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

Refer to NMFS No:
WCRO-2023-00128

May 7, 2024

Calvin J. Terada
Director
United States Environmental Protection Agency, Region 10
1200 Sixth Avenue, Suite 155
Seattle, Washington 98101-3123

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the Wyckoff/Eagle Harbor Superfund Site, Perimeter Wall Replacement, Kitsap County, Washington (6th Field HUC 171100190404).

Dear Mr. Terada:

Thank you for your letter of February 8, 2023, requesting initiation of consultation with NOAA's National Marine Fisheries Service (NMFS) pursuant to section 7 of the Endangered Species Act of 1973 (ESA) (16 U.S.C. 1531 et seq.) for the Wyckoff/Eagle Harbor Superfund Site, Perimeter Wall Replacement. In this opinion, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of Puget Sound (PS) Chinook salmon, PS steelhead, Puget Sound/Georgia Basin (PS/GB) bocaccio, PS/GB yelloweye rockfish, and Southern Resident (SR) killer whale. The project is also not likely to result in the destruction or adverse modification of critical habitat designation for PS Chinook salmon, PS steelhead, PS/GB bocaccio, PS/GB yelloweye rockfish and SR killer whale.

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

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

Please contact Tyler Yasenak of the Oregon/Washington Coastal Area Office at (206) 207-0092, or by email at tyler.yasenak@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: J. Bernadette Wright, Environmental Protection Agency

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

Wyckoff/Eagle Harbor Superfund Site, Perimeter Wall Replacement

NMFS Consultation Number: WCRO-2023-00128

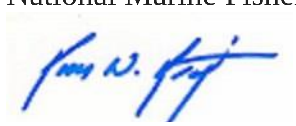
Action Agency: U.S. Environmental Protection Agency

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?
PS Chinook salmon (*Oncorhynchus tshawytscha*)	Threatened	Yes	No	Yes	No
PS steelhead (*O. mykiss*)	Threatened	Yes	No	N/A	N/A
PS/GB bocaccio (*Sebastes paucispinis*)	Endangered	Yes	No	Yes	No
PS/GB yelloweye rockfish (*S. ruberrimus*)	Threatened	No	No	No	No
SR killer whale (*Ocinus orca*)	Endangered	No	No	No	No

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: May 7, 2024

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1. INTRODUCTION

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

1.1. Background

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

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

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

1.2. Consultation History

The U.S. Environmental Protection Agency (EPA) requested informal consultation on February 8, 2023. On June 8, 2023, NMFS notified EPA that the effects of the proposed action would be more than insignificant to ESA-listed species and critical habitat and that the consultation would need to be formal. On August, 29 2023 EPA responded to NMFS with a revised BA. On August 30, 2023, NMFS initiated formal consultation. This biological opinion is based on the information provided in the April 28, 2023, biological assessment (BA) and supporting documents. A complete record of this consultation is on file at the Oregon Washington Coastal Office located in Lacy, Washington.

The EPA concluded that the proposed action is not likely to adversely affect (NLAA) PS Chinook salmon (*Oncorhynchus tshawytscha*), PS steelhead (*O. mykiss*), PS/GB Bocaccio (*Sebastes paucispinis*), PS/GB yelloweye rockfish (*S. ruberrimus*) and SR killer whales (*Ocinus orca*) and their critical habitats. However, due to perpetuation of the effects of the extended life of the sea wall, NMFS has concluded that the proposed action is likely to adversely affect (LAA) PS Chinook salmon, PS steelhead, and PS/GB bocaccio, and critical habitat for PS Chinook salmon and PS/GB bocaccio.

NMFS also reviewed the likely effects of the proposed action on EFH, and concluded that the action would adversely affect the EFH of Pacific Coast salmon, Pacific Coast groundfish and coastal pelagic species.

Updates to the regulations governing interagency consultation (50 CFR part 402) were effective on May 6, 2024 (89 Fed. Reg. 24268). We are applying the updated regulations to this consultation. The 2024 regulatory changes, like those from 2019, were intended to improve and clarify the consultation process, and, with one exception from 2024 (offsetting reasonable and prudent measures), were not intended to result in changes to the Services' existing practice in implementing section 7(a)(2) of the Act. 89 Fed. Reg. at 24268; 84 Fed. Reg. at 45015. We have considered the prior rules and affirm that the substantive analysis and conclusions articulated in this biological opinion and incidental take statement would not have been any different under the 2019 regulations or pre-2019 regulations.

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

The intent of this project is to construct a new seawall landward of the existing perimeter sheet pile seawall to protect humans, fishes, and other organisms from direct exposure to polycyclic aromatic hydrocarbons (PAHs) and creosote. The entire project would be constructed from the upland, apart from the last step which entails cutting off the existing sheet pile wall at the mudline on the beach in the dry (during low tide). A corrosion evaluation was completed in 2013 to determine the condition of the existing steel sheet pile seawall, and results of the evaluation determined that the splash zone of the existing wall is failing (Figure 1). Contaminants are actively seeping into the nearshore environment through pinhole failures in the sheet pile seawall and catastrophic failure of the wall is a risk that would potentially result in mobile non-aqueous phase liquid (NAPL) and contaminated soil being released into the nearshore environment. It is critical to replace the existing seawall to prevent recontamination of intertidal and subtidal environments.

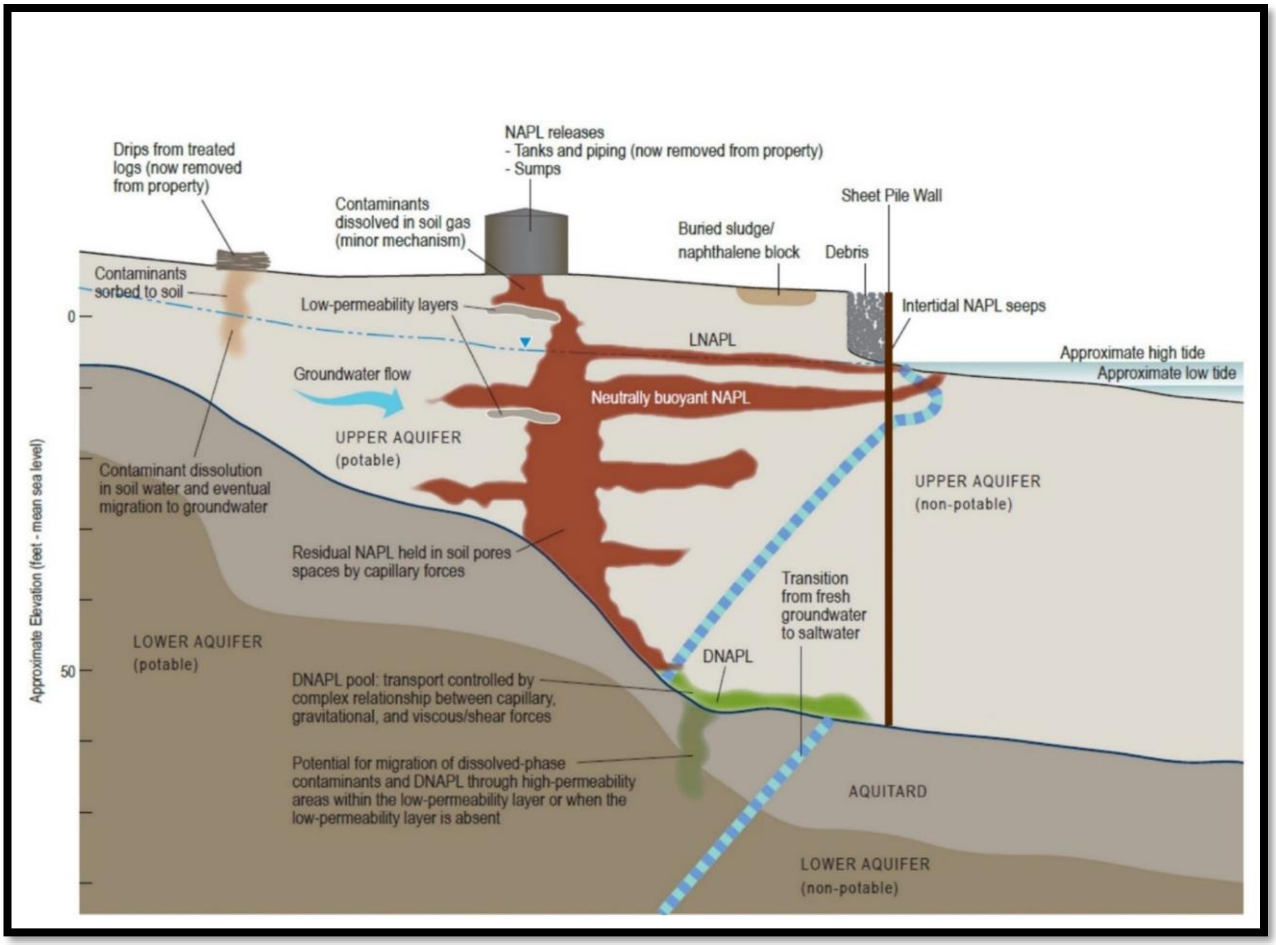

Figure 1. Migration of contaminants through existing sea wall.

The new seawall would have multiple components (Figure 2). In the uplands a cutterhead soil mix (CSM) wall would be installed in between new soldier piles to create a low permeability barrier. The upland soils surrounding the CSM wall would be strengthened *in situ* by mixing cement and other amendments with existing soil. The CSM wall would be protected by a concrete armor wall constructed immediately landward of the existing sheet pile wall.

