UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No.:
WCRO-2023-00605

January 30, 2024

Susan Poulsom
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United States Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 155
Seattle, Washington 98101

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Reissuance of the National Pollutant Discharge Elimination System Permit for the Joint Base Lewis-McChord Municipal Separate Storm Sewer System, Permit# WAS026638

Dear Ms. Poulsom:

This letter responds to your May 8, 2023, request for reinitiation of consultation with the National Marine Fisheries Service (NMFS) pursuant to Section 7 of the Endangered Species Act (ESA) for the subject action. Your request qualified for our expedited review and analysis because it met our screening criteria and contained all required information on, and analysis of, your proposed action and its potential effects to listed species and designated critical habitat.

We reviewed EPA's consultation request and related initiation package. Where relevant, we have adopted the information and analyses you have provided and/or referenced but only after our independent, science-based evaluation confirmed they meet our regulatory and scientific standards. We adopt by reference here sections of the *2023 Addendum to the 2013 Biological Evaluation to Reinitiate Endangered Species Act and EFH Consultation for NMFS Listed Species for EPA's Reissuance of NPDES Permit No. WAS026638 (JBLM MS Permit) May 2023* (2023 BE Addendum), and corresponding sections of the 2013 BE (*Biological Evaluation and Essential Fish Habitat Assessment for Issuance of NPDES Permit #WAS-026638 for Discharges from the Joint Base Lewis-McChord Municipal Separate Storm Sewer System (MS4)*) as follows:

- Section 2 and 4 for the proposed action and action area;
- Section 3 for the status of species and critical habitat;
- Section 3 and 4 for the environmental baseline; and
- Section 5 for the effects of the action

<u>Consultation History</u>
Prior to receiving EPA's request for consultation, several calls were held between NMFS and EPA to discuss the project, species presence and potential exposure pathways, the consultation process and information requirements. Once the request for consultation was received, NMFS reviewed the consultation package provided on May 8, 2023 and determined that all information necessary to complete consultation was provided, and formal consultation was initiated on May 8, 2023.

Between October 25, 2023 and January 8, 2024, several emails and calls between the EPA and NMFS provided further clarifying details of the proposed action, including permit duration, and water quality monitoring and reporting, as well as to discuss draft terms and conditions. On December 1 and 13, 2023, the EPA provided via email additional details on the proposed action, including the permitting process and monitoring, as well as details on baseline conditions. We adopt by reference this additional information for the proposed action and environmental baseline, respectively.

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

Proposed Action

In compliance with the Clean Water Act, the purpose of the EPA's action is reissuance of the NPDES permit authorizing discharge of stormwater runoff from the JBLM Municipal Separate Storm Sewer System (MS4) owned and operated by JBLM. JBLM is located in Washington State, south-southwest of the city of Tacoma. Receiving waters of the JBLM stormwater runoff discharge include The Puget Sound, near the JBLM Canal outfall at Solo Point; Murray Creek; American Lake; American Lake Pond; Lynn Lake; Kennedy, Bell, Hamer, Elliot and McKay Marshes (and associated wetland areas in the JBLM cantonment area); Clover Creek; Lake Steilacoom; Carter Lake; and wetlands near JBLM-McChord Field. The Nisqually River and Much Creek are also part of the action area, but there are no stormwater runoff discharges through any MS4 infrastructure to either waterway, or other surface waterbody.

NPDES permits must address the Act's requirements for technology-based limits which protect water quality as required by CWA Section 301. All NPDES permits must also include effluent limits at least as stringent as the applicable technology-based limits regardless of the discharge's impact on water quality. NPDES permits also implement the Act's "fishable/swimmable" goal (CWA Section 101(a)(2)) by including water quality-based limits that may be more stringent than technology-based limits. Water quality-based effluent limits are required by Section 301(b)(1)(C) of the Act and protect the aquatic life, human health, and recreation uses of the nation's waters.

In 2013, NMFS provided a letter of concurrence to the EPA, concurring that the EPA's issuance of the 2013 permit was not likely to adversely affect ESA-listed species or their critical habitat. The permit was first issued in September 2012. Because the EPA did not reissue the existing MS4 before it expired in late 2018, the original 2013 permit is administratively continued, and its permit conditions continue in force and effect until a new permit is issued. EPA has determined that re-initiation of ESA and EFH consultation is warranted due to new information regarding potential effects to ESA-listed species that were not considered in the 2013 consultation, and the 2016 designation of PS steelhead and their critical habitat. EPA has expanded the list of ESA-listed species and critical habitat that may be affected by the action, and also determined that the action is likely to adversely affect some species and critical habitat.

