Map online tool (https://www.arcgis.com/home/item.html?id=19b8f74e2d41470cbd80b1af8dedd6b3; accessed on May 25, 2022), there is documented forage fish spawning at or adjacent to the project site. Herring and smelt spawning within the project area, and sand lance adjacent.

Eelgrass and Kelp: According to the Ecology online tool, Washington State Coastal Atlas Map (https://apps.ecology.wa.gov/coastalatlas/tools/Map.aspx;accessed on May 25, 2022), the project is within a ShoreZone unit with eelgrass and kelp. Eelgrass beds are located in lower intertidal areas offshore of the Port Madison shoreline and outside of the Project area. Eelgrass beds are documented offshore of the action area from about 0.21 to -13.41 feet MLLW (WDNR 2021). The proposed outfall will be located at about 8.0 feet MLLW, and approximately 40 linear feet from the mapped eelgrass beds located at about 0.2 feet MLLW.

Water Quality: Water quality in Port Madison about 1 mile north of the action area is listed as a Category 5 impaired water under Ecology's 303(d) list for the dissolved oxygen parameter (Ecology 2021). The purpose of the Project is to improve water quality collected and discharged to Port Madison from four upland drainage basins comprising approximately 184 acres.

<u>Surrounding land/water uses</u>: The surrounding areas are composed of roadway, residential, and commercial areas and undeveloped areas in the community of Suquamish and unincorporated Kitsap County. The marine environment of Port Madison is used for fishing, recreation, and wildlife habitat. Landscaped vegetation and mowed lawns are the dominant vegetation communities within the action area. Most of the construction activities are proposed in areas with existing impervious paved or gravel surfaces. The new outfall structure and energy dissipation pad will be placed on the beach. The beach is undeveloped but includes two other stormwater

outfall structures to the north and south of the Project and riprap and concrete debris scattered along the toe of the bluff.

Use of the action area by listed species

Chinook Salmon:

Chinook salmon presence is documented within Port Madison, and juveniles and adults migrate in the action area (WDFW 2021a, 2021b). Puget Sound is a migratory corridor for adult Chinook salmon and provides habitat for out-migrating juvenile Chinook salmon from rivers into Puget Sound before their eventual oceanic phase as adults. Juvenile Chinook salmon habitat in the vicinity of the action area includes nearshore and estuarine areas. It is expected that adult and juvenile Chinook salmon may be present in the vicinity of the action area during construction. Adults are likely be present in deeper waters of Port Madison and in central Puget Sound year-round and are expected to occur in the deepwater areas in the vicinity of the action area during the summer and fall during their upstream spawning migration. Juveniles may occur in the shallow nearshore during typical out-migration periods between February and July (the work window is July 16 and February 15 to avoid peak presence of juvenile Chinook salmon).

Steelhead:

Steelhead presence is documented within Port Madison, and juveniles and adults migrate in the action area (WDFW 2021a, 2021b). The closest steelhead-bearing stream to the action area is an unnamed stream that flows into Miller Bay about 3 miles north of the action area. Based on typical run timing for winter steelhead (December through mid-March) and summer steelhead (August through December) and spawning patterns, juvenile steelhead would be expected to outmigrate between mid-March and early June. Based on the work window of July 16 and February 15, adult steelhead are more likely than juvenile steelhead to be present during construction effects.

Bocaccio:

Bocaccio rockfish adults stay in deep waters (98 feet or deeper) but juveniles use shallow areas within their designated critical habitat, and larval lifestages float in the water column. Larvae are born with limited abilities to swim, maintain buoyancy in the water column, and feed. These larvae are pelagic for approximately 2 months and occur in the water column from near the surface to depths of 328 feet or more. Larval presence in Puget Sound peaks in spring and again in summer, and larvae commonly associated with kelp beds. Larvae and small juveniles located within the greater Puget Sound during the spring and summer months are subject to currents that may potentially drift the fish into the action area, but they are not expected to intentionally utilize the action area. Therefore, their numbers in the action ear are expected to be in low numbers.

Yelloweye:

Similar to bocaccio, yelloweye rockfish larvae are produced 2 times per year in Puget Sound, and float within the water column for approximately 2 months. Unlike bocaccio, yelloweye juveniles ‘settle’ in deeper water, and thus critical habitat and juvenile and adult lifestages are expected only in the deep-water portion of the action area.

SRKW: Southern Resident killer whale may occur in Port Madison. Areas with water less than 20 feet deep are not designated as critical habitat for SRKW, but offshore habitat of Port Madison, with water deeper than 20 feet, are within SRKW designated critical habitat.

2.4. Effects of the Action

Under the ESA, "effects of the action" means the direct and indirect effects of an action on the species or critical habitat, together with the effects of other activities that are interrelated or interdependent with that action, that will be added to the environmental baseline (50 CFR 402.02). Indirect effects are those that are caused by the proposed action and are later in time, but still are reasonably certain to occur.