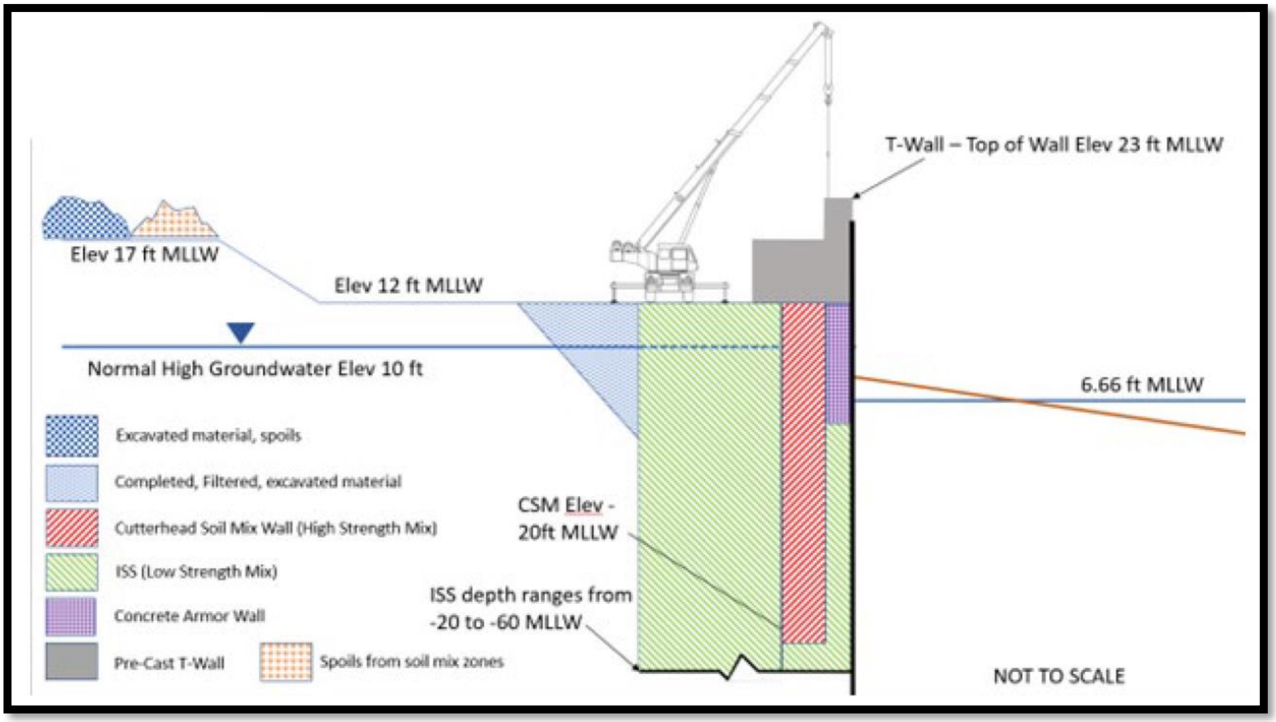

Figure 2. Profile view of components of the proposed sea wall.

The proposed action would be implemented in three parts: 1) site preparation consisting of upland debris removal and ground improvements, 2) construction of approximately 1,376 linear feet of new seawall with a CSM and concrete armor wall landward of the existing seawall, and 3) site restoration including removal of the old steel sheet pile seawall. In part one, subsurface debris would be removed via excavation and screening and removal of coarse material (greater than 3-inch), and an upland construction platform would be created. In part two, *in situ* soil solidification/stabilization (ISS) would improve wall stability and reduce loads on the CSM wall and would treat non-aqueous phase liquids in the uplands. The CSM element would be reinforced with 33-inch H piles every seven feet along its length (approximately 196 total piles). The planned installation method for these H-piles is static pushing into the wet CSM material. Static push should be sufficient since any blocking material would have been removed prior to pile installation (through excavation, filtering sediments and the use of the cutterhead) and since the receiving CSM material would be unconsolidated. Despite the extremely low likelihood that static push would not be sufficient, a vibratory driver would be on hand to drive these piles to the intended depth. However, the vibratory hammer would be used as a last resort, since the vibration poses a risk of damaging newly installed wall adjacent to the pile driving activity. Furthermore, vibratory pile driving would only be conducted at a tide low enough that water is not in contact with the sea wall (e.g. +5 ft MLLW or lower) to avoid sound inputs into marine waters. Phased construction of the CSM and concrete armor would serve to protect the marine environment from release of contaminants from the Wyckoff/Eagle Harbor Superfund Site. In part three, the existing perimeter sheet pile seawall would be removed by cutting off the wall at the mudline. This work would be restricted to the in-water work window of 2 July through 15 January. The work would include recovery and temporary removal of eroded riprap that protects the East Beach tie-in. Upon completion of the sheet pile removal, the riprap would be replaced in its original location. This third part may disturb 2.25 acres of in-water sediments. Water quality monitoring will be conducted at 150 ft from disturbance.

If necessary, small temporary cofferdams may be used to allow a longer working period between tide cycles. If used, they would only be deployed on falling tides and would be temporary in nature (e.g. supersacks). They would be managed to ensure that fish handling would be conducted in accordance with U.S. Fish and Wildlife Service guidelines (USFWS 2012). The deployment of cofferdam is expected to be deployed such that no greater than 138 feet of sea wall would be isolated and isolation will be limited to the in-water work window.

The perimeter of the project area is divided into three sections: East Beach, North Shoal, and West Beach. The proposed project would replace the perimeter sheet pile seawall along the entirety of East Beach and North Shoal, and along the northern portion of West Beach. Along the southern portion of West Beach, the existing seawall would remain in place during as this section is in relatively good condition. Replacement of the remaining sheet pile seawall on West Beach would be part of a future design and construction phase.

This proposed project is the first of four scheduled phases. The description of future phases are as follows:

- Phase 2 (Wellfield Realignment and Thermal Pilot Test Demolition) of remedial action involves decommissioning existing onsite wells and installation of new wells to support the maintenance of the containment remedy during upland construction, referred to as the wellfield realignment design. Phase 2 also includes demolition of previous thermal pilot test infrastructure.
- Phase 3 (Upland Remedy) of the remedial action consists of the remainder of the upland remedy as described in the 2019 RODA (EPA 2019). This phase would include upland debris removal, installation of an underground slurry cutoff wall along the south side of the former process area (FPA), treating NAPL-contaminated soil and groundwater through ISS, installing a low permeability cap and cover over the FPA, and constructing a new outfall pipe. Passive discharge drains would be used to manage groundwater with treatment if necessary, and institutional controls would be implemented to prevent human exposure to contamination remaining below the cap.
- Phase 4 (Intertidal Beach Remedy) of the remedial action consists of the intertidal beach remedy as described in the 2018 RODA (EPA 2018). This phase would include dredging areas with a multilayer cap, which would restore the dredged areas to grade. Monitoring post remedy would be conducted to confirm remediated areas remain clean and that natural recovery is effective in areas outside the active cleanup footprint. Institutional controls would be implemented to prohibit activities that could disturb remediated areas.

Upon development of additional information regarding Phases 2-4, EPA would initiate consultation with NMFS to ensure adequate protection of endangered and/or threatened species affected by the additional Phases of construction.

Access to the site for mobilizing and demobilizing construction equipment is expected to occur from Eagle Harbor Drive NE via the improved access road (Creosote Place NE). The contractor may also use barges form mobilizing and demobilizing construction materials to the site. Barge access has been utilized in the past from the northeast corner of the site and barge traffic is not expected to exceed 5 trips over the course of the project. Barges would not be allowed to ground on the beach, which means barge access is only possible during high tides. It is expected that no more than 5 trips by barge would be made over the course of the project.

Best Management Practices (BMPs):

- All equipment and vehicles would be required to be kept in good operating condition to minimize exhaust emissions.
- To minimize vehicle emissions, engines should not idle for longer than five minutes.
- To reduce fugitive dust during construction and during daily operations and maintenance of the proposed project, standard practices such as soil watering, covering storage piles when not in use, limiting dusty work on windy days or time of day would be used.
- Vehicles and equipment leaving the exclusion zone at the site would be decontaminated prior to exiting. Two decontamination areas would be available on the east and west sides of the exclusion zone. Wash water would be treated at the existing treatment plant.
- Equipment used for this project would be free of external petroleum-based products while used below the high tide line (HTL). Accumulation of soils, vegetation or debris would be removed from the drive mechanism (wheels, tires, racks, etc.) and the undercarriage of equipment prior to use on site.
- Equipment mobilized on the beach should be the lightest and smallest construction equipment possible for the work to avoid compaction of the beach.
- Drive trains of vehicles and equipment shall not operate in the water.
- All work would be performed in the dry. Temporary supersack cofferdams may be used to extend the daily work window as a contingency measure. If temporary cofferdams such as supersacks are used during the project, any resulting fish handling would be conducted in accordance with USFWS guidelines (USFWS 2012). The deployment of cofferdam would be limited to isolating 138 linear feet of sea wall.
- The Contractor shall submit a water quality monitoring plan that describes visual and instrumented monitoring during sheetpile cutting, barge use, and coffer dam installation and removal. Water quality monitoring results would ensure compliance with applicable state water quality standards at the appropriate points of compliance. Mitigation measures for exceedances to water quality standards shall be described. EPA and USACE will not approve any plan that does not meet the 150 ft monitoring requirement.
- All vehicles and equipment would be inspected daily for fluid leaks before the onset of operations. Any leaks detected shall be repaired in the vehicle staging area, if possible, and before the vehicle resumes operation. Inspections shall be documented in a record that is available for review upon request by EPA, Ecology, or USACE.
- Fuel hoses, oil drums, oil or fuel transfer valves and fittings, etc., shall be checked regularly for drips or leaks, and shall be maintained and stored properly to prevent spills. Any discharge of oil, fuel, or chemicals into Puget Sound, or onto lands with a potential for entry into said waters is prohibited.

- A spill prevention and containment plan would be developed and implemented for this project. The contractor would be required to have an absorbent containment boom on site for deployment should sheening be observed.
- A stormwater management plan would be developed and implemented for this project. The contractor would be required to ensure all discharges comply with applicable water quality standards.
- Adequate and appropriate spill response and cleanup materials would be available on site to respond to any release of petroleum products or any other material into waters of the state.
- Materials transported on barges shall be covered and/or secured to ensure no material blow into the water. It is expected that no more than 5 trips by barge would be made over the course of the project.
- Garbage, plastic, and any other anthropogenic debris encountered during construction shall immediately be removed, stored, and ultimately disposed in an appropriate designated upland facility.

