UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
777 Sonoma Avenue, Room 325
Santa Rosa, California 95404-4731

August 1, 2022 **Refer to NMFS No:** WCRO-2022-00817

Dr. Tessa E. Beach
Chief, Environmental Divisions
U.S. Department of the Army
San Francisco District, Corps of Engineers
450 Golden Gate Avenue, 4th Floor, Suite 0134
San Francisco, California 94102-3406

Re: Endangered Species Act Section 7(a)(2) Biological Opinion, and Magnuson-Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for Reinitiation of Consultation on the Humboldt Harbor and Bay Operations and Maintenance Dredging Project (2021-2025) in Humboldt County, California

Dear Dr. Beach:

Thank you for your letter of March 24, 2022, requesting reinitiation 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 Humboldt Harbor and Bay Operations and Maintenance Dredging (2021-2025) Project. On July 5, 2022, the United States District Court for the Northern District of California issued an order vacating the 2019 regulations adopting changes to 50 CFR part 402 (84 FR 44976, August 27, 2019). This consultation was initiated when the 2019 regulations were still in effect. As reflected in this document, we are now applying the section 7 regulations that governed prior to adoption of the 2019 regulations. For purposes of this consultation, we considered whether the substantive analysis and its conclusions regarding the effects of the proposed actions articulated in the biological opinion and incidental take statement would be any different under the 2019 regulations. We have determined that our analysis and conclusions would not be any different.

Thank you, also, for your request for consultation pursuant to the essential fish habitat (EFH) provisions in Section 305(b) of the Magnuson-Stevens Fishery Conservation and Management Act (MSA)(16 U.S.C. 1855(b)) for this action.

This letter transmits NMFS' final biological opinion and EFH response for the proposed Humboldt Harbor and Bay Operations and Maintenance Dredging (2021-2025) Project (Project).

The enclosed biological opinion describes NMFS' analysis of effects on threatened Southern Oregon/Northern California Coast (SONCC) coho salmon *(Oncorhynchus kisutch)* and California Coastal (CC) Chinook salmon *(O. tshawytscha)* and their designated critical habitat in accordance with section 7 of the ESA. Based on the best scientific and commercial information available, NMFS concludes that the proposed action is not likely to jeopardize the continued existence of SONCC coho salmon and CC Chinook salmon, nor is the project likely to destroy or adversely modify designated critical habitat for these species. NMFS expects the proposed action would

result in incidental take of SONCC coho salmon and CC Chinook salmon. An incidental take statement with terms and conditions is included with the enclosed biological opinion. NMFS has also concurred with the United States Army Corps of Engineers (Corps) determinations that the Project is not likely to adversely affect Northern California (NC) steelhead and its designated critical habitat, or Southern Distinct Population Segment (SDPS) of North American green sturgeon or its designated critical habitat.

The enclosed EFH consultation was prepared pursuant to section 305(b) of the MSA. The proposed action includes areas identified as EFH for species managed under the Pacific Coast Salmon Fishery Management Plan (FMP), Pacific Coast Groundfish FMP, and Coastal Pelagic Species FMP. Based on our analysis, NMFS concludes that the project would adversely affect EFH of all three FMPs and has provided one EFH Conservation Recommendation.

Please contact Matt Goldsworthy, Northern California Office, Arcata, at (707) 825-1621 or via email at Matt.Goldsworthy@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Enclosure

cc: FRN # 151422WCR2022AR00079

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

Humboldt Harbor and Bay Operations and Maintenance Dredging (2021-2025) Project
Reinitiation of Consultation, Humboldt County, California

NMFS Consultation Number: WCRO-2022-00817
Action Agency: United States Army Corps of Engineers, San Francisco District

Table 1. Affected Species and NMFS' Determinations:

ESA-Listed Species	Status	Is Action Likely to Adversely Affect Species or Critical Habitat?	Is Action Likely To Jeopardize the Species?	Is Action Likely To Destroy or Adversely Modify Critical Habitat?
Southern Oregon/North California Coast (SONCC) coho salmon	Threatened	Yes	No	No
California Coastal (CC) Chinook salmon	Threatened	Yes	No	No
Northern California (NC) Steelhead	Threatened	No[1]	NA	N/A
Southern DPS North American Green Sturgeon	Threatened	No[1]	N/A	N/A

Table 2. Essential Fish Habitat and NMFS' Determinations:

Fishery Management Plan With EFH in the Action 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:

Alecia Van Atta
Assistant Regional Administrator
California Coastal Office

Date: August 1, 2022

[1] Please refer to section 2.13 for those species and critical habitats that are not likely to be adversely affected.

Table of Contents

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

NOAA's 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 USC 1531 et seq.), 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 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 within two weeks at the NOAA Library Institutional Repository [NOAA Library Repository Link]. A complete record of this consultation is on file at the NMFS Northern California Office in Arcata, California.

1.2 Consultation History

On March 24, 2022, NMFS received the Corps request for reinitiation of formal ESA consultation, and for EFH consultation, regarding the Humboldt Harbor and Bay (2021-2025) Operations and Maintenance Dredging Project. The Corps proposes to change the existing dredging work window (March 15 through September 30) to March 15 through November 30. The Corps anticipated adverse effects to Southern Oregon/Northern California Coast (SONCC) coho salmon, California Coastal (CC) Chinook salmon, and their designated critical habitat. The Corps determined the Project would not likely adversely affect Northern California (NC) steelhead, Southern Distinct Population Segment (SDPS) of North American green sturgeon, or their designated critical habitats. The Corps determined the Project may adversely affect EFH designated by the Pacific Coast Salmon Fishery Management Plan (FMP), Pacific Coast Groundfish FMP, and Coastal Pelagic Species FMP. Formal ESA consultation for the Project was initiated upon receipt of the request from the Corps, on March 24, 2022, as well as consultation for EFH.

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

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 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).

"Interrelated actions" are those that are part of a larger action and depend on the larger action for their justification. "Interdependent actions" are those that have no independent utility apart from the action under consideration (50 CFR 402.02). We considered whether or not the proposed action would cause interrelated and interdependent actions. Although the proposed Project will help maintain existing navigation channels, future implementation of the Project will not increase the number of vessel transits per day, vessel size, or other maritime activities in the action area for the foreseeable future because the Project does not include any additional dredging for new or expanded maritime facilities. Therefore, NMFS does not anticipate any interrelated or interdependent actions associated with the Project.

Humboldt Bay has been maintained for shipping commerce since 1881, when the interior channels were first constructed to provide safe navigation into and within the bay. The first attempt at stabilizing the entrance to Humboldt Bay occurred in 1889, resulting in the construction of twin jetties that bounded the Bar and Entrance Channel.

1.3.1 Project Description

Although the new work window proposed will be two months longer and allow dredging during the period from October 1 to November 30, actual dredging activities would still be limited to 60 days per year in one or multiple episodes. The proposed action involves the annual maintenance dredging of the Bar and Entrance Channel and the North Bay, Eureka, Samoa, and Field's Landing Channels (interior channels) and associated turning basins located in Humboldt Harbor and Bay, for fiscal years 2021 through 2025. Maintenance dredging is required to achieve the dimensions required to facilitate the intended operations of the Federal Navigation Channel facilities in Humboldt Bay. A maximum of 2 million cubic yards (MCY) are expected to be dredged annually from the Bar and Entrance channel and the various interior channels during FY2021-25 using the Corps hopper dredges *Essayons* and *Yaquina*, or with contracted hopper dredges (see Table 1). Dredge material will be placed at the permanently designated Humboldt Open Ocean Disposal Site (HOODS). Annual maintenance dredging to maintain navigability of Humboldt Bay's navigation channels will occur for up to 60 days during the time period from March 15 through November 30. Dredging may occur in one or multiple episodes.