Effects of the proposed action include both temporary and long-term effects. Temporary effects are associated with construction (two weeks of work below OHWM to occur between July 16 and February 15), whereas long-term effects are associated with the presence and operation of the permitted facility. For this proposed action, temporary effects include turbid conditions during construction, and modification to shore/bank conditions. Long-term effects result from the presence of the outfall and the effluent discharged into Puget Sound.

2.4.1 Effects on Critical Habitat

Turbidity

Work to modify the bank and install the outfall from the treatment facility is expected to occur below the OHWM, however work is intended to be performed during low tides, in dry conditions. Tides are likely to suspend disturbed sediment, and create a small area of increased turbidity. This turbidity mixing zone not extend more than 150 feet (turbidity point of compliance in WAC 173-201A) radially from the point of construction. Within this area, water quality would be degraded for approximately 2 weeks, the period of work anticipated for in-water activities. This brief period of suspended sediment adversely affects water quality, but given the small area affected, only critical habitat for Puget Sound Chinook salmon, bocaccio, and SRKW would be affected. Given the short duration of disturbance, we expect that all values for which the habitat was designated (survival, growth, and maturation) would be retained.

SRKW critical habitat includes areas as shallow as 20 feet. Critical habitat may be briefly affected by increased suspended sediment, but this effect is both brief and spatially limited, and we consider this effect not at a scale that would diminish the conservation role of any PBF for SRKW.

Bank Conditions

The baseline condition of the outfall alignment is riprap and concrete rubble. The proposed dissipation pad will consist of a mix of beach cobble, using streambed cobbles up to 12-inch diameter. The new outfall and dissipation pad would cover a small area of up to 175 sf, approximately 130 sf of which will be waterward of OHWM. The outfall structure and dissipation pad would be protected by large wood pieces between 24 and 36 inches in diameter to be installed along the north and south sides. Each of the large wood pieces would be anchored and supported by approximately four large boulders on each side (for a total of eight 3-man boulders). The large woody debris and boulders would be located and oriented as appropriate based on the final location of outfall structure and dissipation pad and available materials.

The construction of the dissipation pad would briefly alter the available benthic prey communities, but this reduction in prey availability typically re-establishes by natural recruitment within weeks to months. The replacement of riprap and concrete with stream cobbles and boulders, and the addition of large wood, will improve conditions when the is inundated by providing more natural bank conditions, providing more suitable cover and likely serving as additional source of prey (e.g. Benke and Wallace 2010; Sobocinski et al. 2010). These modifications are limited in location and affect only the designated critical habitat of PS Chinook salmon and bocaccio. Considered together, these modifications are only briefly detrimental when the initial work diminishes prey availability, and the values of the designated area (survival, growth, and maturation) largely retained, with a slight incremental improvement in cover, and possibly in prey diversity.

Non-native riparian vegetation would be removed for the construction of the dissipation pad and outfall. Native vegetation will be replanted in disturbed areas outside of the outfall alignment and the dissipation pad. This would also create a reduction in prey, as detrital prey from vegetation communities on the bank would decrease, and be reduced for several years, until the newly planted native vegetation establishes and matures.

Effluent (Contaminants) Discharged to Puget Sound Waters

Water quality is a feature of critical habitat for all each fish species considered in this opinion, and is a feature of critical habitat for SRKW. Humpback whale critical habitat does not include the action area.

Stormwater runoff is a major contributing factor to water quality impairments throughout Washington State (EPA 2020). Impervious surfaces, such as roads and parking lots, alter the natural infiltration of vegetation and soil, and accumulate many diverse pollutants. During heavy rainfall or snowmelt events, accumulated pollutants are mobilized and transported in runoff from roads and other impervious surfaces. Individual stormwater outfalls ultimately discharge to streams, rivers, lakes, and marine waters. In chemical terms, runoff from roadways, parking lots, and other hardscaped elements of the transportation grid represents an extraordinarily complex mixture, consisting of thousands of distinct compounds, the vast majority of which have not been identified or characterized in terms of adverse environmental effects (Du et al. 2017, Peter et al. 2018). The proposed action intends to capture and treat stormwater prior to discharge into Puget Sound. The proponent would use a proprietary biofiltration method, BioPod, in addition to a vault series, for treatment. BioPod is designed for filtration, sorption, and biological uptake and the Washington State Department of Ecology has identified BioPod at the General Use Level for Basic TSS, dissolved metals, and phosphorus.