Upon reissuance, the JBLM MS4 Permit will continue to authorize the discharge of stormwater runoff from the installation through JBLM's MS4 outfalls, contingent upon JBLM's continued implementation of a comprehensive Stormwater Management Program (SWMP) as outlined in the Permit. Detailed descriptions of JBLM's SWMP, including JBLM's Stormwater Retrofit Plan are provided in the 2013 BE (Section 2) and the 2023 BE Addendum (Section 2 and 4). The permit is effective for a term of five years from its effective date.

As described in a December 1, 2023 email from the EPA to NMFS, the proposed action is the re-issuance of the permit for a 5-year term. However, if the permittee submits to EPA a timely application for permit renewal and EPA is unable to complete the permit reissuance prior to the expiration date of the permit it may be administratively extended and the permit will remain in effect until it is reissued. In addition, the proposed action includes future reissuances of this permit, at which time EPA would coordinate with NMFS when evaluating the requirements to re-initiate ESA consultation, consistent with 50 CFR § 402.16, and EFH consultation, consistent with 50 CFR § 600.920. EPA expects implementation of the permit requirements to reduce effects to listed species and habitat throughout the permit term and future reissuances through reduced discharge volume and improved water quality from JBLM MS4 discharges into adjacent waters.

As described in the 2013 BE and 2023 BE Addendum, stormwater conveyance covered by the proposed permit is generated within the 142 square-mile area of JBLM. A December 13, 2023 email from the EPA to NMFS quantified the total area contributing stormwater, which drains into the JBLM Canal and Clover Creek. The total drainage area into these waterways is estimated at 5,052 acres. Of this, 2,795 total acres of JBLM Main drain into the JBLM Canal via outfall 2 and 3 (OF2 and OF3), 1,110 acres of JBLM North into JBLM Canal via outfall 4 and 5 (OF4 and OF5), and 1,147 acres of JBLM-McChord East Basin into Clover Creek outfalls. An estimated half of these areas are impervious surfaces, for a total of 2,525 acres of impervious surfaces in the JBLM MS4 permit area that contribute stormwater to the Puget Sound and tributaries. These impervious surfaces include pollution generating impervious surfaces (PGIS; e.g. paved roads and parking lots), but also include areas that are non-pollution generating impervious surfaces (NPGIS). As described in the 2013 BE and 2023 BE Addendum, existing treatment of stormwater at JBLM ranges from untreated to fully infiltrated.

Status of Species and Critical Habitat

We examined the status of each species that would be adversely affected by the proposed action to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. We also examined the condition of critical habitat throughout the designated area and discuss the function of the physical or biological features essential to the conservation of the species that create the conservation value of that habitat. We adopt by reference Section 3 of the 2023 BE and Section 3 of the 2013 BE for descriptions of the status of species and critical habitat. We supplement what is described in the BE and BE Addendum, with the following information about the status of ESA-listed species and critical habitat.

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

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

Species

Juvenile and adult Puget Sound (PS) Chinook salmon and steelhead occur in the action area, with designated critical habitat for both species in freshwater portions of the action area, and for PS Chinook salmon in the marine portions as well. Within the action area, PS Chinook salmon critical habitat is designated in the lower reaches of the Nisqually River, which supports juvenile rearing and migration, and adult migration of the Nisqually River population; and in the nearshore of the Puget Sound, which supports juvenile and adult migration of fish from the Nisqually River and other populations in the southern Puget Sound that migrate through this area. Puget Sound resident Chinook salmon (Chinook salmon that spend their entire lives within the Puget Sound and its tributaries; also known as "blackmouth") may also use this area for juvenile through adult rearing. Within the action area, critical habitat for PS steelhead is only designated within the Puget Sound. This habitat primarily supports migrating Nisqually River population juvenile and adult steelhead, but PS steelhead from other south and central Puget Sound tributaries may also occur. NOAA Fisheries (2005) identifies the habitat in the lowland Nisqually River watershed as being of fair to good quality. Water quality is a physical and biological feature (PBF) of freshwater and marine critical habitat of these species that could be affected by the proposed action.