Table 1 Overview of the channel dimensions authorized by Congress with depths as measured at Mean Lower Low Water (MLLW), widths as measured in feet, and lengths as measured in feet, for all of the navigation channels expected to be treated during implementation of the Project.

Navigation Channel	Depth (feet at MLLW)	Width (feet)	Length (feet)
Bar and EntranceChannels	48	500 – 1,600	8,500
North Bay Channel	38	400	18,500
Samoa Channel	38	400	8,100
Samoa Turning Basin	38	1,000	1,000
Eureka Channel	35	400	9,700
Field's Landing Channel	26	300	12,000
Field's Landing Turning Basin	26	600	800

1.3.2 Dredging Process

Two Corps hopper dredges, the *Essayons* and the *Yaquina*, or similar contracted dredges, will be used for the proposed maintenance dredging of the Humboldt Bay federal channels. Contract dredges would operate and be of similar size and capacity as the *Yaquina*. A hopper dredge is equipped with port and starboard drag arms, and each drag arm has drag heads attached to the bottom end. The drag arms are lowered into the water until the drag heads are on the channel bottom, and are then slowly dragged over the bottom by forward movement of the vessel. Dredged material is drawn up through the drag arms by on-board pumps, and pumped into the hopper bins in the vessel's mid-section. As the dredging progresses, the hopper is filled with slurry of sediment and water.

As pumping continues to fill the hopper with water and sediment, the level rises in the hopper bins, and the heavier, coarser material settles out to the bottom of the dredge. The lighter, finer sediment remain suspended in the water, which flows into weirs and tubes, and is released under the dredge. This excess water, or overflow, returns fine material to the water column. When the hoppers are full, the dredge raises the drag arms, moves to the designated placement site, and empties the dredged material through large doors located in the bottom of the vessel.

1.3.3 Hopper Dredge *Essayons*

The *Essayons* is a 350-foot, self-propelled hopper dredge powered by two 3,600 horsepower diesel engines. When in use, the *Essayons*' drag arms can extend up to 94-feet (ft) in length. When fully loaded, it has a mean draft of approximately 32ft, and can reach speeds of up to 13.5 knots. When the *Essayons* is not loaded, the dredge has a mean draft of about 22ft and can reach speeds of up to 13.8 knots. The *Essayons* has four dredge pumps, two 1,650 horsepower pumps located on the drag arm, and two 3,000 horsepower pumps mounted inboard. The *Essayons* can dredge up to 80ft MLLW, and its hopper can hold up to 6,000 cy of dredged material. Sophisticated instrumentation allows the *Essayons* to dredge 24 hours per day, which can result in dredging up to 50,000 cy of material per day. During the 2002 to 2003 shipyard repairs of the *Essayons*, devices called anti-turbidity valves were added to the overflow weirs. The purpose of the valves is to reduce the environmental affect caused by the dredging process, and these devices greatly reduce the turbidity in the water around the operating dredge by reducing the

volume of air that is entrained in the overflow mixture. The dredged material exits the vessel from 12 independently-opening doors (each 10ft long by 8.7ft wide) located along the ship's hull. The doors are positioned in two rows of six with one row along the starboard and the other row along the port side of the vessel. The doors open simultaneously, and the total placement duration is approximately 15 to 30 minutes. As the sand falls through the water column it spreads out creating a mound whose height can be regulated by moving the *Essayons* during placement.

1.3.4 Hopper Dredge *Yaquina*

The *Yaquina* is 200ft long and smaller than the *Essayons* and, therefore, is often used to dredge smaller, shallow coastal channels. When the dredge is fully loaded, its draft is approximately 14 ft, and it can attain speeds of 10 knots. When it is not loaded, the draft is 8ft, and it can travel at speeds of 11 knots. The *Yaquina*'s drag arms normally dredge to a depth of 45 feet MLLW; however, when loaded, the drag arms can extend to a depth of 55ft MLLW. The hopper capacity of the Yaquina is 1,050 cy of dredged material. The *Yaquina* operates with two 565 horsepower centrifugal dredge pumps, each with an 18-inch intake and a 16-inch discharge. As with the *Essayons*, the *Yaquina* operates with an unattended engine room, and a semi-automatic drag arm handling system. The Y*aquina* has two 1,125 horsepower diesel engines. Generally, the *Yaquina* maintains a 24-hour per day dredging schedule; however, the dredge is decommissioned for approximately 8 hours per week to refuel and restock with supplies.

1.3.5 Sediment Suitability and Disposal

Based on decades of dredging experience, sediment dredged from the Humboldt Bar and Entrance channel, and from all the interior channels, is predominantly (80-98%) clean sand that is clearly suitable for disposal at HOODS. The Corps is currently sampling and testing sediment from these channels and a report will be available during spring of 2021. Concentrations of metals and polycyclic aromatic hydrocarbons (PAHs) detected in samples from channel composite areas were generally low. Nearly no pesticides, Polychlorinated Biphenyl (PCB), or butyltin constituents were detected in any composite sample.

HOODS was first used as a disposal site for the sediment from Humboldt Harbor and Bay in September of 1990. Beginning in 2021, HOODS will have an expanded footprint where all dredge spoils may be deposited as part of this Project. Additionally, it should be noted that placement (beneficial use) of sandy dredged material at a nearshore sand placement site (NSPS) to alleviate the effects of erosive wave actions along the North Spit could potentially occur during the 5-year period once a demonstration site is created and permitted. Material determined to be unsuitable or infeasible for nearshore beneficial use that meets the standards and criteria for open ocean disposal would still be placed at HOODS.

1.3.6 Minimization Measures

To avoid or minimize effects on federally-listed species and their habitat within the action area, the following general avoidance and minimization measures will be implemented:

- The Corps shall limit the duration of overflow to the extent practicable during each dredge cycle.

- Standard best-management practices (BMPs) will be applied to protect species and their habitat(s) from pollution because of fuels, oils, lubricants, and other harmful materials. Equipment that is used during the proposed project will be fueled and serviced in a manner that will not affect federally-protected species in the action area or their habitats;
- A Spill Prevention Control and Countermeasure (SPCC) plan will be prepared to address the emergency cleanup of any hazardous material and will be available on site. The SPCC plan will incorporate measures to address hazardous waste, stormwater, and other emergency planning requirements;
- Well-maintained equipment will be used to perform the work, and, except in the case of a failure or breakdown, equipment maintenance will be performed off site. Equipment will be inspected daily by the operator for leaks or spills. If leaks or spills are encountered, the source of the leak will be identified, leaked material will be cleaned up, and the cleaning materials will be collected and properly disposed of;
- Fueling of marine-based equipment will occur at designated safe locations adjacent to the proposed project. Spills will be cleaned up immediately using spill-response equipment. The Corps will exercise every reasonable precaution to protect listed species, critical habitats, and EFH from pollutants and other deleterious materials.

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 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 provides 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.

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 "to jeopardize the continued existence of" a listed species, which is "to engage in an action that would be expected, directly or indirectly, to reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of that species" (50 CFR 402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification," which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat for the conservation of a listed species. Such alterations may include, but are not limited to, those that alter the physical or biological features essential to the conservation of a species or that preclude or significantly delay development of such features" (81 FR 7214, February 11, 2016).

The designations of critical habitat use the term primary constituent element (PCE) or essential features. The 2016 final rule (81 FR 7414; February 11, 2016) that revised the critical habitat regulations (50 CFR part 424) replaced this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a "destruction or adverse modification" analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

- Evaluate the rangewide status of the species and critical habitat expected to be adversely affected by the proposed action.
- Evaluate the environmental baseline of the species and critical habitat.
- Evaluate the effects of the proposed action on species and their 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.