Despite water quality standards and treatment, environmental monitoring has documented pollution-driven degradation in nearly all aquatic habitats (freshwater, estuarine, and marine) for NOAA trust resources, including those presently listed for protection under the U.S. Endangered Species Act (ESA). In Puget Sound, for example, this includes habitat supporting several species of Pacific salmon and steelhead, rockfish, SRKW and humpback whales. The agency must consider potential direct and indirect (and/or delayed in time) impacts of toxics on species and their habitats, including critical habitat (under the ESA) and essential fish habitat (under the MSA, considered in Section 3 of this document). The physical, biological, and chemical dimensions of habitat quality, including aquatic food webs, encompass the abundance and productivity of freshwater macroinvertebrates (as prey for juvenile salmon), the health of shoreline macroalgal communities (e.g., sheltering eelgrass habitats), and the survival and abundance of shore-spawning herring and other marine forage fish (keystone species for marine food webs).

Recent research by 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. Conversely, parallel studies have shown that clean water/green infrastructure treatment methods can remove pollutants from stormwater. We expect that despite treatment to be performed at the proposed regional facility, effluent will still contain some contaminants, such as PAHs and 6PPD/6PPD-quinone (6PPD-q). Water quality will improve, but discharges will 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).

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 Puget Sound have proportionally higher contractions 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 (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.

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)	Roads, railways, lawns, levees, golf courses, parks
Nutrients and sediment	Nitrogen, phosphorus fertilizers, fine-grained inorganic sediment	Fertilizer, soil erosion
Persistent bio-accumulative toxicants (PBT)	POPs (persistent organic pollutants) PCBs (polychlorinated biphenyls) PBDEs (polybrominated 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

Stormwater negatively impacts critical habitat of the ESA listed fishes and SRKW by degrading water quality, (water quality is also a feature of essential fish habitat, see the EFH analysis presented in section 3 of this document). Contaminants in stormwater can be transported far downstream to estuaries and the ocean dissolved in surface waters, attached to suspended sediments, or via aquatic food webs (e.g., bioaccumulation). 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 ingestion of contaminated plankton, invertebrates, detritus, or sediment, indicating that prey and substrate are also adversely affected features of critical habitat.

We anticipate water quality to be degraded by the discharge of stormwater effluent from the proposed regional treatment facility. Although the facility would provide treatment to achieve state standards, significantly reducing toxins in stormwater effluent, we expect some degradation of the water quality PBF of critical habitat for PS Chinook salmon, PS/GB bocaccio, PS/GB yelloweye rockfish, and SRKW. However, given that discharges from the treatment facility would contain less contaminant within the effluent than is currently discharged, we believe that water quality, sediment quality, and prey communities would continue to support the conservation role for each of the designated species.

2.4.2 Effects on Species

Turbidity

Based on location and timing of the area where suspended sediment is expected to occur, only PS Chinook salmon, PS steelhead, larval and/or juvenile PS/GB bocaccio rockfish and larval PS/GB yelloweye rockfish are expected to be exposed to turbid conditions.

PS steelhead, if present in the action area, are expected to be present as adult fish or larger/more mature juveniles, which are not nearshore dependent. These fish are able to detect areas of higher suspended sediment and are highly mobile. Therefore, NMFS assumes the only response of this species would be behavioral, in the form of avoidance, such that no injury results from exposure. Based on the size and age of this species, we do not expect the avoidance behavior to result in decreased foraging success, nor in greater susceptibility to being preyed upon.

PS Chinook salmon adults would have similar ability to detect and avoid areas of higher turbidity, and are also unlikely to have any reduction in forage success or decreased predator avoidance. For juvenile Chinook salmon, we do believe that behavioral response is also likely, however timing of the work indicates that exposure would be of relatively few fish at this life stage (at either the beginning or the end of anticipated outmigration window). Those exposed juvenile Chinook salmon could be briefly displaced from preferred forage areas, and/or have a slightly increased risk of being preyed upon by larger fish, as they avoid the shallow, 150-foot radial area where turbidity is likely.

Larval rockfish (bocaccio and yelloweye) passively drift at this life stage, and avoidance behaviors would not be possible. Larval rockfish occur year-round in the Puget Sound and it is possible that they could be present in large numbers. No available studies indicated larval response to high levels of turbidity. However, we expect that effects on other larval species could be relevant here. Ohata et al. (2011) performed a study which indicates that anthropogenic increases of turbidity may increase the relative impact of jellyfish predation on fish larvae of red sea bream and larval ayu (a species related to smelt). Assuming that predation could increase in the area in which rockfish larvae and turbid conditions coincide, given the overlap spatially is limited, and also constrained to a 2-week period, we assume the total numbers of rockfish larvae at this increased risk would be relatively small.

SRKW were observed entering Port Madison, on three occasions in July of 2022 (https://www.orcanetwork.org/recent-sightings-copy; accessed 10/10/2022). SRKW have designated critical habitat as shallow as 20 feet, so the potential for exposure to high turbidity within the action are does exist. However, we expect that given the proximity to shore, and noise and disturbance associated with construction, that SRKW are unlikely to enter areas of high turbidity and that exposure is unlikely. If exposed, that exposure would be brief, and likely at an area of lower intensity at the margin of area with elevated turbidity where settling of suspended sediment has already largely occurred, and thus response would be minor.