Conservation Measures:

Avoidance/Minimization of Short-Term Effects

- Construction on the beach (i.e., sheet pile wall cutting) would occur during the in-water work window of July 16 through October 14 to avoid peak periods of salmonid abundance. Beach work would be timed to be completed during low tides, in the dry, to minimize the potential for disturbance to fish.
- A Water Quality Monitoring Plan (WQMP) (including visual and instrumented monitoring) would be developed and implemented for in-water work. Water quality monitoring results would ensure compliance with applicable state water quality standards at the appropriate points of compliance and inform the implementation of additional BMPs as needed (per EPA's Clean Water Act ARAR Substantive Compliance Memo). The plan would focus on sheet pile wall access and active cutting, and the barge access location as needed.
- Barges shall not ground out during in-water construction, staging or storage.
- Anchors and/or spuds shall not be deployed in eelgrass, kelp, or forage fish spawning areas. The beach underlying the barge access area would be monitored to ensure barge/transport activities are not adversely affecting the beach or eelgrass. Any damage to the beach (e.g., holes) would be repaired to ensure they do not trap fish or cause erosion on the beach.
- Any vessel operations that could damage eelgrass, kelp, or forage fish spawning areas (e.g., prop wash) would be managed to avoid impacts to these areas.
- On falling tides, supersacks, if used would be managed to ensure that fish are not trapped in beach depressions/voids or behind these features.
- Equipment access/transit and construction activities would avoid impacts to eelgrass and would keep as close to the existing sheet pile wall as possible. The upper intertidal elevation for eelgrass presence on site would be staked for avoidance at the onset of wall cutting. The stakes would be maintained in active access/transit and construction areas to ensure eelgrass is avoided.

- The EPA would require that all prudent and necessary steps would be taken to assure that no petroleum products, chemicals, or toxic materials would enter the water from construction equipment.
- The EPA would require that the contractor have sorbent materials including a floating contaminant boom at the construction site, ready to deploy quickly if the construction results in a visible sheen on the surface of the water.

Avoidance/Minimization of Long-Term Effects

- The contractor shall be prepared to identify barge access methods and location(s) during the pre-construction meeting, as well as plans specific to their equipment and schedule that would minimize barge impacts to beach and intertidal areas during loading and unloading of heavy equipment, supplies, debris, etc. Barges shall not run aground, and no stockpiling of equipment and materials may occur below the HTL.
- To protect adjacent coastal waters and their designated uses from potential discharges of oils and grease, the contractor shall identify all equipment staging, cleaning, maintenance, refueling, and fuel storage areas. These activities shall take place within specific location(s). Fuel hoses, oil drums, oil or transfer valves and fittings, etc., shall be checked regularly for drips and leaks, and shall be maintained and stored properly to prevent spills into state waters.
- Low weight/soft tracked equipment would be used to prevent compaction of the beach during wall cutting activities.

"Be Whale Wise" Guidance

- Be Cautious and Courteous: approach areas of known or suspected marine wildlife activity with extreme caution. Look in all directions before planning approach or departure.
- Slow Down: reduce speed to less than 7 knots when within 1,000 m, or a half mile, of the nearest whale. Avoid abrupt course changes.
- Keep clear of the whales' path. If whales are approaching, cautiously move out of the way.
- Do not approach whales from the front or from behind. Always approach and depart whales from the side, moving in a direction parallel to the direction of the whales.
- Do not approach or position your vessel closer than 100m/yards to any whale.
- Disengage engines if whales appear within 300 m/yards and allow whale(s) to pass.
- Stay on the offshore side of the whales when they are traveling close to shore.
- Do not swim with, touch, or feed marine wildlife.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not.

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 this project includes the upland area north of Eagle Harbor Drive NE, and aquatic area which include the 45 feet construction limit on the beach and 150 feet waterward where turbidity may be elevated (Figure 3). The project area is within the action area and is the immediate location of the proposed construction (including access and staging areas within the site).

Figure 3. Satellite image of Eagle Harbor showing the Action Area at the Wyckoff Facility.

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 EPA determined, and NMFS concurs, the proposed action is not likely to adversely affect PS/GB Basin yelloweye rockfish and SR killer whale. Our concurrence is documented in the "Not Likely to Adversely Affect" Determinations section (Section 2.11).

2.1. Analytical Approach

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

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

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

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

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their critical habitat using an exposure–response approach.
- Evaluate cumulative effects.

- In the integration and synthesis, add the effects of the action and cumulative effects to the environmental baseline, and, in light of the status of the species and critical habitat, analyze whether the proposed action is likely to: (1) directly or indirectly reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species; or (2) directly or indirectly result in an alteration that appreciably diminishes the value of critical habitat as a whole for the conservation of a listed species.
- If necessary, suggest a reasonable and prudent alternative to the proposed action.

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 ℃ higher than the 1850-1900 baseline period, with larger increases over land ~1.6 ℃ 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 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 project 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 Representative Concentration Pathways 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. mykis*). 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, Meyers 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 and 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 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 streams 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 at. (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 effect 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 toxins (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-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 evolutionarily significant units (ESUs) or distinct population segments (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, Burk 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 the 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 salmon 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 et al. 2014) and Atlantic salmon (Olmose 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 changed 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 reduction 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), through the low levels of remaining diversity present challenges to this effort (Freshwater et al. 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 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). Critical habitat is not designated for PS steelhead in marine waters or for nearshore marine waters adjacent to this action for PS/GB yelloweye rockfish.

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 values 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 serving another important role.

A summary of the status of critical habitats, considered in this opinion, is provided in Table 1.

Table 1. Critical habitat, designation date, federal register citation and status summary for critical habitat.

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 stream miles, 41 square mile of lakes, and 2,182 miles of nearshore marine habitat in Puget Sound. The Puget Sound Chinook salmon ESU has 61 freshwater and 19 marine areas within its range. Of the freshwater watersheds, 41 are rated as high conservation value, 12 low conservation value, and 8 received a medium rating. Of the marine areas, all 19 are ranked with high conservation value.
Puget Sound/Georgia Basin DPS bocaccio	11/13/14 79 FR 68042	Critical habitat for bocaccio includes 590.4 square miles of nearshore 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.

2.2.2. Status of the Species

Table 2 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, ESU, Multiple Population Grouping (MPG), Northwest Fisheries Science Center (NWFSC), and Technical Recovery Team (TRT).

Table 2. 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	Shared Strategy for Puget Sound 2007 NMFS, 2006	NWFSC 2015; Ford 2022	This ESU comprises 22 populations distributed over 5 geographic areas. Most populations within the ESU have declined in abundance over the past 7 to 10 years, with widespread negative trends in natural-origin spawner abundance, and hatchery-origin spawners present in high fractions in most populations outside of the Skagit watershed. Escapement levels for all populations remain well below the TRT planning range for recovery, and most populations are consistently below the spawner-recruit levels identified by the TRT as consistent with recovery.	• 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	NWFSC 2015: Ford 2022	This DPS comprises 32 populations. The DPS is currently at very low viability, with most of the 32 populations and all three population groups at low viability. Information considered during the most recent status review indicates that the biological risks faced by the Puget Sound steelhead DPS have not substantively changed since the listing in 2007, or since the 2011 status review. Furthermore, the Puget Sound steelhead TRT recently affirmed that the DPS was at very low viability, as were all three of its constituent MPGs, and many of its 32 populations. In the near term, the outlook for environmental conditions affecting Puget Sound steelhead is not optimistic. While harvest and hatchery production of steelhead in Puget Sound are currently at low levels and are not likely to increase substantially in the foreseeable future, some recent environmental trends not favorable to Puget Sound steelhead survival and production are expected to continue.	• Continued destruction and modification of habitat • Widespread declines in adult abundance despite significant reduction 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

Table 2. Continued

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 2017	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 change to rockfish habitat • Small population dynamics

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 impacts to listed species or designated critical habitat from federal agency activities or existing federal agency facilities that are not within the agency’s discretion to modify are part of the environmental baseline (50 CFR 402.02).

The Wyckoff facility is in Eagle Harbor, on the southeastern portion of Bainbridge Island, which is approximately 2.2 miles long and 0.35 miles wide. Three year-round streams and six seasonal streams discharge into Eagle Harbor, none of which support ESA-listed salmonid species. Eagle harbor has significant vessel traffic, which includes the Bainbridge Island Ferry, public moorage and three commercial marinas. In addition to the Category 5 water quality listings (impaired for PAHs and polychlorinated biphenyls (PCBs)) (Ecology 2021), a seafood consumption advisory has been in place at Eagle Harbor since the early 1980s. Recreational shellfish harvesting is not advised and commercial harvest of shellfish is prohibited – partly because of chemical contamination from the Wyckoff facility, and also because of a nearby municipal sewage outfall operated by the City of Bainbridge Island (DOH 2009).

Portions of the intertidal beaches have not met the cleanup levels specified in the 1994 Record of Decision (ROD) (EPA 1994), despite more than 20 years of natural recovery following source control through installation of the perimeter sheet pile wall. EPA implemented a West Beach mitigation project to remove the existing bulkheads, excavated and disposed of old fill materials placed during the historic development of the property, and created shallow subtidal and intertidal habitat (USACE 2000) to offset the adverse effects of containment and remediation activities at the site. The existing perimeter wall is corroding rapidly and is at risk of structural failure; it must be replaced to prevent further contamination of the beaches. The sheet pile wall was constructed between November 2000 and February 2001. The 1,870-foot-long cantilever wall was constructed by driving steel sheet piling through marine sediments and 4-5 ft into the underlying glacial till aquitard. Migration of NAPL through the wall was first observed in 2018 (EPA 2018 and CH2M 2019).