2.2.1 Species Description and General Life History

2.2.1.1 SONCC Coho Salmon

Coho salmon have a generally simple 3-year life history. The adults typically migrate from the ocean and into bays and estuaries towards their freshwater spawning grounds in late summer and fall, and spawn by mid-winter. Adults die after spawning. The eggs are buried in nests, called redds, in the rivers and streams where the adults spawn. The eggs incubate in the gravel until fish

hatch and emerge from the gravel the following spring as fry. These 0+ age fish typically rear in freshwater for about 15 months before migrating to the ocean. The juveniles go through a physiological change during the transition from fresh to salt water called smoltification. Coho salmon smolts typically outmigrate between March and July (Ricker et al. 2014). Coho salmon typically rear in the ocean for two growing seasons, returning to their natal streams as 3-year-old fish to renew the cycle.

2.2.1.2 CC Chinook Salmon

CC Chinook salmon are typically fall spawners, returning to bays and estuaries before entering their natal streams in the early fall. The adults tend to spawn in the mainstem or larger tributaries of rivers. As with the other anadromous salmon, the eggs are deposited in redds for incubation. When the 0+ age fish emerge from the gravel in the spring, they typically migrate to saltwater shortly after emergence. Therefore, Chinook salmon typically enter the estuary as smaller fish compared to coho salmon. Chinook salmon are typically present in the stream-estuary ecotone, which is located in the downstream portions of major tributaries to estuaries like Humboldt Bay, from early May to early September, with peak abundance in June/July (Wallace and Allen 2007). Similar to coho salmon, prey resources during out-migration are critical to Chinook salmon survival as they grow and move out to the open ocean.

2.2.2 Status of Species and Critical Habitat

In this biological opinion, NMFS assesses four population viability parameters to help us understand the status of each species and their ability to survive and recover. These population viability parameters are: abundance, population productivity, spatial structure, and diversity (McElhaney et al. 2000). While there is insufficient information to evaluate these population viability parameters in a thorough quantitative sense, NMFS has used existing information, including the Recovery Plan for SONCC Coho Salmon (NMFS 2014) and Coastal Multispecies Recovery Plan (NMFS 2016), to determine the general condition of each population and factors responsible for the current status of each Evolutionarily Significant Unit (ESU). We use these population viability parameters as surrogates for numbers, reproduction, and distribution, the criteria found within the regulatory definition of jeopardy (50 CFR 402.02).

2.2.2.1 Status of SONCC Coho Salmon

SONCC Coho Salmon Abundance and Productivity: Although long-term data on coho salmon abundance are scarce, the available evidence from short-term research and monitoring efforts indicate that spawner abundance has declined since the last status review for populations in this ESU (Williams et al. 2016). In fact, 24 of the 31 independent populations in the ESU are at high risk of extinction because they are below or likely below their depensation threshold, which can be thought of as the minimum number of adults needed for survival of a population. No populations are at a low risk of extinction and all core populations are thousands short of the numbers needed for recovery (Williams et al. 2016).

SONCC Coho Salmon Spatial Structure and Diversity: The distribution of SONCC coho salmon within the ESU is reduced and fragmented, as evidenced by an increasing number of previously occupied streams from which SONCC coho salmon are now absent (NMFS 2001, Good et al. 2005, Williams et al. 2011, Williams et al. 2016). Extant populations can still be found in all major river basins within the ESU (70 FR 37160; June 28, 2005). However, extirpations, loss of

brood years, and sharp declines in abundance (in some cases to zero) of SONCC coho salmon in several streams throughout the ESU indicate that the SONCC coho salmon's spatial structure is more fragmented at the population-level than at the ESU scale. The genetic and life history diversity of populations of SONCC coho salmon is likely very low. The SONCC coho salmon ESU is currently considered likely to become endangered within the foreseeable future in all or a significant portion of its range, and there is heightened risk to the persistence of the ESU as Viable Salmonid Population parameters continue to decline and no improvements have been noted since the previous status review (Williams et al. 2016).

2.2.2.2 Status of CC Chinook Salmon

CC Chinook Salmon Abundance and Productivity: Low abundance, generally negative trends in abundance, reduced distribution, and profound uncertainty as to risk related to the relative lack of population monitoring in California have contributed to NMFS' conclusion that CC Chinook salmon are likely to become an endangered species within the foreseeable future throughout all or a significant portion of their range. Where monitoring has occurred, Good et al. (2005) found that historical and current information indicates that CC Chinook salmon populations are depressed. Uncertainty about abundance and natural productivity, and reduced distribution are among the risks facing this ESU. Concerns regarding the lack of population-level estimates of abundance, the loss of populations from one diversity stratum[2], as well as poor ocean survival contributed to the conclusion that CC Chinook salmon are likely to become an endangered species in the foreseeable future (Good et al. 2005, Williams et al. 2011, Williams et al. 2016).

CC Chinook Salmon Spatial Structure and Diversity: Williams et al. (2011) found that the loss of representation from one diversity stratum, the loss of the spring-run history type in two diversity substrata, and the diminished connectivity between populations in the northern and southern half of the ESU pose a concern regarding viability for this ESU. Based on consideration of this updated information, Williams et al. (2016) concluded the extinction risk of the CC Chinook salmon ESU has not changed since the last status review. The genetic and life history diversity of populations of CC Chinook salmon is likely very low and is inadequate to contribute to a viable ESU, given the significant reductions in abundance and distribution.

2.2.2.3 Status of Critical Habitats

The condition of SONCC coho salmon and CC Chinook salmon critical habitat, specifically its ability to provide for their conservation, has been degraded from conditions known to support viable salmonid populations. NMFS has determined that currently depressed population conditions are, in part, the result of the following human induced factors affecting critical habitat: logging, agriculture, mining, urbanization, stream channelization, dams, wetland loss, and water withdrawals (including unscreened diversions for irrigation). Impacts of concern include altered stream bank and channel morphology, elevated water temperature, lost spawning and rearing habitat, habitat fragmentation, impaired gravel and wood recruitment from upstream sources, degraded water quality, lost riparian vegetation, and increased erosion into streams from upland areas (Williams et al. 2016, Weitkamp et al. 1995). Diversion and storage of river and stream flow has dramatically altered the natural hydrologic cycle in many of the streams within the ESU's and DPS. Altered flow regimes can delay or preclude migration, dewater aquatic

[2] A diversity stratum is a grouping of populations that share similar genetic features and live in similar ecological conditions.

habitat, and strand fish in disconnected pools, while unscreened diversions can entrain juvenile fish.

2.2.3 Factors Responsible for the Decline of Species and Critical Habitat

The factors that caused declines of species and degradation of critical habitat include hatchery practices, ocean conditions, habitat loss due to dam building, degradation of freshwater habitats due to a variety of agricultural and forestry practices, water diversions, urbanization, over-fishing, mining, climate change, and severe flood events exacerbated by land use practices (Good et al. 2005, Williams et al. 2016). Sedimentation and loss of spawning gravels associated with poor forestry practices and road building are particularly chronic problems that can reduce the productivity of salmonid populations. Late 1980s and early 1990s droughts and unfavorable ocean conditions were identified as further likely causes of decreased abundance (Good et al. 2005). From 2014 through 2016, drought conditions in California reduced stream flows and increased temperatures, further exacerbating stress and disease. Ocean conditions have been unfavorable in past years due to the El Niño in 2015 and 2016 and other anomalously warm waters in the Gulf of Alaska. Reduced flows can cause increases in water temperature, resulting in increased heat stress to fish and thermal barriers to migration.