Bank Conditions

Only juveniles of PS Chinook salmon and PS steelhead are likely to be exposed to modified bank conditions, occurring only when the project location is inundated at higher tides. As mentioned in the effects to critical habitat section, above, prey availability would be temporarily reduced as riprap and concrete are removed and replaced with a river cobble dissipation pad. The addition of cobble and large wood is expected to improve natural cover for fish, particularly PS Chinook salmon, which are present as a smaller juvenile fish and are nearshore-dependent. The disrupted prey communities may take weeks or months to reestablish their former level of productivity and species composition, but we expect that this location would experience improved prey communities with large wood serving as an additional source for wood- burrowing invertebrates. The brief period of reduced prey is not expected to result in decreased growth or fitness of salmonids because prey is not known to be limited in the action area.

Similarly, upland from the OHWM, the removal of invasive plants in the riparian area is likely to slightly reduce the availability of detrital prey, but replanted vegetation is expected to establish and re-establish a new source of detrital prey. We expect this diminishment to persist for approximately 5 years as replanted species become well established. This would temporarily slightly reduce prey availability and diversity of prey communities for salmonids, but as prey is not noted to be limiting, we expect no significant decline in growth, maturation, or fitness of any individual PS Chinook salmon or PS steelhead.

Rockfish are not expected to have a response to the modified bank conditions. Larval rockfish feed on diatoms, dinoflagellates, tintinnids, and cladocerans. Juveniles consume copepods and euphausiids of all life stages. None of these prey communities are expected to be modified by the habitat conditions of the bank either above or below the OHWM.

SRKW and Humpback whales would not be exposed to changes in bank conditions.

Water quality

Assessments for transportation-related runoff and species/habitats protected under the Endangered Species Act (ESA) and Magnuson-Stevens Fishery Conservation and Management Act (MSA) will need to consider toxic risk in the aggregate. This will necessarily include chemicals beyond 6PPD-q and stressor-response dynamics involving complex chemical mixtures, effects that may be sublethal and/or delayed in time, impacts mediated through food webs, and interactions with non-chemical forcing pressures (most notably climate change).

Toxicity to fish early life stages

PAHs: Petroleum-related toxicity to the early life history stages of fish has been a primary scientific focus area for NOAA's Northwest Fisheries Science Center (NWFSC) for the last 20 years. This targeted research has centered on PAHs and related compounds in the context of two overlapping mission goals for NOAA. These are to understand and minimize the adverse ecological impacts of PAHs from 1) major oil spills, and 2) urban stormwater runoff. A large and growing body of environmental monitoring data (analytical chemistry) has established PAHs as a ubiquitous component of stormwater-driven runoff to Puget Sound streams, lakes, rivers, wetlands, and estuaries. Whether originating from oil 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 compounds 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 oil spills and urban stormwater are increasingly converging on a risk framework where certain PAHs (Figure 1; described in more detail below) cause a well-described syndrome involving the abnormal development of the heart, eye and jaw structure, and energy reserves of larval fish (Harding et al., 2020).

Toxicity to marine fish

The 1989 *Exxon Valdez* oil spill in Prince William Sound, Alaska, produced a dissolved PAH mixture in marine and nearshore habitats dominated by compounds with 2 to 4 benzene rings (Figure 2, top panel, Alaskan North Slope Crude Oil). The multiple ring structure is the basis for the descriptors "polycyclic" or "heterocyclic", the latter for ring configurations having a slight modification, such as the dibenzothiophenes. Over the ensuing 30 years, combined research from NOAA's Alaska Fisheries Science Center (AFSC) and the 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 not 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; Brette et al., 2014; 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 (Figure3).

Figure 3. 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. 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 (∑PAH) 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 the SR520 collection location at the NWFSC in Seattle shows considerable overlap with the pattern of PAHs derived from a pure oil spill (Figure 4 top). 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.