The nearest natal stream for natal Chinook salmon and steelhead is more than 7 miles east in the Duwamish River. The distinct stocks of winter steelhead are identified in Salmonscape (WDFW 2024): Case/Carr Inlet steelhead and East Kitsap steelhead. Distribution of East Kitsap winter steelhead is identified as including runs from Olalla, Cresent, Curley, Gorst, Blackjack, Ross, Barker, Clear, Chico, Scandia, Dogfish, and Grover’s creeks. None of these creeks are near the facility.

2.4. 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 but that are not part of the 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 402.02).

The likely temporary effects on features of habitat associated with construction are:

- Disturbance of bottom sediments which can cause
  - Water quality impacts;
  - Disturbance of benthic communities;
  - Degradation to forage fish; and
  - Propeller wash.

The likely enduring effects on features of habitat associated with in water structures are:

- Persistent shoreline armoring which can cause
  - Migration pathways obstruction;
  - Reductions in aquatic vegetation/cover; and
  - Diminished benthic communities/forage
  - Reduced contaminants in water, sediment, and prey.

Within the category temporary effects, ephemeral effects are those that are likely to last for hours or days, short-term effects would likely last for weeks; long-term effects are likely to last for months, years or decades.

2.4.1 Effects on Critical Habitat

This assessment considers the intensity of expected effects in terms of the change they would cause in affected Primary Biological Features (PBFs) from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect.

Nearshore or marine critical habitat for PS steelhead are not designated in the action area.

As mentioned in Section 2.2, nearshore marine critical habitat for PS Chinook salmon and PS/GB bocaccio occurs within the action area.

The PBFs for PS Chinook salmon within the action area are as follows (PBFs 1, 2, 3 and 6 are not present in the action area and are not discussed in this document):

4. Estuarine areas free of obstruction and water quality, water quantity, and salinity conditions supporting juvenile and adult physiological transitions between fresh-and saltwater; natural cover such as submerged and overhanging large wood, aquatic

vegetation, large rocks and boulders, and side channels; and juvenile and adult forage, including aquatic invertebrates and fishes, supporting growth and maturation.

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

The PBFs for PS/GB bocaccio within the action area are as follows:

1. Quantity, quality, and availability of prey species to support individual growth, survival, reproduction, and feeding opportunities.
2. Water quality and sufficient levels of dissolved oxygen to support, survival reproduction, and feeding opportunities.

As outlined above, effects to habitat features include temporary diminishment of benthic communities and forage fish (i.e., prey abundance and diversity), migratory obstruction and required energy expenditure, and potential temporary and permanent increase in predators and predation upon juvenile salmonids. Timing, duration, and intensity of the effects on critical habitat are considered in the adverse modification analysis.

NMFS reviews the effects on critical habitat affected by the proposed action by examining changes to the condition and trends of PBFs identified as essential to the conservation of the listed species.

The action area contains the estuarine and nearshore marine PBFs (PBFs 4 and 5) of PS Chinook salmon critical habitat. Specifically, PBFs of estuarine and nearshore habitat including complexity, absence of artificial obstructions, natural cover, adequate water, and high water-quality. The nearshore environment supports various life stages of PS Chinook salmon including growing, and sexually maturing adults, migrating spawners, and rearing and growing juveniles. The proposed project would adversely affect water quality, including forage and aquatic vegetation.

The action area for the proposed action contain nearshore critical habitat for PS/GB bocaccio Critical habitat features for PS/GB bocaccio differ between adults and juveniles as each life history stage has different location and habitat needs. The proposed action would adversely affect nearshore bocaccio critical habitat designated specifically for juveniles, but is unlikely to adversely affect deepwater critical habitat.

<u>Temporary effects on features of habitat associated with construction</u>

Water quality impacts
Sheet pile removal and excavation, spudding of barges, and propeller wash are likely to cause short-term and localized degradation in water quality by disturbing sediment. Low weight/soft tracked equipment would be used to prevent compaction of the beach during wall cutting. However, the equipment operating on the beach may disturbed beach sediment resulting in turbidity and total suspended solids within the water column by tidal action or precipitation. We

anticipate multiple days of benthic disturbance for the sheet pile demolition work that may create a small, temporary turbidity plume that would include contaminated sediments. While work is intended to occur when the tide is out (effectively working in the dry), sediment disturbance from construction activity may occur within 45 feet of the existing sea wall (2.25 acres) Rain events and returning tide may suspended sediments, which would be expected to settle out of the water column within 150 ft of the activity. Disturbance of bottom sediments with the contaminants can mobilize PAHs into the surrounding water (Smith 2008; Parametrix 2011). However, the reduction in water quality, being limited spatially and temporally, is not expected to impair the conservation role of promoting juvenile growth, maturation, or survival, feeding or reproduction, for either species' designated critical habitat.

Disturbance of benthic communities
The intrusion of the construction equipment onto the beach (and propeller wash in the shallow water environment) would also contribute to temporary localized effects on marine vegetation and the benthic community, with indirect effects on prey availability for listed species is expected to occur. The benthic communities in the footprint of the construction limit would be disturbed when work is in progress. Suspended sediments would settle in the area adjacent to the disturbance, which can disrupt benthic prey species and if the sediments are contaminated, then sublethal toxicity of benthic species could occur within 150 feet of the remediation activities. Intertidal habitats, including eelgrass beds, would be outside the limited construction zone and would not be impacted by construction. The reduction in benthic prey communities may reduce available forage, but as above, this effect is spatially and temporally limited and is not expected to reduce the feeding, growth, and survival conservation role for which the habitat was designated for either species.

Degradation to forage fish quality/quantity
Forage fish that occur in the immediate project vicinity during in-water construction would be exposed to increased levels of turbidity and contaminant exposure. Sand lance (*Ammodytes hexapterus*) and smelt (*Hypomesus pretiosus*) utilize the shorelines at the project location (WDFW 2024). Therefore, forage fish could be present and potentially affected by bottom disturbing construction activities. Forage fish, as with benthic communities, are a prey resource, particularly for PS Chinook salmon. This reduction, while adverse, is not expected to be at a scale or duration that would reduce the conservation role for PS Chinook designated critical habitat.

To summarize, short-term effects to estuarine and near shore critical habitat for PS Chinook salmon include a temporary degradation of water quality, temporary disturbance of the benthic community (affecting cover and forage invertebrates) and the minor, localized short-term reduction of forage fishes. Short-term effects to PBFs for PS/GB bocaccio include temporary degradation of water quality and temporary decline in prey availability and quality. For both designated critical habitats, the short-term effects are adverse, but the brevity of their duration prevents a diminishment of the conservation role of the habitat in the action area.

Enduring Effects on Critical Habitat

Migration Obstruction

Migration habitat values are not expected to be impaired for PS/GB bocaccio, as this species does not rely on the nearshore area for migration.

There is substantial evidence that in-water structures impede the nearshore movements of juvenile salmonids (Heiser and Finn 1970; Able et al. 1998; Simenstad 1999; Southard et al. 2006; Toft et al. 2007). The continued presence of the sea wall would expose migrating juvenile salmonids to deep waters, and the associated risks of passing the wall during high tides. Juvenile PS Chinook have relatively high reliance on shallow nearshore areas, and therefore salmon habitat would experience enduring incremental diminishment of safe migration for PS Chinook salmon.

Reductions in aquatic vegetation/cover

Shoreline armoring can have lasting effects on food web of the adjacent marine habitat. Areas with substantial shoreline armoring tend to have a decrease in contribution of organic material entering the ecosystem. This is attributed, in part, to both the decline in shoreline vegetation and a reduction of submerged aquatic vegetation (SAV). Eelgrass shoot density and canopy structure are often depressed adjacent to in-water structures (Burdick and Short 1999).

Diminished benthic communities/forage

Altered beaches tends to have less wrack (organic material (e.g., kelp, eelgrass and driftwood) and other debris deposited at high tide). With the decline in wrack and SAV density, the ecosystem diversity declines. Natural beaches in Puget Sound are dominated by oligochaetes and nematodes, amphipods, insects, and collembolans. This diversity declines adjacent to sea walls as crustaceans become dominant (Dugan et al. 2008, Sobocinski et al. 2010, Munsch et al. 2017). For example, in the Duwamish watershed, armored shorelines had a fraction of the epibenthic assemblages observed in nearby unarmored sites (Morley et al. 2012). This effect would also be an incremental diminishment of forage that, while spatially limited, would be persistent and thus could slightly reduce the conservation role for salmonid and bocaccio feeding necessary for survival, growth, development and maturation.

Reduced contaminants in water, sediment, and prey

Since the early 2000s, this sea wall has been protecting the marine environment from the PAH and creosote contaminants associated with the Wyckoff/Eagle Harbor Superfund site. A 2018 study reported that the existing system had begun to fail and that these contaminants were migrating through the sea wall into Eagle Harbor (2018 EPA). The installation of the new sea wall would arrest this migration using the best methods currently available. While this project would not address the contaminates that have already reached the harbor, it would stop future migration and the additional accumulation of contaminants. The EPA would address these contaminants in a future remediation project. The containment of these chemicals would provide a long-term reduction in contaminants in water, sediment and benthic prey. This would provide a benefit to the conservation role of the habitat by incrementally improving multiple features necessary for survival, growth, development, maturation and reproduction for each of the designated critical habitats in this location.

Summary of Effects on Critical Habitat: The project is not anticipated to have significant long-term adverse effects to the above mentioned PBFs as the long-term adverse effects are incremental. The temporary diminishment in water quality from both turbidity and benthic disturbance is brief and would return to baseline water quality conditions rather quickly. As the purpose of the project is to durably arrest the migration of contaminants into Puget Sound, we also find long term effects would improve water quality and the benthic environment within critical habitat for PS Chinook salmon and PS/GB bocaccio. The conservation value of the habitat in the action area is retained.

2.4.2 Effects on Listed Species

Listed species will be present and exposed to both the temporary and long term effects to habitat presented above. Response is influenced by the duration of exposure, the species, and lifestage exposed, and the fitness of the exposed individuals.