One factor affecting the range wide status and aquatic habitat at large is climate change. The best available information suggests that the earth's climate is warming, and that this could significantly impact ocean and freshwater habitat conditions, and thus the survival of species subject to this consultation. Recent evidence suggests that climate and weather is expected to become more extreme, with an increased frequency of drought and flooding (IPCC 2019). Climate change effects on stream temperatures within Northern California are already apparent. For example, in the Klamath River, Bartholow (2005) observed a 0.5°C per decade increase in water temperature since the early 1960's, and model simulations predict a further increase of 1-2°C over the next 50 years (Perry et al. 2011).

In coastal and estuarine ecosystems, the threats from climate change largely come in the form of sea level rise and the loss of coastal wetlands. Sea levels will likely rise exponentially over the next 100 years, with possibly a 50-80 cm rise by the end of the 21st century (IPCC 2019). This rise in sea level will alter the habitat in estuaries and either provides an increased opportunity for feeding and growth or in some cases will lead to the loss of estuarine habitat and a decreased potential for estuarine rearing. Marine ecosystems face an entirely unique set of stressors related to global climate change, all of which may have deleterious impacts on growth and survival while at sea. In general, the effects of changing climate on marine ecosystems are not well understood given the high degree of complexity and the overlapping climatic shifts that are already in place (e.g., El Niño, La Niña, Pacific Decadal Oscillation) and will interact with global climate changes in unknown and unpredictable ways. Overall, climate change is believed to represent a growing threat, and will challenge the resilience of listed salmonids in Northern California.

2.3 Action Area

"Action area" means all areas to be affected directly or indirectly by the Federal action and not merely the immediate area involved in the action (50 CFR 402.02). The action area for the proposed action includes the Humboldt Bay Bar and Entrance Channel, interior channels and

associated turning basins, and the expanded HOODS including the routes used to transport the dredge material for disposal.

2.4 Environmental Baseline

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 consultation, and the impact of state or private actions which are contemporaneous with the consultation in process (50 CFR 402.02).

In the action area, the threat to SONCC coho salmon and CC Chinook salmon from climate change are likely to be similar to those described above in the Species Status section. For example, the action area is likely to experience increases in average summer air temperatures; more extreme heat waves; and an increased frequency of drought (Lindley et al. 2007). In addition to the increased frequency of drought, high intensity rainfall events are also expected to become more common, leading to increased erosion and flooding. In future years and decades, many of these changes are likely to further degrade habitat throughout Humboldt Bay by, for example, reducing streamflow entering the bay during the summer and raising summer water temperatures.

Coho salmon occurring in the action area belong to the Humboldt Bay Tributaries population of SONCC coho salmon, which is currently at a moderate risk of extinction (NMFS 2014). Chinook salmon occurring in the action area belong to the Humboldt Bay Tributaries population of CC Chinook salmon (NMFS 2016), which is well below the number needed to be at a low risk of extinction. Both populations of listed species have the same name and encompass all of the tributaries draining into Humboldt Bay. The spatial extent of these populations indicates that fish born in Freshwater Creek (a Humboldt Bay tributary) may return to Humboldt Bay as adults and spawn in any of the Humboldt Bay tributaries, as the entire network of tributaries draining into the bay constitute one population area.

The highest rated threats identified in the recovery plan for SONCC coho salmon include roads, channelization/diking, and agricultural practices (NMFS 2014). The highest rated threats identified in the recovery plan for CC Chinook salmon include roads/railroads and channel modifications such as levees (NMFS 2016). High priority recovery actions in the SONCC Coho Salmon Recovery Plan and the Coastal Multi-Species Recovery Plan (Chinook salmon) are to increase instream structure; construct off channel habitats and oxbows; remove or set back levees; improve grazing practices; and restore tidally influenced areas (NMFS 2014, 2016).

2.4.1 Status of Listed Species and Critical Habitat in the Action Area

Freshwater Creek is one of the major tributaries draining into Humboldt Bay and is likely to represent about half of the anadromous habitat within the Bay. Counts of adult salmonids, including SONCC coho salmon and CC Chinook salmon, at the Freshwater Creek weir from 1994 through 2014 indicates that both wild populations have declined (Ricker et al. 2014). Ricker et al. (2014) characterized the decline in CC Chinook salmon in Freshwater Creek as dramatic, and raised concerns over depensatory population effects. Once the augmentation of hatchery reared Chinook salmon ceased in 2004, weir captures declined rapidly into the single

digits and ultimately reached an all-time low of no returning adults in 2013 (Ricker et al. 2014). Freshwater Creek adult abundance estimates for SONCC coho salmon also indicates that adult escapement has declined, ranging from a high of 1,807 in 2002-03 to a low of 89 in 2009-10 (Moore and Ricker 2012).

Salmonids occurring in estuaries are highly mobile and in Humboldt Bay, low numbers of fish are spread over a large area, which can complicate scientific observations or captures intended to understand their habitat preferences (Garwood et al. 2013 and Pinnix et al. 2005). Garwood et al. (2013) studied fish assemblages in Humboldt Bay by conducting monthly sampling over a period of several years and only captured one listed salmonid during the multi-year study. Pinnix et al. (2005) sampled Humboldt Bay over a 2-year period using fyke nets, shrimp trawls, beach seines, purse seines, cast nets, and minnow traps. Pinnix et al. (2005) identified a diverse and abundant fish community in Humboldt Bay, including a total of 49 species from 22 families of fishes. However, over the two years of sampling, no salmonid species were captured in any of the six different types of sampling gear. No listed salmonids were captured during regular trawling conducted by the Corps from March through October at five paired locations in and just outside of the federal channels in Humboldt Bay in 2019 and 2020 (Novotny et al. 2020a,b).

A recent study related to 1+ age coho salmon smolts in Humboldt Bay, by Pinnix et al. (2013) used acoustic transmitters surgically implanted into the out-migrating smolts. Coho salmon smolts spent more time in the stream-estuary ecotone, which is located in the downstream portions of major tributaries to Humboldt Bay. During their residency in Humboldt Bay, coho smolts primarily used deep channels and channel margins and were present in the estuary an average of 10 to 12 days.

The PBF of SONCC coho salmon and CC Chinook salmon designated critical habitat pertinent to this consultation are those estuarine areas that support juvenile growth and provide migration corridors free of obstruction. The condition of SONCC coho salmon and CC Chinook salmon critical habitat in the action area, specifically its ability to provide for their conservation, is degraded from conditions known to support viable populations. The action area and nearby areas have been subjected to a high degree of historic anthropogenic disturbance and manipulation, starting in the 1880's after the construction of the jetties and subsequent designation and maintenance of the Federal Navigation Channels. These changes have contributed to changes in the widths, depths, and velocities at the Entrance and action area. The Entrance Channel is flanked by the North and South Jetties on either side, where artificial substrates (concrete, boulders, and concrete dolos) have been installed, which create habitat favored by predators of juvenile salmonids. Humboldt Bay is a major deep water port, where there is frequent vessel activity and other projects under construction. These conditions and obstructions likely increase the number of days required for SONCC coho salmon and CC Chinook to navigate their way through the migratory corridor of Humboldt Bay and into the open ocean.