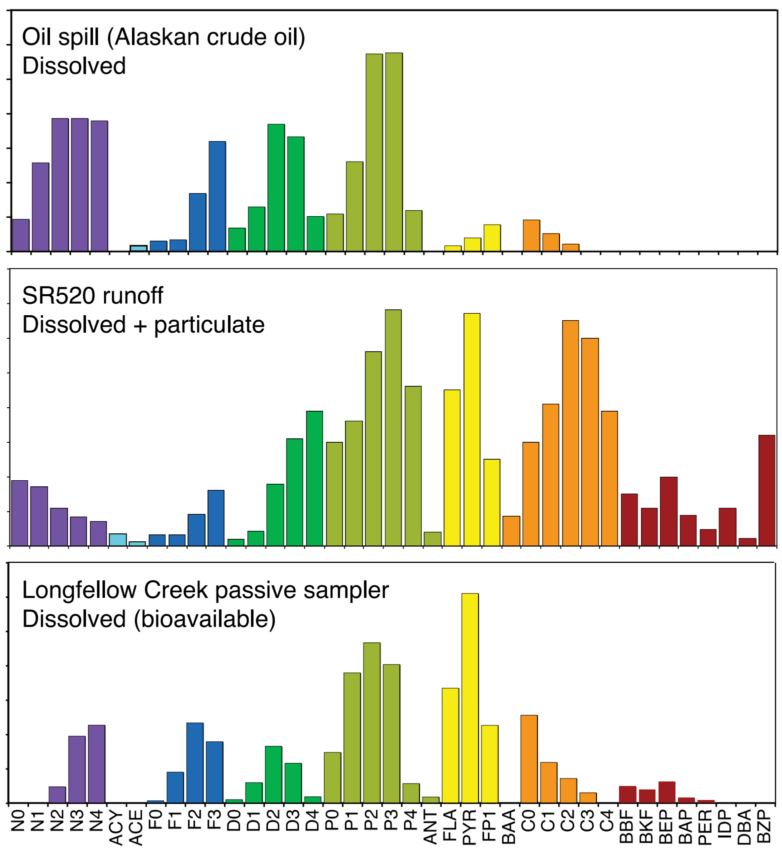

Figure 4. Patterns of PAHs in environmental samples. Top, effluent in seawater flowing over gravel coated with Alaskan crude oil (source for Exxon Valdez). Middle, runoff from the SR520 highway adjacent to NWFSC. Bottom, PAHs extracted from a polyethylene membrane device (PEMD) incubated one week in Longfellow Creek, West Seattle. X-axis shows proportion of total PAH, and values are omitted for simplicity to emphasize overall patterns. 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 Seattle-area urban streams 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 (Figure 4). 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 ∑PAH 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. There is a risk that untreated runoff could cause delayed mortality in ESA-listed salmonids, and also the prey available to salmon and higher-trophic species such as killer whales through losses of nearshore spawning forage fish. This risk declines but may not be entirely avoided by treatment.

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, 2016a&b; 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).

Toxicity to SRKW

SRKW are likely to be occasionally exposed to contaminants in stormwater discharges from the proposed facility. Toxic effects on marine mammals can include anemia, increased oxygen consumption, growth retardation, immunotoxicity, reduced reproduction, neurotoxicity, mutagenesis and carcinogenesis (Harris et al., 2011 and De Jong et al., 1999). For the endangered SRKW exposure to PAHs can potentially cause adverse health effects" (Braig et al. 2021). SRKW scat samples indicate baseline PAH levels in the whales are generally low and exposure includes ingestion by this species in Puget Sound from ambient conditions including as vessel exhaust (Lundin et al 2018). SRKW health effects of PAH exposure presented here are derived from evaluating exposure to exhaust gases (Lacmuth et al. 2011). These include observed effects from acute exposure are: asthma aggravation, respiratory infection, transient changes in pulmonary function, pulmonary and systemic inflammation, oxidative stress, arterial vasoconstriction, and mortality (Koenig 2000; Pope and Dockery 2006). Effects arising from chronic exposure are: disease prevalence, lung growth or decline, lung inflammation, atherosclerosis, and mortality (Koenig, 2000, Pope and Dockery, 2006).

While we expect exposure to PAHs derived from water quality rather than from air quality would avoid some effects, such as lung condition, other effects such as atherosclerosis and greater susceptibility to disease could occur. The SRKWs are among the most contaminated populations of marine mammals in the world, mostly by persistent organic pollutants (e.g., PCBs) and the toxicity of extremely high levels of persistent organic pollutants could be additive or synergistic with exposure to pollutants such as PAHs (Kagawa, 2002). However, we anticipate only occasional exposure to reduced levels of PAHs from the facility in a relatively small portion of their habitat, which we would not expect to cause injury or mortality. The toxicity effects to marine fish described above could also result in a small reduction to the prey available to the whales if they were foraging in the area concurrent with impairment or mortality to their primary prey, Chinook salmon.

Toxics in stormwater discharged from the proposed facility are likely to result in negative health effects on PS Chinook salmon, PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish and SRKW. However, because the proposed action is intended to reduce contaminants discharged into Puget Sound, we believe that the risks associated with exposure to contaminants in the effluent, while not avoided, does decrease as a result of the proposed action.

2.5. 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). 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.

Within the action area, the non-federal effects most likely to occur are the commercial and recreational presence of vessels, creating noise and water quality reductions. Other anticipated effects are the continued effects of upland activities that cause water quality reductions as point or non-point discharges. Salinity, acidity, and water temperatures are also expected to shift increasingly with climate change, though the degree of these changes is difficult to predict. These shifting conditions are likely to modify prey communities and food web interactions over time.