Species Presence and Exposure

Salmonids in the Action Area: The Wyckoff facility is located in East Water Resource Inventory Area (WRIA) 15. There are no natal streams for ESA-listed salmonids on Bainbridge Island, with the nearest natal stream for Puget Sound Chinook salmon and steelhead more than 7 miles east in the Duwamish River. However, low numbers of spawning Chinook salmon are observed on a regular basis in numerous East WRIA streams. The two streams that empty into Eagle Harbor, Cooper Creek and Winslow Ravine Creek, do not support listed salmon species. However, it is reasonable to assume that migrating juveniles and Puget Sound Chinook resident adult fish could use Eagle Harbor for feeding and refugia. We expect exposure of this species, with greater likelihood of juvenile exposure.

The distinct stocks of Puget Sound winter steelhead likely to occur in the action area are identified in Salmonscape: Case/Carr Inlet steelhead and East Kitsap steelhead. Distribution of East Kitsap winter steelhead is identified as including Olalla, Cresent, Curley, Gorst, Blackjack, Ross, Barker, Clear, Chico, Scandia, Dogfish, and Grover’s creeks. None of these creeks are near the facility. Steelhead are larger/stronger fish as juveniles in the marine environment and unlike Chinook, are not considered to have nearshore dependence. Any exposure of this species is likely to be in low numbers, even when considered over the long term.

Rockfish in the Action Area: The project area is within Eagle Harbor and the subtidal zone is primarily sandy beaches with a gradual slope. Shallow, intertidal, nearshore subtidal waters in rocky, cobble and sand substrates (with or without kelp) can provide suitable substrate for juvenile (3-6 months old) bocaccio. The highest densities of juvenile rockfish are found in areas with floating or submerged kelp species. Eelgrass (*Zostera marina*) has been identified in waters adjacent to the site. While kelp was identified at some sites within Eagle Harbor, the action area generally lacks other habitat complexity. Adult or juvenile rockfish are not expected to be in this highly developed shallow mud-bottom bay. Larval rockfish could occur in low numbers in any year, as they are not volitional swimmers, but disperse by tidal, wave, and wind action. The timing of work (July 2 – January 15) could overlap with larval rockfish if a summer spawning episode occurs.

Temporary Effects on Listed Species Associated with Construction

Fish Handling – Cofferdams (supersacks) may be installed during the demolition and removal of the existing steel sea wall in order to limit fish exposure to the temporary habitat consequences described above. They would only be used if the contractor had difficulty meeting work objectives within tide cycle constrains. If used, they would only be deployed on falling tides and would be temporary in nature. They would be managed to ensure that fish handling would be conducted in accordance with U.S. Fish and Wildlife Service guidelines (USFWS 2012). The deployment of cofferdam is expected to be deployed such that no greater than 138 feet of sea wall would be isolated. It is expected that no more than 138 linear feet of sea wall may need to be isolated.

If worksite isolation occurs, it may result in a need to remove fish from the isolated area. Any fish handling would be conducted in accordance with USFWS guidelines (USFWS 2012). Timing of the nearshore work would be between July 2nd and January 15th to avoid peak periods of salmonid abundance. Furthermore, as stated above, the best available information indicated that very few juveniles of ESA-listed fish species would be in Eagle Harbor at any time of year so handling, if it occurs would not be expected to affect many individual salmonids (Chinook are more likely to be handled than steelhead; larval rockfish are unlikely to be detected for capture and removal) Handling has potential adverse effects. The effects of fish handling are typically stress but include possibility of injury or death.

Water Quality/Disturbance of Bottom Sediments – Project activities, such as low weight/soft tracked equipment on the beach, and barge anchoring (to include spud use), and prop wash would disturb bottom sediments. Disturbance of bottom sediments may suspend sediment in up to 2.25 acres of aquatic habitat, which would expose listed fish to both sediment, and contaminants. Larval and juvenile PS/GB bocaccio and juvenile PS Chinook salmon are likely to be exposed since they are shoreline-oriented. Steelhead are not nearshore dependent and are less likely to be present to experience this effect pathway.

Salmon can detect and avoid areas of high turbidity, and exposure of PS Chinook is therefore expected to be limited for this species to both sediment and co-occuring suspended contaminants. Larval bocaccio have limited mobility, and their exposure, of present, could be minutes to hours depending on their proximity to the sediment, tide, wind, waves, and the settle rate of the sediment.

Listed fish near areas of sediment contaminated with PAHs and creosote are at greater risk of exposure to contaminants (Smith 2008; Parametrix 2011). The concentration of PAHs released into surface water rapidly dilutes. Smith (2008) reported concentrations of total PAHs of 101.8 micrograms per liter (μg/L) 30 seconds after creosote-pile removal and 22.7 μg/L 60 seconds after removal. While Weston Solutions 2006 found PAH concentrations of over 134 μg/L were observed 5 minutes following disturbance and concentrations in samples did not always go down at 5 minutes after removal. Contaminants in the water column generally settle out soon after the disturbance (Smith 2008).

While the duration of exposure of any individual salmon is expected to be limited, response to to contaminants can occur with low exposure. Some of the effects of these contaminants to salmonid species include:

- Sublethal effects to fish such as external injury (damage to the skin, fins, and eyes) as well as latent or sublethal internal organ problems such as liver tumors from exposure to PAH contaminated sediments and water. Gill tissues are highly susceptible to damage because they actively pass large volumes of water and are thereby exposed to PAHs present in water (SHNIP 2016). Most non-benthic fish tissue contain relatively low concentrations of PAH, and accumulation is usually short term because these organisms can rabidly metabolize and excrete them (Lawrence and Weber 1984 and West et al. 1984, as cited in Eisler 1987).
- These contaminants have been documented to cause massive cardiac effects in very low concentrations, especially at early life stages and in fish with developing hearts (West et.al, 2019).
- Many studies have reported the nature of PAHs in aquatic environment and their metabolism in fishes. Fish exposure to PAHs has been linked to a wide range of physiological dysfunctions in fish, including neoplasia, endocrine disruption, immunotoxicity, and transgenerational impacts (Tierney et al. 2014)
- Exposure of fish to PAHs is generally associated with narcosis, resulting in a general depression of biological and physiological activities (Van Brummelen et al. 1998). These effects may be linked to reduced immune function, increased mortality after disease challenge, and reduced growth (Karrow et al. 1999; Varanasi et al. 1989; Arkoosh et al. 1991, 1998)
- PAHs have been found to reduce fitness and have potential to kill juvenile salmonids through the effect of “toxicant-induced starvation” in which lipid stores and biomass are reduced (Meador et al. 2006). Impacts of PAHs on the reproduction and development of wild Puget Sound salmon have not been well characterized, although some laboratory studies have shown abnormal behavioral effects during early development of coho salmon exposed to PAHs (Ostrander et al. 1988).

Reduced forage - The reduction of benthic organisms (including forage fish spawn) would reduce the abundance of prey resources, forcing juvenile PS Chinook and PS/GB bocaccio (larval rockfish would not be affected by this pathway) to temporarily forage more broadly over a greater area. However, because prey base is not identified as limited in the nearshore environment, we consider the reduction of benthic resources would be too small to cause any detectable effects on the fitness, growth or normal behaviors of ESA-listed fish species in the action area.

Prop Wash – In addition to suspended sediment effects described above, project-related propeller wash, from barges delivering construction materials and equipment, is likely to adversely affect juvenile ESA-listed fish species. Spinning boat propellers kill fish and small aquatic organisms (Killgore et al. 2011; VIMS 2011). Spinning propellers also generate fast-moving turbulent water that is known as propeller wash. Exposure to propeller wash can displace and disorient small fish. It can also mobilize sediments and dislodge aquatic organisms, particularly in shallow water and/or at high power settings. This is called propeller scour.

It is anticipated that most, if not all, of the equipment, materials and supplies would be transported to the site by truck via Eagle Harbor Drive NE and the improved access road (Creosote Place NE). If necessary, equipment, materials and supplies may be transported via barge. Brage traffic is expected to be limited to 5 trips over project implementation. Project-related barge operations would cause propeller wash within the action area. Adult fishes may be present in the action area during the project activities. However, should they be present, they would avoid the project-related noise and activity. Further, they would be able to swim against most propeller wash they may be exposed to without any meaningful effect on their fitness or normal behaviors. Conversely, the juvenile ESA-listed fish species that may be present within the area are likely to be relatively close to the surface and too small to effectively swim against the propeller wash. Individuals that are struck or very nearly missed by the propeller would be injured or killed by the exposure. Farther away, propeller wash may displace and disorient fish. Depending on the direction and strength of the thrust plume, displacement could increase energetic costs, reduce feeding success, and may increase the vulnerability to predators for individuals that tumble stunned and/or disoriented in the wash.

The number of juvenile ESA-listed fish species that would be affected by propeller wash attributable to this action is unquantifiable with any degree of certainty. Since the extra barge traffic is associated with the upland construction of the new sea wall, this would not be limited by the in-water work window; however, as stated above, the best available information indicated that very few juveniles of PS Chinook salmon and PS/GB bocaccio would be in Eagle Harbor at any time of year. Further, the relatively small size of the affected area would limit the exposure risk to a small subset of those ESA-listed fish species that may be present. Therefore, the number of juvenile ESA-listed fish species that would be affected by propeller wash would be extremely low.

Enduring Effects on Listed Species

Extended useful life of sea wall – In-water structures in the nearshore influence habitat functions and processes for the duration of the time they are present within the habitat. The effects of this project include: 1) altered food web, 2) disrupted migration, and 3) reduced level of contamination. These effects are chronic, persistent, and co-extensive with the useful life of replaced and repaired structures.