2.4.2 Previous ESA Section 7 Consultations in the Action Area

NMFS' ESA Section 10(a)(1)(A) research and enhancement permits and research projects in the annual California Department of Fish and Wildlife ESA Section 4(d) rule research program could potentially occur in Humboldt Bay or within nearby estuarine portions of tributaries, including the reaches within the action area. In general, these activities are closely monitored and require measures to minimize take during the research activities. NMFS determined these

research projects are unlikely to affect future adult returns. The United States Environmental Protection Agency recently consulted with NMFS pursuant to the expansion of HOODS, allowing dredged materials from dredging projects along the Northern California coast to continue to deposit clean dredge spoils at HOODS. NMFS evaluated effects to EFH and ESA listed species and their designated critical habitats from disposals at HOODS and found that they are unlikely to jeopardize the survival and recovery of SONCC coho salmon and CCC Chinook salmon. (NMFS ECO#: WCRO-2019-03626). Other activities which have been previously consulted on and expected to routinely occur within or nearby the action area include: dredging of marinas, docks, and boat launches; maintenance and replacement of docks and pilings; maintenance and reconstruction of the North and South Jetties; restoration projects; oyster and macro-algae mariculture; and placement of utility lines.

2.5 Effects of the Action

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

2.5.1 Turbidity, Propeller Wash, Discharge, and Predation

The proposed project will result in temporary and localized increases in turbidity during dredging activities. Overall, increases in turbidity are expected to be temporary and localized, and often not different from conditions that occur naturally. Surveys were conducted using the Corp's *Yaquina* hopper dredge, which is not equipped with an Anti-Turbidity Valve as is the *Essayons*. As such, turbidities measured following the use of the *Yaquina* are expected to be higher than if the *Essayons* were used. Furthermore, the *Yaquina* is used to dredge the Interior Channels, which are composed of finer-grained sediment, and the *Essayons* is used to dredge the Bar and Entrance Channel, which is composed of coarse-grained sand and gravel. Overall, the overflow plumes monitored appeared to be a well-defined, short-duration phenomenon. In addition, the overflow plumes in the two channels behaved similar in spatial dimensions (approximately 200 by 200 meters); however, the measured turbidities and decay rates of the overflow plumes differed, owing to the differences in sediment composition. Conditions returned to ambient conditions from 15 to 58 minutes after dredging, with the longest times required at the Samoa Channel area (the Samoa Channel is an Interior Channel) where sediment particle sizes are smallest.

The duration of turbidity is longest in the Interior Channels, and the Interior Channels are also much narrower than the Bar and Entrance Channels, leaving less space for individuals to transit and therefore representing increased likelihood of exposure. Furthermore, the Interior Channels are located closer to the tributaries where SONCC coho salmon and CC Chinook spawn and represent areas where exposure would be more likely. Interior Channel dredging typically occurs once every 5-years based upon Corps records, although dredging of Interior Channels is not scheduled in advance and when it would occur during the 2021-2025 Project will be unknown. The Bar and Entrance Channels are much larger channels, leaving ample space for juvenile and adult salmonids to better avoid the activity and any turbidity when in those larger portions of the action area.

As described in the Status of the Species in the Action Area section, SONCC coho salmon and CC Chinook salmon outmigrate during a portion of the Project's proposed work window (March, April, and May). Because of their young ages and poor swimming capabilities, NMFS expects a percentage of the total outmigrants for a given season to be exposed to increases in predation rates during their outmigration in March, April, or May that coincides with dredging in the Interior Channels. Within the Interior Channels, younger and smaller life stages who are less adept swimmers, such as 1+ year old juvenile SONCC coho salmon or 0+ year old juvenile CC Chinook salmon, could become disoriented in vessel propeller wash when combined with the dredge's overflow plume, and as a result be more susceptible to predation. Repeated exposure of individuals to the turbidity plume is likely the greatest where successive dredge cycles occur over multiple days in the same area. However, because these dredging effects would be temporary and localized, the number of salmonids affected is expected to be very small and limited to the Interior Channels where turbid conditions prevail for longer durations. Only one hopper dredge is working at time, so any effects would be limited to one portion of the action area at any time and allow for juveniles to transit the action area while the hopper dredges leave the bay to dispose of spoils at HOODS or the NSPS

NMFS expects that the Interior Channels would be dredged once during the 2021-2025 Project, and anticipates about one percent of that year's total number of juvenile SONCC coho salmon and CC Chinook salmon outmigrants (the proportion of the population expected to occur within the Interior Channels during March, April, or May) utilizing the Interior Channels of the action area would experience adverse effects during overflow dredging that would decrease their abundance due to increased predation mortality. NMFS expects that juvenile SONCC coho and CC Chinook salmon transit the action area rapidly, and that 1% of the total number of juveniles transiting the action area during the year in which the Corps dredges the Interior Channels would be exposed to increased predation risk after becoming disoriented.

2.5.2 Entrainment

McGraw and Armstrong (1990) conducted fish entrainment studies on hopper dredge entrainment in Gray's Harbor, Washington. Results of their studies indicated that juvenile salmonids in estuaries and large river mouths are highly migratory and relatively fast swimmers, and avoided being entrained by hopper dredges. Similarly, dredge entrainment monitoring has been conducted aboard the *Essayons* during most years in San Francisco Bay since 2011, and no juvenile salmonids have been detected although they likely have been present in the area (Novotny et al. 2019). As previously discussed in the Status of the Species in the Action Area section, few juvenile salmonids have been captured in Humboldt Bay, and NMFS expects the small numbers of SONCC coho salmon and CC Chinook salmon present in the action area during certain portions of the work window to avoid entrainment. Entrainment of adult salmonids is not expected during dredging due to their larger body size and stronger swimming ability.

2.5.3 Disposal

The effects of disposals at HOODS have been previously evaluated by NMFS as described above in the Environmental Baseline section. Therefore, the effects analysis section of this Opinion is focused on the proposed Nearshore Sand Placement Site (NSPS), where there may be turbidity

and potential for burial of SONCC coho salmon or CC Chinook salmon individuals. However, the areas affected by disposal are small relative to the vast area of coastal and ocean habitat available. Therefore, NMFS expects that disposal of dredged materials directly above or close by one or more listed salmonids is extremely unlikely, making risks to listed salmonids negligible.

2.5.4 Effects to Critical Habitat

The PBF of SONCC coho salmon and CC Chinook salmon designated critical habitat pertinent to this consultation are those estuarine areas that support juvenile growth and provide migration corridors free of obstruction. Critical habitat for SONCC coho salmon and CC Chinook salmon is not designated in the Pacific Ocean and therefore does not apply to portions of the action area outside of Humboldt Bay, such as the NSPS. The turbid conditions associated with the periods of dredge overflow adversely affect the Migratory Corridor PBF for SONCC coho and CC Chinook salmon by obstructing it. These adverse effects are expected to ameliorate rather quickly and return to baseline conditions upon completion of annual dredging work (typically around 10 days per year).

Benthic organisms and infaunal prey item in the federal channels would be directly removed by dredging, and the annual disturbance from dredging may prevent complete recolonization of benthic communities in dredged areas. Prey species will also be entrained, such as Pacific sandlance, Pacific herring, early life history stages of Dungeness crab, and northern anchovies (Novotny 2020a,b). Northern anchovies have been the most common species collected during entrainment monitoring conducted when the *Essayons* is working in San Francisco Bay (Novotny et al. 2019). Overall, the direct removal of prey is expected to be localized and temporary and not influence the fitness of individuals or adversely affect Prey Resources PBF's of designated critical habitat.