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 2.3).

The action area is influenced by actions within Puget Sound marine waters, along the shoreline, and in tributary watersheds. Some types of human activities that contribute to cumulative effects are expected to have adverse impacts on populations and PBFs, many of which are activities that have occurred in the recent past and had an effect on the environmental baseline. These can be considered reasonably certain to occur in the future because they occurred frequently in the recent past, especially if authorizations or permits have not yet expired. State, tribal, and local government actions are likely to be in the form of legislation, administrative rules, or policy initiatives, shoreline growth management, and resource permitting. Private activities include continued resource extraction, vessel traffic, development, and other activities which contribute to poor water quality in the marine environments of Puget Sound.

Although these factors are ongoing to some extent and likely to continue in the future, past occurrence is not a guarantee of a continuing level of activity. That will depend on whether there are economic, administrative, and legal impediments (or in the case of contaminants, safeguards). Therefore, although NMFS finds it likely that the cumulative effects of these activities will have adverse effects commensurate to those of similar past activities, as described in the Environmental Baseline, these effects may occur at somewhat higher or lower levels than those described in the Baseline.

Based on current trends, there will continue to be a net reduction in the total amount of shoreline armoring in Puget Sound (PSP 2019). Changes in tributary watersheds that are likely to affect the action area include reductions in water quality, water quantity, and sediment transport. Future actions in the tributary watersheds whose effects are likely to extend into the action area include operation of hydropower facilities, flow regulations, timber harvest, land conversions, disconnection of floodplain by maintaining flood-protection levees, effects of transportation infrastructure, and growth-related commercial and residential development. Some of these developments will occur without a federal nexus, however, activities that occur waterward of the OHWM require a USACE permit and therefore involve federal activities, which are not considered in this section.

All such future non-federal actions, in the nearshore as well as in tributary watersheds, will cause long-lasting environmental changes and will continue to harm ESA-listed species and their critical habitats. Especially relevant effects include the loss or degradation of nearshore habitats, pocket estuaries, estuarine rearing habitats, wetlands, floodplains, riparian areas, and water quality. We consider human population growth to be the main driver for most of the future negative effects on salmon and steelhead and their habitat.

The human population in the Puget Sound region is experiencing a high rate of growth. The central PS region (Snohomish, King, Pierce and Kitsap counties) has increased from about 1.29 million people in 1950 to over 4.2 million in 2020, and projected to reach nearly 6 million by 2050 (Puget Sound Regional Council 2020). Thus, future private and public development actions are very likely to continue in and around PS. As the human population continues to grow, demand for agricultural, commercial, and residential development and supporting public infrastructure is also likely to grow. We believe the majority of environmental effects related to future growth will be linked to these activities, in particular land clearing, associated land-use changes (i.e., from forest to impervious, lawn or pasture), increased impervious surface, and related contributions of contaminants to area waters. Land use changes and development of the built environment that are detrimental to salmonid habitats are likely to continue under existing regulations. Though the existing regulations minimize future potential adverse effects on salmon habitat, as currently constructed and implemented, they still allow systemic, incremental, additive degradation to occur.

Several not for profit organizations and state agencies are also implementing recovery actions identified in the recovery plans for Puget Sound Chinook salmon, PS steelhead, and PS/GB yelloweye rockfish and bocaccio. The state passed House Bill 1579 that addresses habitat protection of shorelines and waterways (Chapter 290, Laws of 2019 (2SHB 1579)), and funding was included for salmon habitat restoration programs and to increase technical assistance and enforcement of state water quality, water quantity, and habitat protection laws. Other actions included providing funding to the Washington State Department of Transportation to complete fish barrier corrections. Although these measures won't improve prey availability immediately, they are designed to improve conditions in the long-term.

Notwithstanding the beneficial effects of ongoing habitat restoration actions, the cumulative effects associated with continued development are likely to have ongoing adverse effects on all the listed salmonid and rockfish species addressed in this opinion, and abundance and productivity that outpace the effects of restoration activities. Only improved low-impact development actions together with increased numbers of restoration actions, watershed planning, and recovery plan implementation would be able to address growth related impacts into the future. To the extent that non-federal recovery actions are implemented and offset ongoing development actions, adverse cumulative effects may be minimized, but will probably not be completely avoided.

2.6. 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.

2.6.1 ESA Listed Species

The status of each ESA species considered in this opinion is threatened, except for SRKW and bocaccio which are endangered. The status of all species is based in low abundance relative to historic numbers, with reduced productivity, spatial structure, and diversity. This depressed condition is a function of many factors, including reductions in the amount or quality of habitat throughout their range, and overharvest in previous years. Baseline conditions in the action area which were described earlier in this document reflect habitat degradation typical in the near-marine environment.