Juvenile and adult PS/Georgia Basin (PS/GB) bocaccio and yelloweye rockfish and their designated critical habitat are present within the marine portion of the action area. Nearshore areas are designated for juvenile bocaccio, and deeper areas for adult bocaccio and juvenile and adult yelloweye rockfish. We expect larvae of both species, which are mostly passively carried by water currents, to be present throughout the marine areas. Water quality is a PBF of critical habitat for both species that may be affected by the proposed action.

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 2017; 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

Species	Listing Classification and Date	Recovery Plan Reference	Most Recent Status Review	Status Summary	Limiting Factors
Puget Sound/ Georgia Basin DPS of yelloweye Rockfish	Threatened 04/28/10	NMFS 2017a	NMFS 2016	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
Puget Sound/ Georgia Basin DPS of Bocaccio	Endangered 04/28/10	NMFS 2017a	NMFS 2016	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

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 (NOAA 2005). The conservation rankings were high, medium, or low. To determine the conservation value of each watershed to species viability, the CHARTs evaluated the quantity and quality of habitat features, the relationship of the area compared to other areas within the species' range, and the significance to the species of the population occupying that area. Even if a location had poor habitat quality, it could be ranked with a high conservation value if it were essential due to factors such as limited availability, a unique contribution of the population it served, or is serving another important role.

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

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

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

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). We adopt by reference Section 2 of the 2023 BE addendum for the description of the action area.

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). We adopt by reference Section 3 and Section 4 for the description of the environmental baseline.

Effects of the Action

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

The 2013 BE and 2023 BE Addendum provides a detailed discussion and comprehensive assessment of the effects of the proposed action in Section 3.1, and is adopted here (50 CFR 402.14(h)(3)). NMFS has evaluated this section and after our independent, science-based evaluation determined it meets our regulatory and scientific standards.

As described in the 2023 BE Addendum, PS Chinook salmon, PS steelhead, PS/GB bocaccio and PS/GB yelloweye rockfish critical habitat will be affected by the proposed action. Water quality, a PBF of critical habitat of all three species, is expected to be degraded as a result of stormwater contaminants discharged in the JBLM Municipal Separate Storm Sewer System (MS4). This degradation would be intermittent during and immediately following periods of precipitation, when stormwater inputs result from rainfall on pollution generating impervious surfaces (PGIS), for the duration of the NPDES permit period (5 years from date of issuance).

Cumulative Effects

"Cumulative effects" are those effects of future state or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation (50 CFR 402.02 and 402.17(a)). Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. We adopt by reference Section 6 of the 2013 BE for the description of cumulative effects, and supplement it with the following.

The action area is influenced by non- federal actions within Puget Sound marine waters, along the shoreline, and in tributary watersheds Within the action area, the non-federal effects most likely to occur are the commercial, industrial 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. The human population in the Puget Sound region is expected to reach nearly 5 million by 2040 (Puget Sound Regional Council 2020). If population growth trends remain relatively consistent with recent trends, we can anticipate future growth at approximately 1.5 percent per year. Thus, future private and public development actions are very likely to continue in and around Puget Sound. As the human population continues to grow, demand for agricultural, commercial, and residential development and supporting public infrastructure is also likely to grow. We anticipate 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, and additive degradation to occur.

All such future non-federal actions in the action areas 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.

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 adopted from sections 3 and 4 of the BA to inform our Environmental Baseline, these effects may occur at somewhat higher or lower levels than those described in the BA.

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, while all relevant future climate-related environmental conditions in the action area are described in the environmental baseline (Section 2.4), we reiterate some effects of climate change here.

Anticipated climate effects on abundance and distribution of PS Chinook salmon and PS steelhead include a wide variety of climate impacts. The greatest risks will likely occur during incubation, when eggs are vulnerable to high mortality due to increased flooding and variability in seasonal flow (Ward et al. 2015). Crozier et al. (2019) identified early life stages such as incubating eggs as highly sensitive when exposed to more variable hydrologic regimes. Crozier et al (2019) also predicted that 8% of spawning habitat will change from snow-dominated to transitional, and 16% will change from transitional to rain-dominated. These projections suggest that winter flooding will become more common, directly affecting incubating eggs and increasing the risk of high flows scouring out redds. Stream temperature ranks high in the extent of change expected, which could increase pre-spawn mortality in low-elevation tributaries (Cristea and Burges 2010). Rising temperatures during late spring and summer may also impact Chinook salmon juveniles in estuary and riverine habitats. Most Puget Sound estuaries already surpass optimal summer rearing temperatures, and the expectation of additional warming would further degrade already degraded habitat (Crozier et al 2019, Appendix S3). 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.