2.6 Cumulative Effects

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

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

SONCC coho salmon and CC Chinook salmon in the action area are likely to be affected by future, ongoing non-federal activities like marine commerce and recreational activities such as fishing. Effects in the action area originating from activities upstream of the action area will also contribute to diminished water quality or quantity, such as agriculture, water diversion, and timber harvest. Water diversions contribute to diminished stream flows and warmer water

temperatures, while agriculture may increase nutrients and degrade dissolved oxygen or water clarity. The future effects of timber harvest include continued land disturbance, road construction and maintenance, and higher rates of erosion and sedimentation. These activities contribute additional sediments to Humboldt Bay, which eventually deposit in the action area and necessitate additional sediment removal actions and dredging.

2.7 Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (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 for the conservation of the species.

SONCC coho salmon and CC Chinook salmon have declined to a large degree from historic numbers. The small loss of juveniles caused by the Project is not expected to affect future returns for either species. The obstructions to the Migratory Corridor PBF will increase the amount of time that some juveniles may require in order to navigate from their natal streams and into the Pacific Ocean. Interior Channel dredging typically occurs once every 5-years, and these areas are expected to require the longest amount of time to complete and contribute to the most significant turbidity effects. Given the expected densities of SONCC coho salmon and CC Chinook are expected to be low, thus exposing a very small number of juveniles, these effects are not expected to influence future adult returns or contribute to population level effects that could affect either ESU.

The action area and ranges of these species are likely to be subject to higher average summer air temperatures and lower total precipitation levels due to climate change. Although the total precipitation levels may decrease, the average rainfall intensity has increased and is expected to continue to increase in the future. Higher air temperatures would likely warm stream temperatures. Reductions in the amount of precipitation would reduce stream flow levels and estuaries may also experience changes in productivity due to changes in freshwater flows, nutrient cycling, and sediment amounts. For this project, all activities would be completed by 2026 and the likely long-term effects of climate change described above are unlikely to be detected within that time frame. The short-term effects of project construction would have completely elapsed prior to these climate change effects. Overall, the project is unlikely to appreciably reduce the likelihood of survival and recovery of SONCC coho salmon and CC Chinook salmon, and the project is unlikely to appreciably diminish the value of designated critical habitat for the conservation of these species.

2.8 Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, any effects of interrelated and interdependent activities, and cumulative effects, it is NMFS' biological opinion

that the proposed action is not likely to jeopardize the continued existence of SONCC coho salmon, CC Chinook salmon, or destroy or adversely modify their designated critical habitats.

2.9 Incidental Take Statement

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

2.9.1 Amount or Extent of Take

NMFS expects the Project to result in the incidental take of one percent of the total Humboldt Bay tributaries population of juvenile SONCC coho salmon and one percent of the total Humboldt Bay tributaries population of juvenile CC Chinook salmon during one year out of the next five years (2021-2025) when dredging is expected to occur in the Interior Channels. These fish will be harmed by being subjected to higher rates of predation. The amount of incidental take resulting from predation cannot be enumerated because the future abundance of juvenile SONCC coho salmon and CC Chinook salmon in the action area is unknown. Therefore, NMFS characterizes take by the extent of the impacts expected through changes in water quality of the habitat, as determined by the maximum volume of annual dredging episodes for both channel areas (Bar and Entrance Channels and Interior Channels) and the frequency at which the Interior Channels are dredged (2,000,000 cy annually; and Interior Channel dredging once every five years respectively) as a surrogate for the amount of take likely.

2.9.2 Effect of the Take

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

2.9.3 Reasonable and Prudent Measures

"Reasonable and prudent measures" are nondiscretionary measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02). NMFS believes the following reasonable and prudent measures are necessary and appropriate to minimize take of SONCC coho salmon and CC Chinook salmon:

1. The Corps shall monitor the duration of overflow dredging.
2. The Corps shall monitor and report dredging activity annually.

2.9.4 Terms and Conditions

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

1. The following terms and conditions implement reasonable and prudent measure 1:
    a. The Corps shall record and report on the durations of overflow dredging each year, providing a report to NMFS by December 31.
2. The following terms and conditions implement reasonable and prudent measure 2:
    a. The Corps shall provide a written report to NMFS by December 31 of each year, summarizing the number of days of dredging work conducted, the estimated volumes removed, and the durations of overflow dredging described in RPM 1.
    b. The Corps shall submit the annual report, by December 31, to Matt.Goldsworthy@noaa.gov

2.10 Conservation Recommendations

Section 7(a)(1) of the ESA directs Federal agencies to use their authorities to further the purposes of the ESA by carrying out conservation programs for the benefit of the threatened and endangered species. Specifically, conservation recommendations are suggestions regarding discretionary measures to minimize or avoid adverse effects of a proposed action on listed species or critical habitat or regarding the development of information (50 CFR 402.02). NMFS has no conservation recommendations to suggest other than those within the MSA EFH consultation.

2.11 Reinitiation of Consultation

This concludes formal consultation for the Humboldt Harbor and Bay Operations and Maintenance Dredging (2021-2025) Project. As 50 CFR 402.16 states, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been retained or is authorized by law and if: (1) The amount or extent of incidental taking specified in the ITS is exceeded, (2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this opinion, (3) the agency action is subsequently modified in a manner that causes an effect on the listed species or critical habitat that was not considered in this opinion, or (4) a new species is listed or critical habitat designated that may be affected by the action.

2.12 "Not Likely to Adversely Affect" Determinations

2.12.1 NC Steelhead

NC steelhead smolts in the action area are in the second and third year of life, are relatively large (150-200 mm), remain in relatively deep water, and move rapidly through the estuary to the ocean in late spring and summer (Wallace and Allen 2007). No steelhead were captured during regular trawling conducted by the Corps from March through October at five paired locations in and just outside of the federal channels in Humboldt Bay in 2019 and 2020 (Novotny et al. 2020a,b). NC steelhead smolts exposed to increased levels of turbidity are likely to temporarily relocate to suitable habitat elsewhere, as juvenile NC steelhead are highly mobile and adept to avoid plumes of sediment (O'Connor 1991, USACE 1998). NMFS does not expect there to be any fitness consequence (reduced feeding or growth) to NC steelhead who avoid the turbidity plume by relocating to suitable habitat elsewhere. NMFS expects the effects of turbidity to NC steelhead smolts in Humboldt Bay to be insignificant, as there is ample habitat and prey elsewhere in the action area. NMFS expects the effects of entrainment to be discountable, given that steelhead juveniles will likely not encounter the four-foot radius near the suction dredge intakes where entrainment risks are high. Therefore, NMFS concurs with the Corps that the project is not likely to adversely affect NC steelhead individuals or their designated critical habitat.

2.12.2 Southern DPS Green Sturgeon

Southern DPS green sturgeon inhabit estuaries along the west coast during the summer and fall months (Moser and Lindley 2007) and are known to use the North Humboldt Bay heavily (Goldsworthy et. al. 2016, Pinnix 2008). Juvenile Southern DPS green sturgeon rear in their natal streams in California's Central Valley, so only sub-adult and adult Southern DPS green sturgeon are present in the marine environment offshore of Humboldt Bay and are the only life stages of Southern DPS green sturgeon that could be exposed to the effects of the Project. Sub-adults range from 65-150 cm total length from first ocean entry to size at sexual maturity. Sexually mature adults range from 150-250 cm total length.

Demersal species, such as green sturgeon, are particularly vulnerable to entrainment due to their behavior of residing or burrowing into bottom substrates. Data collected by the United States Fish and Wildlife Service indicate that green sturgeon are found more frequently in the North Bay. Green sturgeon adults and sub adults are temporary residents in Humboldt Bay from June through October, utilizing North Bay as summer-fall holding or feeding habitat, and the deeper waters of the North Bay Channel as a migratory corridor between the Pacific Ocean and Arcata Bay (Pinnix 2008). Green sturgeon are known to move rapidly within an estuary and travel within the top 6.5ft of a water column over deeper water at a speed of approximately 1.8ft per second. According to a study in the San Francisco Bay, green sturgeon that were near the surface of the water were also reported to swim in swift flowing regions of the bay, and were oriented in the direction of the current. The green sturgeon in Humboldt Bay will likely exhibit similar behavior and are expected to use the deeper waters of the Entrance Bay and the North Bay Channel for migration.