Forage - Shoreline armoring can have lasting effects on food web of the adjacent marine habitat. As described in section 2.4.1, the presence of seawalls affects the presence or density of eelgrass beds and the diversity of the benthic community overall. Eelgrass beds are important foraging habitat for juvenile PS Chinook, PS steelhead and PS/GB bocaccio and its presence helps to facilitate their foraging success. PS steelhead are less reliant on nearshore environment than PS Chinook, but they are observed in eelgrass beds. In a recent study, harpacticoid copepods dominated juvenile Chinook salmon diet (Kennedy et al. 2018). These copepods were found in abundance in eelgrass blades. Furthermore, the presence of shoreline structures reduced the amount of organic material that enters marine waters, thus limiting the nutrients that supports a diverse prey base for juvenile fishes. With the decreased diversity and abundance of prey resources, juvenile fishes would need to forage over a greater area. Over the extended period that this project will be in place, a small number of salmonids and juvenile bocaccio will encounter this condition each year. We expect that a subset of that small number would be harmed due to degraded foraging conditions, expressed as reduced growth or fitness.

Migration - In marine nearshore, there is substantial evidence that in-water structures impede the nearshore movements of juvenile salmonids (Heiser and Finn 1970; Able et al. 1998; Simenstad 1999; Southard et al. 2006; Toft et al. 2007). Juvenile salmonids stop at the edge of the structure due to loss of shallow-water habitat or because the structure interrupted their movement. During high tides, juvenile salmon swimming adjacent to a sea wall are forced to utilize deeper habitat, thereby exposing them to increased piscivorous predation. Hesitating upon first encountering the structure also exposes salmonids to predators, such as great blue heron (*Ardea herodias*), that would take advantage of areas of high fish density (Sherker 2020). Over the extended period that this project will be in place, a small number of salmonids will encounter this condition each year We expect that a subset of that small number would be injured or killed due to lack of shallow water refugia in which to avoid predators. We do not expect the seawall to affect migration patterns of bocaccio.

Reduced Contaminants - Since the early 2000s, this sea wall has been protecting the marine environment from the PAH and creosote contaminants associated with the Wyckoff/Eagle Harbor Superfund site. A 2018 study reported that the existing system had begun to fail and that these contaminants were migrating through the sea wall into Eagle Harbor (EPA 2018). The installation of the new sea wall would arrest this migration using the best methods currently available. While this project would not address the contaminates that have already reached the harbor, it would stop future migration and the additional accumulation of contaminants. The EPA would address these contaminants in a future remediation project. Reduced exposure to contaminants via water quality, sediment quality, and via prey are expected to growth, fitness and development in juveniles, resulting in and long-term incremental benefits to juvenile to adult survival. This incremental improvement, while beneficial for abundance, will be difficult to detect however, at the population scale.

<u>Summary of Effects on Listed Species</u>: Construction activities can lead to short-term effects that would affect only those cohorts of fishes present during the in-water work. The presence of low weight/soft tracked equipment on the beach and barge activity may lead to increased turbidity and disrupted benthic communities. Disturbed sediments may result in turbidity in proximity to the disturbance. However, all in-water work would be conducted during low tide, in the dry, or behind a coffer dam to minimize such suspension. Temporary localized effects on marine vegetation, benthos, and forage fish, with indirect effects on prey availability for listed species is expected to occur. The benthic communities in the footprint of the construction limit would be disturbed when work is in progress. If necessary, the utilization of cofferdams may expose fishes to handling. Also, if necessary, the transport of equipment and materials via barge may increase fish's exposure to prop wash and those associated risks. These effects only occur during construction activities and would quickly stabilize after construction is complete.

In addition to the short-term construction-related effects that would affect only those cohorts of fish present during the work, the proposed action has long-term effect on the marine nearshore environment that multiple cohorts of fish would experience over the useful life of the structure, which is estimated to be 100 years. These long-term effects result in potential delayed migration, potential reduction in SAV density and food supply. The species most likely to be repeatedly/chronically exposed to these conditions are juvenile PS Chinook salmon which typically migrate or rear in the nearshore area. Steelhead are less affected by the habitat detriment associated with the action because by the time they reach the marine environment, they are larger fish more adapted to deeper water, and so have lower demand for nearshore migration, predator refugia, and prey base. The reduction in food supply and SAV would adversely affect juvenile PS/GB bocaccio present in the nearshore.

These long-term habitat changes, which would persist for the life of the structure, result in incremental increases in stress, reduction in foraging success, alteration of migration patterns (juveniles hesitating at structure's edge), and impairment of predator avoidance. Effects to individual fish would occur among an undetermined percentage of all future cohorts of all populations that use the nearshore area of the project's action area. We anticipate that a small number of juveniles of each species would be injured or killed because of the reduced habitat suitability for listed species and increased predation resulting from the action. We expect these decreases to be proportional to the relatively small amount of habitat adversely affected.

However, the purpose of the project is to durably arrest the ongoing migration of contaminants from the Wycoff/Eagle Harbor Superfund Site into the marine environment. This would result in improved water quality and benthic conditions. While the project with not address the contaminants that have already reached the harbor, stopping the migration would enable the site to begin to recover naturally until the EPA addresses the contaminated sediments in a future remediation project.

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.

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

Anticipated climate effects on abundance and distribution of PS Chinook salmon include a wide variety of climate impacts. Rising temperatures during late spring and summer may also impact Chinook salmon juveniles in estuary 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).

Climate change has also become an increasing driver for infrastructure development and changes to protect against sea level rise in coastal areas. These flood protection projects would likely include, filling, raising of habitat, dikes, dunes, revetments, flood gates, pump stations, and sea walls; all habitat modifications that would be detrimental to salmon. Over the useful life of the existing sea wall covered in this Opinion, we expect the effects of climate change in the action area would include decreasing salinity, modified temperature regime, increasing acidity, and sea-level rise.

Other non-federal cumulative effects reasonably certain to occur in the action area include operation of the ferry terminal as well as future upland activities including commercial and residential development resulting from population growth, commercial and recreational use of Puget Sound. Water quality in the action area is influenced by upland uses that contribute point and nonpoint sources of water pollution. The human population in the PS region increased from about 1.29 million people in 1950 to about 4.2 million in 2020, and is expected to reach nearly 5 million by 2040 (Puget Sound Regional Council 2020). Planned growth consistent with county land use and growth management plans, would, in the long-term, result in additional effects to ecological functions, surface water quality, and nearshore habitat. 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 would 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 contaminated to area waters. Land use changes and development of the built environment that 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. We consider human population growth to be the main driver for most of the future negative effects on salmon, steelhead, and bocaccio and their habitats.

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.

Two species considered in this opinion (PS Chinook salmon and PS steelhead) are listed as threatened with extinction. The third (bocaccio) is listed as threatened. These listings are because of declines in abundance, poor productivity, and reduced structure and diminished diversity. The declines and poor productivity for the salmonids are based in part on habitat systemic habitat loss and degradation, including conditions in the action area. The environmental baseline in the action area is a mix of commercial fishing and vessel infrastructure as well as commercial development landward of the highest astronomical tide, or HAT, that degrade habitat conditions for listed species in their nearshore marine life stage. Within the action area there are sources of noise and shade (vessels), water quality impairments (nonpoint sources), and artificial light (marinas and fishing piers). These conditions do not provide optimal conditions for individuals of the listed species' growth, fitness, development/maturation or survival, particularly if present in high numbers. Bocaccio are endangered largely due to historic overfishing is long lived with late fecundity, inhibiting productivity. Habitat conditions, including in the action area, also impair survival of spawn and juveniles of this species.

These species also face risks from cumulative effects that are likely in the future. The greatest risks associated with climate change for the salmonid species would 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 percent of spawning habitat would change from snow-dominated to transitional, and 16 percent change from transitional to rain-dominated. These projections suggest that winter flooding would become more common, directly affecting incubating eggs. Stream temperature ranks high in the extent of change expected, which could increase pre-spawn mortality in low-elevation tributaries (Bowerman et al. 2017). Systemic anthropogenic detriments in fresh (for PS Chinook salmon and PS steelhead) and marine habitats are limiting the productivity for these species. PS/GB bocaccio, also considered in this opinion, is listed as endangered.

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

2.6.1 Critical Habitat

When the temporary and long-term effects are added to the baseline, and considering the status of critical habitat rangewide for PS Chinook salmon and PS/GB bocaccio, we find that the temporary adverse effects, even those that can occur over 2.25 acres, are of insufficient duration to reduce the conservation value of the critical habitat. Because water quality promptly regains its baseline level the role it provides for young steelhead growth, fitness and survival is not diminished. Sediment conditions and prey resources regain their baseline level more slowly, but prey is not known to be limiting in the action area, and again, even when added to the baseline, we do not find that the conservation role for juvenile salmonids or bocaccio is reduced, despite the temporary reduction of this PBF. When long term effects are evaluated, there are incremental reductions in prey base (and migration value for Chinook) that over time could inhibit growth, fitness, or survival of several individuals from each species, but the long-term effects also include benefits to water quality, sediment quality and prey which can provide improved growth, fitness, and survival of individuals contemporaneously. When taken together, we consider the long-term adverse effects balanced by the long-term beneficial effects. The project's adverse are not likely to impair long term conservation values of critical habitat in the action area We expect the overall conservation value, despite adverse effects being added to the baseline, would be retained.

2.6.2 ESA Listed Species

PS Chinook salmon and PS steelhead – As detailed in Section 2.4.3, the adverse effects that are added to the baseline will result in a variety of responses among exposed salmonids and bocaccio, ranging from behavioral responses such as avoidance by salmonids (of suspended sediment) to reduced fitness (due to energy expense in foraging among salmon PS Chinook, and juvenile bocaccio) to reduced fitness, injury, or death (from prop wash and increased susceptibility to predation among Chinook and bocaccio, and from contaminant exposure of all three species). However, based on likely presence and duration of exposure to temporary effects, we expect a very small reduction in abundance, and when we consider the long-term effects, we find that habitat gains from reduced contaminant exposure will promote healthier fish with greater survival among the exposed species, which can increase overall abundance. We believe that when taken together, even when cumulative effects are considered, productivity of the three species will not be altered by the effects of the proposed action.