To this status, we add the effects of the proposed action. Most of the effects of the proposed action are spatially very constrained (bank modification, area of increased suspended sediment) with very limited effect on any of the listed species. The exception is the discharge of effluent from the proposed stormwater treatment facility. The proposed action's discharge would create a chronic area of exposure for PS Chinook salmon, PS steelhead, and PS/GB yelloweye rockfish and bocaccio, and occasional exposure of SRKW.

Contaminants in this discharge are likely to produce a range of adverse health effects – both acute and latent, particularly among larval rockfish of both species and juvenile salmonids. However, it is important to note that the discharge is of treated stormwater from the proposed facility, the purpose of which is to capture and improve the treatment of currently minimally treated stormwater to reduce contaminants prior to discharge. For this reason, we expect harm or death associated with the proposed action may occur at a lower rate than at the baseline (pre-project) level.

2.6.2 Critical Habitat

The action area is within designated critical habitat for PS Chinook salmon, PS/GB bocaccio, PS/GB yelloweye rockfish, and SRKW. Water quality is a feature of critical habitat for each of these species.

All nearshore marine units of critical habitat for PS chinook salmon, including the action area, are rated as having high conservation value based on the vital role these locations serve for survival of the species (NMFS 2005). Critical habitat in the nearshore marine areas of Puget Sound are to have water quality conditions that support growth and maturation which allow juveniles to transition to their marine lifestage.

For both species of rockfish, Puget Sound should have water quality and sufficient levels of dissolved oxygen to support growth, survival, reproduction, and feeding opportunities of the species. For SRKW essential to the conservation of the DPS is water quality to support growth and development of individuals of the species.

The proposed project will discharge contaminants in the effluent from its proposed wastewater treatment facility. While the discharge itself contains degrading contaminants, the project's purpose is to capture a larger percentage of generated stormwater than currently occurs, in order to reduce the overall load of contaminants in streams that discharge into Puget Sound. The outcome, while still retaining some detriment, is likely to provide a reduction in overall level of pollutant in Puget Sound, conferring a potential improvement to this feature of critical habitat for each species.

2.7. 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, any effects of activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of PS Chinook, PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish, or SRKW. Further, the proposed action is not likely to destroy or adversely modify the designated critical habitat for PS Chinook, PS/GB bocaccio, PS/GB yelloweye rockfish, or SRKW.

2.8. 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.

2.8.1 Amount or Extent of Take

When take is in the form of harm from habitat degradation, it is often impossible to enumerate the take that would occur because the number of fish and marine mammals likely to be exposed to harmful habitat conditions is highly variable over time, influenced by environmental conditions that do not have a reliably predictable pattern, and the individuals exposed may not all respond in the same manner or degree. Where NMFS cannot quantify take in terms of numbers of affected individuals, we instead consider the likely extent of changes in habitat quantity and quality to indicate the extent of take as surrogates. The best available indicators for the extent of take, proposed actions are as follows.

As described in our effects analysis, NMFS has determined that incidental take is reasonably certain to occur as follows:

- Death of larval PS/GB bocaccio and yelloweye rockfish from increased predation risk associated with temporary elevated turbidity levels from construction activities; and
- Injury or death of juvenile and adult PS Chinook salmon, PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish, and sublethal harm to SRKW from exposure to toxic chemicals in stormwater effluent discharged from the facility.

For take of larval rockfish resulting from elevated turbidity levels we use the surface area (sf) of the footprint of structures (outfall structure and dissipation pad) below the OHWM and the total time (days) of construction work below the OHWM that cause this disturbance as surrogate take indicators. The estimated area is 130 sf (55 sf for the outfall structure and 75 sf for the dissipation pad) and is expected to be completed within 14 days. These take indicators are causal and proportional to take we identified in this opinion resulting from turbidity associated with the construction of the proposed structures. Take would be exceeded if the footprint of structures below the OHWM is greater than 130 sf or if construction activity below the OHWM takes longer than 14 days.

For take of PS Chinook salmon, PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish, and SRKW resulting from the discharge of stormwater effluent, we use the area (acres) of the contributing drainage basins (4) as the surrogate take indicator. This area is approximately 184 acres. This take indicator is causal and proportional to take we identified in this opinion resulting from effects of effluent discharge from the proposed treatment facility. Take would be exceeded if the area of contributing drainage basins increased (over 184 acres) through the collection of runoff/effluent from additional drainage areas/basins.

2.8.2 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.

2.8.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). The following measure is necessary and appropriate to minimize the impact of incidental take of listed species from the proposed action.

1. Ensure the function and effectiveness of stormwater treatment; and
2. Ensure completion of a monitoring and reporting program for incidental take pathways.