Available information suggests the potential for green sturgeon entrainment by a suction dredge is low. Five years of entrainment sampling by Mari-Gold Environmental Consulting and Novo Aquatic Sciences (2010) in the Sacramento-San Joaquin Delta did not observe entrainment of any sturgeon, including the more common white sturgeon. All green sturgeon in the San Francisco Estuary are also relatively large in size (i.e., typically 18 inches in length or greater), such as those in the action area in Humboldt Bay. Larger fish have stronger swimming capabilities and, thus, are less vulnerable to entrainment.

Regular trawling from March through October at five paired locations in and just outside of the federal channels in Humboldt Bay in 2019 and 2020 (Novotny et al. 2020a,b) captured only one green sturgeon (total length = 964 mm) in the federal channels in October 2020. Goldsworthy et al. 2016 and Pinnix 2008, describe an area of high use for green sturgeon near Sand Island, in the North Bay where the majority of SDPS green sturgeon who enter the Bay tend to reside during the summer. Effects on water quality associated with dredging are not expected to negatively affect green sturgeon. Increased levels of turbidity and SSC from dredging are expected to affect Dissolved Oxygen (DO) levels in the water column throughout the Interior Channels. Although temporary increases in turbidity will likely result in decreased visibility for green sturgeon, NMFS does not anticipate green sturgeon to be negatively affected, because green sturgeon are highly mobile and adept at avoiding turbidity plumes. Therefore, NMFS concurs with the Corps that Southern DPS green sturgeon and their critical habitat are not likely to be adversely affected by the Project.

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. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) 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 (50 CFR 600.905(b)).

Habitat Areas of Particular Concern (HAPC) are described in the regulations as subsets of EFH that are identified based on one or more of the following considerations: the importance of the ecological function provided by the habitat; the extent to which the habitat is sensitive to human-induced environmental degradation; whether, and to what extent, development activities are, or will be stressing the habitat type; and the rarity of the habitat type (50 CFR 600.815(a)(8)). Designated HAPC are not afforded any additional regulatory protection under MSA; however,

federal projects with potential adverse impacts to HAPC are more carefully scrutinized during the consultation process. The EFH consultation mandate applies to all species managed under a Fishery Management Plan (FMP) that may be present in the action area.

3.1 Essential Fish Habitat Affected by the Project

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for the following fishery management plans (FMPs): Pacific Coast Salmon (Pacific Fishery Management Council (PFMC) 2016), coastal pelagic species (PFMC 2019a), and Pacific Coast Groundfish (PFMC 2019b). The Pacific Coast Groundfish EFH includes all waters from the mean high water line, and the upriver extent of saltwater intrusion in river mouths, along the coasts of Washington, Oregon, and California seaward to the boundary of the EEZ (PFMC 2019b). The east-west geographic boundary of Coastal Pelagic EFH is defined to be all marine and estuarine waters from the shoreline along the coasts of California, Oregon, and Washington offshore to the limits of the EEZ and above the thermocline where sea surface temperatures range between 10ºC and 26ºC. The southern extent of EFH for Coastal Pelagics is the United States-Mexico maritime boundary. The northern boundary of the range of Coastal Pelagics is the position of the 10ºC isotherm, which varies both seasonally and annually (PFMC 2019a). In estuarine and marine areas, Pacific Coast Salmon EFH extends from the nearshore and tidal submerged environments within state territorial waters out to the full extent (200 miles) of the U.S. Exclusive Economic Zone (EEZ) offshore of Washington, Oregon, and California north of Point Conception to the Canadian border (PFMC 2016). Thus, the proposed Project occurs within EFH for various Federally managed species in the Pacific Coast Salmon, Pacific Coast Groundfish, and Coastal Pelagic Species FMPs. Furthermore, the action area is designated as a HAPC for Pacific Coast Salmon (estuary), and Pacific Coast Groundfish (estuary).

3.2 Adverse Effects on Essential Fish Habitat

Most of the adverse effects to EFH for the Pacific Salmon Fishery Management Plan (FMP) were previously described in the ESA portion of this document and NMFS also expects the action to adversely affect the Estuary HAPC designated for the Pacific Coast Salmon FMP. Adverse effects to the Estuary HAPC for the Pacific Coast Salmon FMP are expected to include the removal of prey via entrainment, brief periods of turbidity, propeller wash, and synergistic effects leading to increased predation risks.

Adverse effects to EFH and Estuary HAPC for the Pacific Coast Groundfish FMP and adverse effects to EFH for Coastal Pelagic Species includes entrainment of prey for numerous managed species; brief periods of turbidity; temporary loss of habitat; temporary or permanent elimination of infaunal prey organisms until recolonization of occurs in the Interior Channels; permanent loss or removal of demersal and pelagic prey organisms; propeller wash; increased predation within EFH; and disposal of dredged sediments offshore at the Nearshore Sand Placement Site.

3.3 Essential Fish Habitat Conservation Recommendations

Most of the adverse effects from the proposed action are temporary and expected to recover within rather short periods of time. However, many of the effects are expected to be permanent within the Bar and Entrance Channel due to repeated annual dredging cycles, continually

disturbing the benthic environment before it can recover. Interior Channels are not expected to be dredged annually, and will recover their benthic and infaunal prey and habitat features in between dredging episodes. The removal of prey items and managed species themselves via entrainment in the suction dredge hopper is substantial. In their trawling survey of Humboldt Bay, Novotny et al. (2020a) captured 12,048 northern anchovy and 100 Pacific herring in 2019. Northern anchovy often has been the most common species collected during entrainment monitoring conducted when the *Essayons* is working in San Francisco Bay (Novotny et al. 2019), and given that Northern anchovy was by far the most abundant fish species captured overall, it is reasonable to assume they likely represent one of the most affected species. Large numbers of Dungeness crabs, of various life stages and sizes, are well known to be entrained by hopper dredges and experience mortality rates as high as 86% (Wainwright et al. 1992). Larval and juvenile Dungeness crabs are a critical prey resource for a variety of Pacific Coast Groundfish species. Therefore, NMFS suggests the following Conservation Recommendation to offset or otherwise compensate for the significant adverse effects to the Pacific Coast Groundfish and Coastal Pelagic Species FMPs:

1. The Corps should offset the adverse effects caused by the significant removals of prey species entrained in the suction dredge by contributing towards the improvement of the productivity of the action area and surrounding environment in Humboldt Bay. Contributing to tidal restoration actions would ameliorate the losses of prey by providing additional habitat and tidal areas where prey resources can be produced to replace and compensate for impacts out of kind.

Fully implementing this EFH conservation recommendation would protect EFH and HAPC, by avoiding or minimizing the adverse effects described in section 3.2 above.

3.4 Statutory Response Requirement

As required by section 305(b)(4)(B) of the MSA, the Corps 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 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 Corps 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 user of this opinion is the U.S. Army Corps of Engineers. Other interested users could include the California Department of Fish and Wildlife, and others dependent upon dredging activities for commerce, such as commercial fishers and industrial exporters. A copy of this opinion was provided to the Corps. The format and naming adheres 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 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.

5 REFERENCES

Bartholow, J. M. 2005. Recent water temperature trends in the Lower Klamath River, California. North American Journal of Fisheries Management 25(1):152–162.