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

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 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

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

Harm of PS Chinook salmon, PS steelhead and PS/GB bocaccio from exposure to:

- suspended sediments/contaminants;
- increased predation (reduced cover and shallow water habitat);
- reduced prey availability from benthic disturbance;
- propeller wash (juveniles of the species only); and
- fish handling.

The distribution and abundance of listed species 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 listed species that are reasonably certain to be injured or killed during construction activities or after their habitat is modified or degraded by the proposed action.

Therefore, the NMFS cannot predict with meaningful accuracy the number of PS Chinook salmon, PS steelhead, PS/GB bocaccio or SR killer whale that are reasonably certain to be injured or killed annually by the exposure to the stressors identified above. 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 a causal link established between the activity and the likely extent and duration of changes in habitat conditions as surrogates 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.

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

- The extent of take in the form of harm from water quality reductions associated with suspended sediments and contaminants during sea wall demolition and removal, is a total of 2.25 acres that may be disturbed during sea wall demolition and riprap manipulation. A larger area would likely increase the amounts of contaminated turbidity and expose more listed fishes to this degraded habitat condition;
- The extent of take in the form of harm from extended useful life of the sea wall is the 1,376 linear feet of new sea wall. A larger amount length sea wall would further increase predation and reduce habitat quality that would otherwise support rearing and migration of juvenile listed fish species.

- The extent of take in the form of harm from associated with fish handling during cofferdam deployment and fish salvage efforts, is 138 linear feet of sea wall that is isolated. A larger amount of sea wall isolation would further increase the risk of fish handling of listed fish species.
- The extent of take in the form of harm from prop wash associated with delivery barges is 5 delivery events. A larger amount of delivery events would further increase the risk of listed juvenile fishes from being exposed to prop wash.

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" refer to those actions the Director considers necessary or appropriate to minimize the impact of the incidental take on the species (50 CFR 402.02).

The EPA shall require their contractor to:

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

2.9.4 Terms and Conditions

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

1. To implement RPM number 1, Implement a monitoring and reporting system to confirm that the take exemption for the proposed action is not exceeded, the EPA shall develop and implement a plan to collect and report details about the take of listed species. That plan shall:
    a. Require the contractor to maintain and submit logs to verify:
        i. The dates and description(s) of the remedial activities;
        ii. The lateral extent of any turbidity plume and measures taken to maintain it within 150 feet;
        iii. The extent of benthic disturbance within the in-water construction limits;
        iv. The linear feet of sea wall that is replaced;
        v. As-built areas of temporary fish isolation structures (i.e., coffer dam) and linear feet of sea wall isolated;

vi. The number and life history phase of all fish salvaged (e.g., juvenile vs adult), making note of injured individuals. Document number of and life history phase of individuals, by species, killed during salvage; and
vii. The number of barge delivery events.

b. Require the contractor to establish procedures for the submission of activity logs and other material to the EPA, and
c. Require the EPA to submit an electronic annual construction update and post-construction report to NMFS within six months of project completion in each work window. Send the report to: projectreports.wcr@noaa.gov. Be sure to include Attn: WCRO-2023-00128 in the subject line.

2.9. 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).

The EPA should require their contracted vessels to use the lowest safe speeds and power settings when maneuvering in shallow waters close to the sea wall to minimize propeller wash and mobilization of sediments.

2.10. "Not Likely to Adversely Affect" Determinations

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

As described in Section 2 and below, the EPA's BA had concluded that the proposed action would not likely to adversely affect PS/GB yelloweye rockfish (*Sebastes ruberrimus*) and SR killer whale (*Orcinus orca*). The NMFS has concluded that the proposed action would be not likely to adversely affect PS/GB yelloweye rockfish or SR killer whale and their designated critical habitat. Detailed information about the biology, habitat, and conservation status and trends of PS/GB yelloweye rockfish can be found in the listing regulations and critical habitat designations published in the Federal Register, as well as in the recovery plans and other sources at: https://www.fisheries.noaa.gov/species-directory/threatened-endangered/fish/, and are incorporated here by reference.

The applicable standard to find that a proposed action is not likely to adversely affect listed species or critical habitat is that all of the effects of the action are expected to be discountable, insignificant, or completely beneficial. Beneficial effects are contemporaneous positive effects without any adverse effects to the species or critical habitat. Insignificant effects relate to the size of the impact and should never reach the scale where take occurs. Discountable effects are those extremely unlikely to occur. The effects analysis in this section relies heavily on the descriptions of the proposed action and project site conditions discussed in Section 1.3 and 2.4, and on the effects analysis presented in Section 2.5.

Effects on Critical Habitat for PS/GB Yelloweye Rockfish

Critical habitat for adult and juvenile PS/GB yelloweye rockfish includes 414.1 square miles of deepwater marine habit in Puget Sound, all of which overlaps with areas designated for adult bocaccio. No nearshore components were included in the critical habitat listing for juvenile yelloweye rockfish as they, different from bocaccio, 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). No project effects are expected to extend into these deepwater habitats, nor measurably alter the PBFs of this habitat, including prey species, water quality and structure. We consider exposure of this species critical habitat to be discountable.

Effects on PS/GB Yelloweye Rockfish

Unlike PS/GB bocaccio, larval and juvenile PS/GB yelloweye rockfish do not typically utilize the nearshore environment and are more likely to be found in areas with greatest depth. It is unlikely that juvenile yelloweye rockfish would occur within SAV habitats or the action area because they do not use the nearshore for rearing. As described in section 1.3, it is highly unlikely that a vibratory pile driver would be required over the course of the project. However, if it does occur, BMPs are in place to ensure that adjacent marine waters are not ensonified. Larval rockfish presence typically peaks twice, once in spring and once in late summer. Larval rockfish likely remain within the basin they are released (Drake et al. 2010) but may be broadly dispersed from the place of their birth (NMFS 2003). Still, we find the likelihood of larval or juvenile PS/GB yelloweye rockfish to be occupying the action area to be low. Similarly, the presence of adult PS/GB yelloweye in the action area is extremely unlikely. Suitable habitat for the adult lifestage is extremely limited in the area that affects fish based on preferred habitat depths and features such as rugosity. Although, given the ability of this species to move throughout the marine environment, we cannot conclude that they would not ever occur within the action area, either during construction action or over a proposed structure's useful life. However, we expect exposure of all life stages of PS/GB yelloweye rockfish to project effects to be extremely unlikely and therefore discountable.

Accordingly, the action is not likely to adversely affect PS/GB yelloweye rockfish or its critical habitat.

Effects on Critical Habitat for SR Killer Whale

This assessment considers the intensity of expected effects in terms of the change that would cause in the affected PBFs from their baseline conditions, and the severity of each effect, considered in terms of the time required to recover from the effect. Designated critical habitat for SR killer whales include marine waters of the Puget Sound that are at least 20 feet deep. The expected effects on SR killer whale critical habitat from completion of the proposed action, including full application of the conservation measures and BMPs, would be limited to the impacts on the PBFs as described below.

Based on the natural history of SR killer whales and their habitat needs, NMFS identified the following PBFs essential to conservation: 1) Water quality to support growth and development; 2) Prey species of sufficient quantity, quality and availability to support individual and population growth as well as reproduction and development; and 3) Passage conditions to allow for migration, resting, and foraging. Prey species and passage PBFs occur in the action area and would be affected, and so we evaluate if the effect will be significant.

The proposed action would cause short-term unmeasurable effects on prey availability and quality. Action-related impacts would annually injure extremely low numbers of individual PS Chinook salmon (primary prey), including exposing some individuals to contaminated 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 the sediment contaminants and SR killer whales. Therefore, it would cause no detectable reduction in prey availability and quality. Furthermore, the purpose of the proposed project is to durably arrest the migration of contaminants into the marine environment; therefore, after initial the initial disturbance stabilizes, the quantity and quality of prey fish available to SR killer whales would be improved. We consider these effects at a low enough level that the effects are insignificant.

The proposed action may result in the use of slow-moving barges delivering equipment and materials to the project site. This would be limited to 5 deliveries throughout the course of the project. Killer whale typically avoids the high-traffic area around Eagle Harbor, which is home to the Bainbridge Island ferry terminal. Vessels associated with the proposed construction are barges, which are slow moving, follow a predictable course, do not target whales, and should be easily detected by marine mammals. As a result, vessel strikes are extremely unlikely and any potential for effects from vessel strikes are therefore discountable. Houghton et al. (2015) found that vessel speed is the greatest predictor of noise levels received by whales. Vessel operations may cause temporary disturbance; however, such disturbances are likely to be infrequent, short-term and localized, with no lasting effects, and therefore insignificant. When in motion, sound produced by the vessels would be transient and expected to be below background levels a short distance removed from the moving vessel.

Effects on SR Killer Whale

SR killer whales are limited to marine water habitats greater than 20 feet deep, and would not be directly exposed to any project-related effects. However, there is a small chance that they are exposed to indirect effects through the trophic wed. As described in Section 2.2 the PS Chinook salmon population that would be affected by the proposed action is extremely small. As described in Section 2.5, the proposed action would affect too few individuals to cause detectable population-level affects. Furthermore, the likelihood that any individual juvenile Chinook salmon is affected by this project to become prey for SR killer whale is very low (Gamble et al. 2018). Therefore, any project-related reduction in Chinook salmon availability for SR killer whales would be undetectable. Similarly, although some PS Chinook salmon would be exposed to contaminated prey at the project site, their individual levels of contamination as well as the total numbers of exposed individuals would be too low to cause any detectable trophic link between the sediment contaminants and SR killer whales.

Moreover, the overall purpose of the proposed project is to durably arrest contaminate migration into the marine environment, reducing the risk of PS Chinook salmon exposure to contamination and subsequently potentially improving the quantity and quality of a SR killer whale food resource.