Several not-for-profit organizations and state agencies are also implementing recovery actions identified in the recovery plans for PS 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 (e.g., riparian planting, instream habitat enhancement, creation of complex channel, fish passage, etc.), the cumulative effects associated with continued development are likely to have ongoing adverse effects on all the listed species populations addressed in this Opinion. 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.

Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action to the environmental baseline and the cumulative effects, taking into account the status of the species and critical habitat, 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.

Species: Each of the ESA-listed species considered in this opinion are threatened, except PS/GB 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 of urban areas of the Puget Sound and highly developed tributary watersheds.

To this status, we add the species' response to project effects. Most of the effects of the proposed action are spatially very constrained (i.e. bank modification, overwater structures) with limited effects on listed species. The exception is the discharge of stormwater effluent. The proposed action's discharge would create a chronic area of exposure for PS Chinook salmon, PS steelhead, PS/GB yelloweye rockfish, PS/GB bocaccio and SRKW. Contaminants in this discharge are likely to produce a range of adverse health effects – both acute and latent, particularly among juvenile rockfish and juvenile salmonids. However, it is important to note that the discharge is of treated stormwater, and reductions in PGIS included as part of the proposed project. For this reason, we expect harm or death associated with the proposed action may occur at a lower rate than at the pre-project level.

PS Chinook salmon are currently listed as threatened with generally negative recent trends in status. Widespread negative trends in natural-origin spawner abundance across the ESU have been observed since 1980. Productivity remains low in most populations, and hatchery-origin spawners are present in high fractions in most populations outside of the Skagit watershed. Although most populations have increased somewhat in abundance since the last status review in 2016, they still have small negative trends over the past 15 years, with productivity remaining low in most populations (Ford 2022). All PS Chinook salmon populations continue to remain well below the TRT planning ranges for recovery escapement levels, and that most populations remain consistently below the spawner-recruit levels identified by the TRT as necessary for recovery.

The most recently completed 5-year review (NWFSC 2015; NMFS 2017b) for Pacific salmon and steelhead noted some signs of modest improvement in PS steelhead productivity since the previous review in 2011, at least for some populations, especially in the Hood Canal and SJDF MPG. However, several populations were still showing dismal productivity, especially those in the Central and South Puget Sound MPG where the action area is located. The 2022 biological viability assessment (Ford 2022) identified a slight improvement in the viability of the PS steelhead DPS since the PS steelhead technical review team concluded that the DPS was at very low viability in 2015, as were all three of its constituent MPGs, and many of its 32 DIPs (Hard et al. 2015). Ford (2022) reported observed increases in spawner abundance in a number of populations over the last five years, which were disproportionately found within the South and Central PS, SJDF and Hood Canal MPGs, and primarily among smaller populations. The viability assessment concluded that recovery efforts in conjunction with improved ocean and climatic conditions have resulted in an increasing viability trend for the PS steelhead DPS, although the extinction risk remains moderate (Ford 2022).

PS/GB bocaccio are listed as endangered and abundance of this species likely remains low. PS/GB yelloweye rockfish are listed as threatened but likely persist at abundance levels somewhat higher than bocaccio. Lack of specific information on rockfish abundance in Puget Sound makes it difficult to generate accurate abundance estimates and productivity trends for these two DPSs. Available data does suggest that total rockfish declined at a rate of 3.1 to 3.8 percent per year from 1977 to 2014 or a 69 to 76 percent total decline over that period. Habitat degradation has limited the carrying capacity of habitat for these species and continued threats inhibit recovery. Other factors, such as overfishing, are more significant threats to PS/GB yelloweye rockfish and bocaccio. While ongoing habitat restoration and advances in best management practices may slow further habitat degradation and reduce direct take, a trajectory for recovery of populations remains uncertain, particularly given anticipated impacts of climate change.