Garwood, R., T.J. Mulligan, and E Bjorkstedt. 2013. Ichthyological Assemblage and Variation in a Northern California Zostera marina Eelgrass Bed. Northwestern Naturalist 94(1):35-50.

Goldsworthy, M., B. Pinnix, M. Barker, L. Perkins, A, David, and J. Jahn. 2016. Green Sturgeon Feeding Observations in Humboldt Bay, California. Field Note from August 19, 2016. National Marine Fisheries Service, United States Fish and Wildlife Service, Arcata, California.

Good, T. P., R. S. Waples, and P. Adams (editors). 2005. Updated status of federally listed ESUs of West Coast salmon and steelhead. U.S. Department of Commerce, NOAA Tech. Memo. NMFS-NWFSC-66. 597 pp.

Intergovernmental Panel on Climate Change (IPCC). 2019. Climate Change 2019 Synthesis Report AR5. Valencia, Spain.

Lindley, S. T., R. S. Schick, E. Mora, P. B. Adams, J. J. Anderson, S. Greene, C. Hanson, B. May, D. McEwan, R. B. MacFarlane, C. Swanson, and J. G. Williams. 2007. Framework for assessing viability of threatened and endangered Chinook salmon and steelhead in the Sacramento-San Joaquin Basin. San Francisco Estuary and Watershed Science 5:4.

MacFarlane, R.B. 2010. Energy dynamics and growth of Chinook salmon (Oncorhynchus tshawytscha) from the Central Valley of California during the estuarine phase and first ocean year. Canadian Journal of Fisheries and Aquatic Sciences 67(10):1549-1565.

Mari-Gold Environmental consulting Inc. and Novo Aquatic Sciences, Inc. 2010. Stockton and Sacramento Deepwater Ship Channel Maintenance Dredging Project – 2009 Fish Community and Entrainment Report. Prepared for the U.S. Army Corps of Engineers, Sacramento District, April 2010.

McElhany, P., M. H. Ruckelshaus, M. J. Ford, T. C. Wainwright, and E. P. Bjorkstedt. 2000. Viable salmonid populations and the recovery of evolutionarily significant units. U.S. Department of Commerce, NOAA Technical Memorandum NMFS-NWFSC-42. 156 pp.

McGraw, K.A. and D.A. Armstrong, 1990. Fish Entrainment by Dredges in Grays Harbor, Washington.

NMFS (National Marine Fisheries Service). 2001. Status review update for coho salmon (Oncorhynchus kisutch) from the Central California Coast and the California portion of the Southern Oregon/Northern California Coast Evolutionarily Significant Units. National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California. April 12. 43 pp.

NMFS. 2014. Final recovery plan for the Southern Oregon/Northern California Coast Evolutionarily Significant Unit of Coho Salmon (Oncorhynchus kisutch). September 2014. Arcata, California.

NMFS. 2016. Final Multispecies Recovery Plan. California Coast Chinook Salmon, Northern California Steelhead, Central California Coast Steelhead. Santa Rosa, California.

NMFS. 2018. NMFS Procedure 03-201-16 for EFH Consultations for United States Army Corps of Engineers Federal Channel Maintenance Dredging. February 2, 2018.

Novotny, S., L. Hornung, and S. Willis. 2019. Fish entrainment monitoring report, 2019 dredging of the Pinole Shoal channel conducted by the U.S. Army Corps of Engineers' Hopper Dredge Essayons. November 2019. 48 pages plus appendices.

Novotny, S., J. Staton, R. Reed, and E. Campbell. 2020a. Benthic fish and invertebrate trawl surveys of sub-tidal habitat reaches inside and outside of the federally maintained Humboldt Bay navigation channels – 2019. January 2020. Report prepared for the U.S. Army Corps of Engineers. 44 pages plus appendices.

Novotny, S., J. Staton, R. Reed, and E. Campbell. 2020b. Benthic fish and invertebrate trawl surveys of sub-tidal habitat reaches inside and outside of the federally maintained Humboldt Bay navigation channels – 2020. December 2020. Report prepared for the U.S. Army Corps of Engineers. 57 pages plus appendices.

Perry, R.W., Risley, J.C., Brewer, S.J., Jones, E.C., and Rondorf, D.W. 2011. Simulating daily water temperatures of the Klamath River under dam removal and climate change scenarios: U.S. Geological Survey Open-File Report 2011-1243. 78 pp.

PFMC (Pacific Management Fishery Council). 2016. The Fishery Management Plan for U.S. West Coast Commercial and Recreational Salmon Fisheries off the Coast of Washington, Oregon, and California. PFMC, Portland. As Amended through Amendment 19, March 2016.

PFMC. 2019a. Coastal Pelagic Species Fishery Management Plan. Portland, Oregon. As Amended through Amendment 17, June.

PFMC. 2019b. Pacific Coast Ground Fish Fishery Management Plan For California, Oregon, and Washington Groundfish Fishery. Portland, Oregon. As Amended through Amendment 28, December.

Pinnix, W. D. 2008. Letter from William Pinnix documenting acoustic detections of green sturgeon in Humboldt Bay. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata, California. 21 pp.

Pinnix, W. D., T. A. Shaw, K. C. Acker and N. J. Hetrick. 2005. Fish communities in eelgrass, oyster culture, and mudflat habitats of North Humboldt Bay, California Final Report. U.S. Fish and Wildlife Service, Arcata Fish and Wildlife Office, Arcata Fisheries Program Technical Report Number TR2005-02, Arcata, California.

Pinnix, W. D., P. A. Nelson, G. Stutzer, and K. A. Wright. 2013. Residence time and habitat use of coho n in Humboldt Bay, California: An acoustic telemetry study. Environmental Biology of Fish 96:315-323.

Ricker, S.J., D. Ward, C.W. Anderson, and M. Reneski. 2014. Results of Freshwater Creek salmonid life cycle monitoring station 2010-2013. California Department of Fish and Wildlife, Anadromous Fisheries Resource Assessment and Monitoring Program, Fisheries Restoration Grant P0910513.

USACE (United States Army Corps of Engineers). 1998. Environmental Assay, Fiscal Year 1998 Spring Maintenance Dredging of the Humboldt Harbor, North Bay, Eureka, Samoa, and Field's Landing Channels.

Wallace, M., and S. Allen. 2007. Juvenile salmonid use of the tidal portions of selected tributaries to Humboldt Bay, California. California Department of Fish and Wildlife, Fisheries Restoration Grants Program Grant P0410504.

Weitkamp, L. A., T. C. Wainwright, G. J. Bryant, G. B. Milner, D. J. Teel, R. G. Kope, and R. S. Waples. 1995. Status review of coho salmon from Washington, Oregon, and California. NOAA Technical Memorandum NMFS-NWFSC-24. U.S. Department of Commerce, NOAA, Northwest Fisheries Science Center, Seattle, Washington. 258 pp.

Williams, T. H., S. T. Lindley, B. C. Spence, and D. A. Boughton. 2011. Status review for Pacific salmon and trout listed under the Endangered Species Act: Southwest. National Marine Fisheries Service, Southwest Fisheries Science Center, Santa Cruz, California.

Williams, T. H., B. C. Spence, D. A. Boughton, R. C. Johnson, L. Crozier, N. Mantua, M. O'Farrell, and S. T. Lindley. 2016. Viability assessment for Pacific salmon and steelhead listed under the Endangered Species Act: Southwest. 2 February 2016 Report to National Marine Fisheries Service – West Coast Region from Southwest Fisheries Science Center, Fisheries Ecology Division, Santa Cruz, California.