2.8.4 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 [name Federal agency] 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 term and condition implements reasonable and prudent measure 1: The USACE or the permit applicant shall provide to NMFS a maintenance and monitoring plan for the proposed stormwater treatment facility that ensures treatment structures and operations remain fully functional and effective at treatment of effluent. This plan shall be provided to NMFS (projectreports.wcr@noaa.gov) within 90 days of completion of the proposed action.
2. The following term and condition implements reasonable and prudent measure 2: The USACE or the permit applicant shall provide to NMFS (projectreports.wcr@noaa.gov) within 60 days of completion of the proposed action a report that provides the following:

a. The surface area (sf) of the footprint of structures (outfall structure and dissipation pad) below the OHWM;
b. The total number of days of construction activity below the OHWM; and
c. The total area of the drainage basins contributing discharge to the treatment facility.

2.9. Species and Critical Habitats Not Likely to be Adversely Affected

Humpback Whales: Humpback whale presence in Puget Sound has increased in recent decades (for example, OceanWatch indicates 3,052 locations of humpback whales sighting in the focal area of the waters around the San Juan Islands and Puget Sound reported to the B.C. Cetacean Sightings Network from 1990 through 2016) with some sighting near Kitsap County[2]. Data suggests approximately 69 percent of whales in Puget Sound are from the unlisted Hawaii DPS, while the remainder are from the Central American (6 percent) and Mexico DPSs (25 percent). Critical habitat is not designated within the action area.

Central America DPS humpback whale. Whales from this breeding ground feed almost exclusively offshore of California and Oregon in the eastern Pacific, with only a few individuals have been identified at the northern Washington-southern British Columbia feeding grounds. The Central America DPS is listed as endangered and has been most recently estimated to include 783 whales (CV = 0.170; Wade 2017) with unknown population trend.

Mexico DPS humpback whale. This DPS has also been documented within the Salish Sea (Calambokidis et al. 2017). Sightings of humpback whales in general have increased dramatically in the Salish Sea from 1995 to 2015, and at least 11 whales from this DPS have been matched to those sighted within this area (Calambokidis et al. 2017). This DPS was most recently estimated to have an abundance of 2,806.

Both DPSs of humpback whales occur only rarely in the action area. The duration of presence at any occurrence is not expected to exceed several hours as members of these species would normally continue in search of prey during their migration. Given the brevity of exposure to contaminants discharged by the treatment facility, we expect no discernible behavioral or health response. Humpback whales would not be expected in the shallow nearshore area where we anticipated elevated levels of turbidity. While exposure is not discountable, response is expected to be insignificant.

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).

[2] https://oceanwatch.ca/bccoast/species-habitats/humpbacks/ accessed 11/1/2022

To further minimize effects of stormwater discharge from the proposed treatment facility, we recommend the USACE or permit applicant do the following:

- Develop and implement an adaptive management plan for stormwater treatment at the Kitsap Stormwater Treatment Facility, which actively pursues and applies upgrades to its treatment methods with future developments in stormwater science and treatment; and
- Work with local jurisdictions to increase green infrastructure and apply 100% stormwater runoff infiltration in contributing basins to reduce contaminants coming off roads.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Kitsap County Stormwater Treatment Facility.

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

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

Section 305(b) of the MSA directs Federal agencies to consult with 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 USACE and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council (PFMC 2005), coastal pelagic species (CPS) (PFMC 1998), and Pacific Coast salmon (PFMC 2014) 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 environmental effects of the proposed action may adversely affect EFH for Pacific Coast salmon, Pacific Coast groundfish and coastal pelagic species, all of which are present in the action area. The action area also contains Habitat Areas of Particular Concern (HAPC) for Pacific Coast salmon and Pacific Coast groundfish. Impacts to EFH include water quality degradation by short-term elevated levels of turbidity during construction activity below the OHWM and by the discharge of stormwater effluent from the treatment facility.

3.2. Adverse Effects on Essential Fish Habitat

The feature of EFH of Pacific Coast salmon, Pacific Coast groundfish and coastal pelagic species affected by the proposed action would include diminishments in water quality, as described above in this Opinion. We anticipate degraded water quality from elevated levels of turbidity approximately 150-feet waterward of the project construction (outfall structure and dissipation pad) areas below the OHWM for up two weeks (the duration of this construction activity). We also expect degraded water quality associated contaminants in stormwater discharged from the proposed facility.

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. Develop and implement an adaptive management plan for stormwater treatment at the Kitsap Stormwater Treatment Facility, which actively pursues and applies upgrades to its treatment methods with future developments in stormwater science and treatment; and
2. Work with local jurisdictions to increase green infrastructure and apply 100% stormwater runoff infiltration in contributing basins to reduce contaminants coming off roads.

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.

3.4. Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the USACE 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.

3.5 Supplemental Consultation

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

4. DATA QUALITY ACT DOCUMENTATION AND PRE-DISSEMINATION REVIEW

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

4.1 Utility

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

4.2 Integrity

This consultation was completed on a computer system managed by 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, if applicable*] 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, if applicable*], and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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