When we evaluate the cumulative effects on these species, we anticipate additional stress added to existing stressors in the baseline in both fresh and marine environments from anthropogenic changes in habitat and increasingly modified conditions related to climate change (e.g. warmer temperatures, and more variable volume and velocities in freshwater, changing temperature, pH, and salinity in marine waters). All of these are likely to exert negative pressure on population abundance and productivity. In this context we add the effects of the proposed action. Even considered over multiple years, with highly variable ocean conditions and climate change stressors, only a small number of fish relative to the affected populations would be killed or injured by the effects that result from the proposed action, so that the reductions in abundance would not rise to create effects on productivity, diversity and spatial structure at discernible levels. Therefore, the proposed action is unlikely to alter the current or future trends for PS Chinook salmon, PS steelhead, PS/GB yelloweye rockfish or PS/GB bocaccio population viability even when cumulative effects and baseline conditions are added to the effects of the proposed action.

In other words, we expect that the total effects of the action on individual fish identified in this opinion would be indiscernible at the population level because, although these species are currently well below historic levels, they are distributed widely enough and are presently at high enough abundance levels that the loss of individual fish resulting from the action would not alter their spatial structure, productivity, or diversity. Therefore, when considered in light of species status and existing risk, baseline effects, and cumulative effects, the proposed action (and those caused by it) itself does not increase risk to the affected populations to a level that would reduce appreciably the likelihood for survival or recovery of PS Chinook salmon, PS steelhead, PS/GB yelloweye rockfish and PS/GB bocaccio.

Critical Habitat: Within the action area, critical habitat is designated for PS Chinook salmon, PS steelhead, PS/GB bocaccio and PS/GB yelloweye rockfish. Throughout the designated area, multiple features of habitat are degraded, but despite such degradation, many accessible areas remain ranked with high conservation value because of the important life history role it plays.

For PS Chinook salmon and steelhead, limiting factors (impaired or insufficient PBFs) include; riparian areas and large woody debris, fine sediment in spawning gravel, water quality, fish passage and estuary conditions. Loss of freshwater and nearshore critical habitat quality is a limiting factor for both species. Current state and local regulations do not prevent much of the development that degrades the quality of nearshore critical habitats. There is no indication these regulations are reasonably certain to change in the foreseeable future.

Critical habitat for PS/GB bocaccio and yelloweye rockfish in the Puget Sound includes hundreds of square miles of deep-water and nearshore areas. Habitat has been degraded by, and continues to be threatened by, water pollution and runoff, nearshore development and in-water construction, dredging and disposal of dredged material, climate-induced changes to habitat and population dynamics, degradation of rocky habitat, loss of eelgrass and kelp, and the introduction of non-native species that modify habitat.

To this degraded baseline we add the habitat effects we expect to be caused by the action. Because the action area includes critical habitat for PS Chinook salmon, PS steelhead, PS/GB yelloweye rockfish and PS/GB, we anticipate effects of the proposed project to degrade critical habitat for these species. As described above and in the 2013 BE and 2023 BE Addendum, the proposed action would cause long-term low-level adverse effects on water quality.

Given the rate of expected population growth in the Puget Sound area, cumulative effects are expected to result in mostly negative impacts on critical habitat quality for PS Chinook salmon, PS steelhead, HCSRC, PS/GB yelloweye rockfish and PS/GB bocaccio. While habitat restoration and advances in best management practices for activities that affect critical habitat could lead to some improvement of PBFs, adverse impacts created by the intense demand for future development is likely to outpace any improvements.

Based on the best available information, the scale of the proposed action’s effects, when considered in combination with the degraded baseline, cumulative effects, and the effects of climate change, habitat degradation would reduce the potential for the habitat in the action area to support recovery, but the proposed project effects themselves would be too small to attribute to that reduction. Despite adverse effects to features of critical habitat, the conservation value of the critical habitat for PS Chinook salmon, PS steelhead, PS/GB yelloweye rockfish and PS/GB bocaccio is largely retained. Therefore, the overall effect of the project on critical habitat, while adverse and chronic, cannot be considered to be of sufficient intensity to reduce the conservation potential of critical habitat in the action area.