Because the short-term effects are not appreciable at the scale of an individual whale or their habitat, we consider the effects to be insignificant for both the species or their critical habitat. The long-term effect is also difficult to measure but is intended to reduce the potential exposure to contaminants and would be considered beneficial.

Accordingly, the action is not likely to adversely affect SR killer whales or their critical habitat.

2.11. Reinitiation of Consultation

This concludes ESA consultation for Wyckoff/Eagle Harbor Superfund Site, Perimeter Wall Replacement.

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

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the associated physical, chemical, and biological 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 may result from actions occurring within EFH or outside of it and may include direct, indirect, site-specific or habitat-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 EPA and descriptions of EFH for Pacific Coast groundfish (Pacific Fishery Management Council (PFMC 2023b), coastal pelagic species (CPS) (PFMC 2023a), and Pacific Coast salmon (PFMC 2022) 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 proposed action for this consultation is described above in Sections 1.3 (Proposed Federal Action) and 2.3 (Action Area). The action area for the proposed project include habitat which has been designated as EFH for various life stages of Pacific coast groundfish, coastal pelagic species, and Pacific Coast salmon.

Of the 83 managed groundfish species, less than half are likely to occur in the nearshore of Puget Sound. EFH for Pacific coast groundfish is defined as aquatic habitat necessary to allow for groundfish production to support long-term sustainable fisheries or groundfish and for groundfish contributions to a healthy ecosystem. This definition includes all waters from the MHHW line, and the upper extent of saltwater intrusion in river mouths along the coasts of Washington, Oregon, and California seaward to the boundary of the Exclusive Economic Zone.

Three coastal pelagic species are known to occur in the greater Puget Sound: northern anchovy, Pacific mackerel, and market squid. The definition for coastal pelagic species EFH is based on the geographic range and in-water temperatures where these species are present during a particular life stage (67 Federal Register 2343-2383). EFH for these species includes all estuarine and marine waters above the thermocline where sea surface temperatures range from 50 to 68°F. Coastal pelagic species have value to commercial Pacific fisheries, and are also important as food for other fish, marine mammals, and birds (63 Federal Register 13833).

Three salmon species are known to occur in the greater Puget Sound: coho, Chinook salmon, and pink. In estuarine and marine areas, salmon EFH extends from the extreme high tide line in nearshore and tidal submerged environments within state territorial waters out to the exclusive economic zone (200 nautical miles) offshore of Washington (PFMC 2022). Within these areas, EFH consists of four major components: (1) spawning and incubation; (2) juvenile rearing; (3) juvenile migration corridors; and (4) adult migration corridors and adult holding habitat.

Habitat areas of particular concern (HAPC) are specific habitat areas, a subset of the much larger area identified as EFH, that play an important ecological role in the fish life cycle or that are especially sensitive, rare, or vulnerable. Coastal pelagic species do not have designated HAPCs. The action area does not include EFH which has been designated as HAPC for groundfish and salmon. As described in section 2.4 (Environmental Baseline), estuaries and submerged aquatic vegetation (SAV), including canopy kelps and eelgrass beds, provide habitats that are biologically productive and provide a significant contribution to the marine and estuarine food webs for these fisheries. In general, there is a steady decline of kelp forests in Puget Sound, which are impacted by sediment, toxic pollution and shoreline alterations. Due to its resilience, eelgrass in Puget Sound is more stable overall, but has a patchy distribution along the subtidal and intertidal areas of the project sites and is impacted by warmer waters and over water shading.

While the action area does not include HAPCs, both kelp and eelgrass are present at the mouth of the harbor and are within 0.5 miles of the Wyckoff/Eagle Harbor Superfund Project. Large eelgrass beds are in waters adjacent of the project area (but would not be disturbed by this project), and *Z. marina* was the predominant species in the waters around North Shoal and East Beach. A mix of *Z. marina* and *Z. japonica* were found around the point of North Shoal and westward, with limited eelgrass found on West Beach (Christiaen et al. 2017 and 2018).

3.2. Adverse Effects on Essential Fish Habitat

Migratory Pathway Obstruction

The proposed replacement of the Wykoff/Eagle Harbor sea wall in aquatic habitat would continue to alter outmigration patterns of juvenile salmonids due to physical characteristics of the structure. The sea wall may contribute to migration delay of salmonids and increased densities at the edges of the structure. Although the total length of sea wall would not change, we expect this action to continue to impair the quality of the migratory corridor and hinder safe passage.

Effects on Forage, Cover, and Predation

SAV was documented in the proximity of the project area. There is a high likelihood that SAV patches would come and go within the action area over the life of the structure. SAV is important in providing protective cover and a food base for juvenile fish, including salmon. Shading and wave energy rebound within the nearshore habitat for the life of the structures can adversely affect primary productivity and SAV. The presence of the wall reduces favorable habitat that supports productive forage fish spawning due to the loss of shallow intertidal area and other favorable characteristics such as wrack development. The subsequent change in sediment composition further affects forage fish spawning productivity. Coastal pelagics, like northern anchovy, use estuarine habitats such as the intertidal zone, eelgrass, kelp, and other macroalgae and could therefore be affected by the impacts on their designated EFH. Any juvenile and sub-adult groundfish within the action area would also be expected near the eelgrass and kelp habitats within the nearshore.

The continuing presence of shoreline armoring can also alter the suitability for EFH species through changes in predation pressures. The presence of the sea wall may cause juvenile fishes to linger increasing their density at certain locations. This would enable predators to take advantage of these high-density locations to increase their predation success. Also, during high tides, small fishes would need to swim in deeper water than they would normally prefer, exposing them to greater predation from larger fishes. This is further exacerbated by the fact that habitat along sea walls lack of complexity (absence of large woody debris) and provide no cover.

Water Quality

Replacement of the Wyckoff/Eagle Harbor sea wall would require low weight/soft tracked equipment to maneuver on the 2.25 acres of beach habitat in front of the wall. This activity would temporarily disturb bottom sediments within the immediate project construction area, resulting in localized increases in suspended sediment concentrations that, in turn, would cause increases in turbidity during the work window. Since these sediments are contaminated with PAHs and creosote, these disturbances facilitate contaminant mobilization.

Nearshore habitat disturbance and localized turbidity increases could affect the water column and substrate that is used as EFH by eggs and larvae of EFH species. Northern anchovy do not spawn on Puget Sound beaches but instead spawn year-round in the water column. Species that deposit eggs on, or in, the substrate have potential to be damaged directly by construction activities or smothered by sediments settling out of the water column. Should nearshore spawning habitats be disturbed during the eggs' presence, these eggs could be dispersed into the water column, increasing their risk of predation.

Elevated turbidity could alter normal dispersal patterns within the water column, potentially reducing survival. Sediments within the action area are subject to leaching PAHs and creosote through the existing corroding sea wall into the environment and may be introduced to the water column when contaminated sediments are disturbed. Larvae for a number of species for which EFH has been designated could also be affected by increased turbidity or contaminant exposure. Changes in water quality throughout in-water construction activities would be relatively small scale and localized and may affect EFH differently depending on varying life histories. Based on the analysis of water quality effects, along with the BMPs and minimization measures included, all effects to EFH from changes in water quality would be minor and localized, and short in duration.

The potential for accidental spills or releases of hazardous materials would be minimized through implementation of spill prevention and response plan to clean up fuel or fluid spills.

<u>Benthic Communities</u>
Temporary (operation of low weight/soft tracked equipment on sediments) and enduring (extended useful life of sea wall) impacts would disrupt benthic environments and larval/juvenile rearing habitats and food sources. Reduced diversity or density of epibenthic meiofauna reduces prey resources. The cumulative impact of numerous and contiguous urban marine structures may be detrimental to the long-term success of numerous species, particularly recovery efforts for anadromous fish species that migrate along shorelines. There would be some degradation of benthic habitat, but it would rebound after the disturbance.

<u>Remediation Actions</u>
The proposed project would have temporary and enduring effects on EFH water bottoms and water columns. These effects culminate in short-term (construction-related) and long-term adverse effects on Pacific Coast groundfish, coastal pelagic species, and Pacific Coast salmon EFH. The proposed action incorporates a number of minimization measures to avoid, reduce, and minimize the adverse effects of the action on EFH. Furthermore, the purpose of the project is to durably arrest the migration of contaminants from the Wyckoff/Eagle Harbor Superfund site into the waters of Puget Sound. While the action may result in some adverse effects, the long-term risk of significant future exposure to PAHs, and creosote would be reduced.

<u>Conclusion</u>
Pacific coast groundfish species are considered sensitive to overfishing, the loss of habitat, and reduction in water and sediment quality. Coastal pelagic species are considered sensitive to overfishing, loss of habitat, reduction in water and sediment quality, and changes in marine hydrology. Pacific salmon EFH is primarily affected by the loss of suitable spawning habitat,

barriers to fish migration (habitat access), reduction in water quality and sediment quality, changes in estuarine hydrology, and decreases in prey food source.

Based on information provided in the biological assessment and the analysis of effects presented here and in the ESA portion of this document, NMFS determined that the proposed actions would have adverse effects on each EFH by perpetuating the existence of shoreline armoring (constituting loss of habitat) and the reduction of in water and sediment quality. While some qualities would improve, such as contaminant migration and loading, others would persist.

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. Increase habitat complexity near the bulkhead by planting native vegetation such as willows and cottonwoods and adding habitat features such as large woody debris.
2. Ensure that an emergency cleanup plan is in the place in the event a vehicle has an incident where contaminated material is spilled. This plan would be on-board the vehicle at all times.
    a. The use of the lowest safe speeds and power settings when maneuvering vessels in shallow waters close to the shoreline.

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, EPA 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 EPA 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 EPA. Other interested users could include U.S. Army Corps of Engineers. Individual copies of this opinion were provided to the EPA. The document will be available at the NOAA Library Institutional Repository [https://repository.library.noaa.gov/welcome]. The format and naming adhere to conventional standards for style.

4.2 Integrity

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

4.3 Objectivity

Information Product Category: Natural Resource Plan

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

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

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

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

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