Conclusion

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

INCIDENTAL TAKE STATEMENT

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

Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as *harm of adult and juvenile PS Chinook salmon, PS steelhead, PS/GB bocaccio and PS/GB yelloweye rockfish from exposure to water quality degradation by stormwater contaminants*.

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

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

The surrogate for take in the form of harm from long-term water quality degradation effects from stormwater discharge is the approximately 2,525 acres of impervious surfaces at JBLM contributing stormwater to the Puget Sound and tributaries. This metric describes the total area of impervious surface in the MS4 owned and operated by JBLM from which precipitation-related runoff is drained and discharged as stormwater runoff to the Puget Sound and tributaries. This is the best available surrogate for the extent of take from exposure to stormwater because they are causal, as the size of the area that contributes stormwater increases, the volume of stormwater and associated contaminants increases.

The effects of stormwater are directly tied to contaminants in the stormwater discharge, either through direct, untreated discharge from PGIS, or through discharge of stormwater from PGIS after treatment. We assume no increase in effects to species or critical habitat associated with stormwater that is treated through 100% infiltration. Triggers for the reinitiation of this Opinion include:

- Any increase in PGIS area contributing untreated stormwater runoff; or
- A net increase of more than 75 acres of treated PGIS that is not treated through 100% infiltration.

These activities are appropriate reinitiation triggers because the EPA has authority to conduct compliance inspections and to take actions to address non-compliance. The total area of PGIS currently within the JBLM MS4 area will be verified in the first annual report, as required by term and condition number 2, below, and any changes to total PGIS will be compared to that value.

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.

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 EPA shall:

1. Minimize incidental take of ESA-listed species associated with the effects of the proposed action (stormwater discharge); and
2. Ensure completion of reporting of incidental take.

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 terms and conditions implement reasonable and prudent measure 1: The EPA shall provide to NMFS (projectreports.wcr@noaa.gov and jeff.vanderpham@noaa.gov; use subject line "Attn: WCRO-2023-00605"):
   a. Within 180 days of the permit effective date, the water quality monitoring plan to measure the effectiveness of permit stormwater management plan (SWMP) control measures to minimize impacts from MS4 discharges on receiving waters.

The plan shall include monitoring of 6PPD-q, including after first flush events, at representative discharge locations in Clover Creek and the JBLM Canal; and

b. Annually, as part of the annual report, the stormwater retrofit plan and the stormwater monitoring report. The stormwater retrofit plan shall target retrofits in part based on monitoring data and include, at a minimum, the retrofit of treatment of 10 acres of PGIS that discharges stormwater into Clover Creek and 10 acres of PGIS that discharges into the JBLM Canal, over the permit term.
c. Over the permit term, implement at a minimum, the retrofit of stormwater treatment described above (1.b.) – 10 acres of PGIS that discharges to Clover Creek and 10 acres of PGIS that discharges to the JBLM Canal.

2. The following term and condition implement reasonable and prudent measure 2: The EPA shall provide to NMFS (projectreports.wcr@noaa.gov and jeff.vanderpham@noaa.gov; use subject line "Attn: WCRO-23-00605") as part of the first annual report the total area of pollutant generating impervious surface (PGIS) within the JBLM military installation covered under the MS4 NPDES permit (proposed action) which contributes stormwater to the Puget Sound and tributaries. The total area of PGIS shall be reported in subsequent annual reports.

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). We have the following conservation recommendations:

1. Develop and implement a management plan for stormwater treatment at JBLM, which actively pursues and applies upgrades to stormwater treatment and discharge methods with future developments in stormwater science and best management practices; and
2. Work with JBLM and local jurisdictions to increase green infrastructure and apply 100% stormwater runoff infiltration in contributing basins to reduce contaminants coming off roads and other PGIS.

Not Likely to Adversely Affect Determinations

When evaluating whether the proposed action is not likely to adversely affect listed species or critical habitat, NMFS considers whether the effects are expected to be completely beneficial, insignificant, or discountable. Completely beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Effects are considered discountable if they are extremely unlikely to occur. When effects are beneficial, insignificant and/or discountable, these species are not likely to be adversely affected by the proposed action and we present our justification for that determination separately from the biological opinion since no take, jeopardy, or adverse modification of critical habitat would reasonably be expected to occur.

We concur with the Corps' NLAA determinations for Southern Resident killer whale (SRKW) and their designated critical habitat, both of which occur within the action area. We adopt by reference Sections 5 and 7 of the 2013 BE and Sections 5 and 6 of the 2023 BE Addendum for the description of effects on SRKW and their designated critical habitat, and summarize and supplement this information with the following.

SRKW was listed as endangered on November 18, 2005 (70 FR69903) and critical habitat was designated on November 29, 2006 (71 FR 69054) and expanded on August 2, 2021 (86 FR 41668). A 5-year review under the ESA completed in 2021 concluded that SRKWs should remain listed as endangered and includes recent information on the population, threats, and new research results and publications (NMFS 2021). At the time of the 5-year review, in 2021 there were 73 whales in the population.

Critical habitat is designated within the marine portions of the action area with depths of at least 20 feet. PBFs for SRKW are:

- Water quality to support growth and development;
- Prey species of sufficient quantity, quality, and availability to support individual growth, reproduction, and development, as well as overall population growth; and
- Passage conditions to allow for migration, resting, and foraging.

We expect the proposed action to result in degraded water quality and a slight reduction in prey (e.g. Chinook salmon). Water quality degradation by stormwater contaminants is expected to be long-term effect of the proposed action. However, with the stormwater treatment currently implemented at JBLM contaminant loads are anticipated to be below levels that could affect the growth and development of SRKW, as described in the 2013 BE and 2023 BE Addendum. Therefore, would have an insignificant effect on the water quality PBF of SRKW critical habitat.

Stormwater contaminants are expected to annually injure or kill a low number of individual adult and juvenile Chinook salmon (primary prey). However, their numbers and levels of contamination would be too small to cause detectable effects on prey availability, or to create any detectable trophic link between action-related contaminants and SRKW, as described in the 2013 BA and 2023 BA Addendum. Therefore, it would an insignificant reduction in prey availability and quality.

Direct exposure to stormwater is expected to be insignificant for SRKW because the contaminants will be dilute upon reaching Puget Sound, and the limited presence of SRKW in the action area is unlikely to create prolonged or intense exposure, as described in the 2013 BE and 2023 BE Addendum. We expect individuals to occur infrequently in the southern Puget Sound, which includes the action area, and to only remain in the action area for a short duration of time (e.g. see Hanson et al. 2017). Exposure to reduction in prey availability is also expected to be insignificant because the likelihood that the small number of juveniles, the age-class with the greatest potential to be affected by stormwater contaminants, that would grow to adulthood and be available as SRKW forage is exceedingly low. Further, the proposed action would annually affect too few individuals to cause detectable population-level effects on the affected

Chinook salmon populations. Therefore, any project related reduction in Chinook salmon availability for SRKW would be undetectable. Therefore, the action's effects on SR killer whales is expected to be insignificant.

Reinitiation of Consultation

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

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

NMFS also reviewed the proposed action for potential effects on essential fish habitat (EFH) designated under the Magnuson-Stevens Fishery Conservation and Management Act (MSA), including conservation measures and any determination you made regarding the potential effects of the action. This review was conducted pursuant to section 305(b) of the MSA, implementing regulations at 50 CFR 600.920, and agency guidance for use of the ESA consultation process to complete EFH consultation. We adopt by reference sections 5 and 6 of the 2013 BE and the 2023 BE Addendum. We summarize and supplement this information with the following.

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. Effects on EFH include water quality degradation by the discharge of stormwater effluent from the treatment facility.

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 associated contaminants in stormwater discharge.

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 a management plan for stormwater treatment at JBLM, which actively pursues and applies upgrades to stormwater treatment and discharge methods with future developments in stormwater science and best management practices; and

2. Work with JBLM and local jurisdictions to increase green infrastructure and apply 100% stormwater runoff infiltration in contributing basins to reduce contaminants coming off roads and other PGIS.

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

This letter underwent pre-dissemination review using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (section 515 of the Treasury and General Government Appropriations Act for Fiscal Year 2001, Public Law 106-554). The biological opinion will be available through NOAA Institutional Repository. A complete record of this consultation is on file at the Lacey, Washington office.

Please contact Dr. Jeff Vanderpham (jeff.vanderpham@noaa.gov) at the Lacey, Washington office if you have any questions concerning this consultation, or if you require additional information

Sincerely,

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