UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
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Refer to NMFS No: WCRO-2021-01271

September 15, 2021

Jacalen M. Printz
Chief, Regulatory Branch
U.S. Army Corps of Engineers, Seattle District
P.O. Box 3755
Seattle, WA 98124-3755

Re: Endangered Species Act Section 7(a)(2) Biological Opinion and Magnuson–Stevens Fishery Conservation and Management Act Essential Fish Habitat Response for the KAL Farms Irrigation Intake Replacement Project, Snake River – McNary pool (HUC170601100404), Walla Walla County, Washington.

Dear Ms. Printz:

Thank you for your letter of April 13, 2021, 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 KAL Farms Irrigation Intake Replacement Project. This consultation was conducted in accordance with the 2019 revised regulations that implement section 7 of the ESA (50 CFR 402, 84 FR 45016).

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. After reviewing the proposed action, we concluded that the action would adversely affect the EFH of Pacific Coast salmon. Therefore, we have included the results of that review in Section 3 of this document.

In this biological opinion (opinion), NMFS concludes that the action, as proposed, is not likely to jeopardize the continued existence of Snake River (SR) spring/summer-run Chinook salmon (*Oncorhynchus tshawytscha*), SR Basin steelhead (*O. mykiss*), SR fall-run Chinook salmon, or SR sockeye salmon (*O. nerka*). NMFS also determined the action will not destroy or adversely modify designated critical habitat for these species. The rationale for our conclusions is provided in the enclosed opinion.

As required by section 7 of the ESA, NMFS provides an incidental take statement (ITS) with the opinion. The ITS describes reasonable and prudent measures (RPMs) NMFS considers necessary or appropriate to minimize the impact of incidental take associated with this action. The take statement sets forth terms and conditions, including reporting requirements that the U.S. Army

Corps of Engineers must comply with to carry out the RPM. Incidental take from actions that meet these terms and conditions will be exempt from the ESA take prohibition.

This document also includes the results of our analysis of the action's effects on EFH pursuant to section 305(b) of the MSA, and includes two Conservation Recommendations to avoid, minimize, or otherwise offset potential adverse effects on EFH. These Conservation Recommendations are an identical set of the ESA Terms and Conditions. Section 305(b)(4)(B) of the MSA requires federal agencies to provide a detailed written response to NMFS within 30 days after receiving these recommendations. If the response is inconsistent with the EFH Conservation Recommendations, the Corps must explain why the recommendations will not be followed, including the justification for any disagreements over the effects of the action and the recommendations. 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, in your statutory reply to the EFH portion of this consultation, NMFS asks that you clearly identify the number of Conservation Recommendations accepted.

Please contact Todd Andersen, Snake Basin Office, (208) 366-9586, todd.andersen@noaa.gov if you have any questions concerning this consultation, or if you require additional information.

Sincerely,

Michael P. Tehan
Assistant Regional Administrator
Interior Columbia Basin Office

Enclosure

cc: David Moore - Corps
Eric Campbell – Campbell Environmental, LLC
Mike Lopez – Nez Perce Tribe
Gary James – Confederated Tribes of the Umatilla
Erin Kuttel – U.S. Fish and Wildlife Service

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

KAL Farms Irrigation Intake Replacement Project

NMFS Consultation Number: WCRO-2021-01271

Action Agency: U.S. Army Corps of Engineers

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?
Snake River Basin steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Snake River spring/summer Chinook salmon (*O. tshawytscha)*	Threatened	Yes	No	Yes	No
Snake River fall-run Chinook salmon (O. tshawytscha)	Threatened	Yes	No	Yes	No
Snake River sockeye salmon (O. nerka)	Endangered	Yes	No	Yes	No

Consultation Conducted By: National Marine Fisheries Service, West Coast Region

Issued By:
Michael P. Tehan
Assistant Regional Administrator

Date: *September 15, 2021*

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BA	Biological Assessment
BMP	Best Management Practice
CFR	Code of Federal Regulations
cfs	Cubic Feet Per Second
Corps (or COE)	U.S. Army Corps of Engineers
CR	Conservation Recommendation
CWA	Clean Water Act
DPS	Distinct Population Segment
DQA	Data Quality Act
EFH	Essential Fish Habitat
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
FMP	Fishery Management Plan
fps	Feet Per Second
FR	Federal Register
gpm	Gallons Per Minute
HAPC	Habitat Area of Particular Concern
ICTRT	Interior Columbia Technical Recovery Team
ISAB	Independent Scientific Advisory Board
ITS	Incidental Take Statement
LAA	Likely to Adversely Affect
MPG	Major Population Group
MSA	Magnuson–Stevens Fishery Conservation and Management Act
NMFS	National Marine Fisheries Service
OHM	Ordinary High Water Mark
opinion	Biological Opinion
PAH	Polycyclic Aromatic Hydrocarbons
PBF	Physical or Biological Feature
PCE	Primary Constituent Element
PFMC	Pacific Fishery Management Council
PCP	Pollution Control Plan
PROJECT	Kal Farms Irrigation Intake Replacement Project
RM	River Mile
RPA	Reasonable and Prudent Alternative
RPM	Reasonable and Prudent Measure
U.S.C.	U.S. Code
USGCRP	U.S. Global Change Research Program
VSP	Viable Salmonid Population
WDFW	Washington Department of Fish and Wildlife

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

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.), and implementing regulations at 50 CFR 402, as amended.

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 (https://repository.library.noaa.gov/welcome). A complete record of this consultation is on file at the Interior Columbia Basin Office, Boise, Idaho.

1.2. Consultation History

On April 13, 2021, NMFS received a letter requesting formal consultation from the U.S. Army Corps of Engineers (Corps) for the KAL Farms Irrigation Intake Replacement Project (project). The Corps also submitted a Biological Assessment (BA) to support their determinations on the species and critical habitat listed under ESA. The BA was prepared by Campbell Environment, LLC, on behalf of the IRZ Consulting, to facilitate the Corps' compliance with Section 7(a)(2) of the ESA. The project will require permits for Corps Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344). Formal ESA consultation was initiated on April 13, 2021.

The BA concluded that the proposed action is likely to adversely affect (LAA) Snake River (SR) spring-run Chinook salmon (*Oncorhynchus tshawytscha*), Snake River Basin (SRB) steelhead (*O. mykiss*), SR fall-run Chinook salmon (*O. tshawytscha*), and SR sockeye salmon (*O. nerka*). The BA also concluded that designated critical habitat for these four species would not likely be adversely affected (NLAA). The BA concluded that Essential Fish Habitat (EFH) for Pacific salmon, as designated by Section 305 of the Magnuson Stevens Fishery Conservation and Management Act (MSA), will not likely be adversely affected by the proposed project.

On July 13, 2021, NMFS sent the Corps an email stating that NMFS could not concur with the NLAA determination for designated critical habitat for SR spring-run Chinook salmon, SRB steelhead, SR fall-run Chinook salmon, and SR sockeye salmon. NMFS determined that the proposed action includes measures to limit effects to habitat, but those actions still appear likely to result in adverse effects to critical habitat. The Corps replied that same day and concurred that the determination for those species should be changed from NLAA to LAA.

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 (50 CFR 402.02).

The Corps proposes to authorize a permit to replace and relocate the aging intake screens on an existing irrigation pumping station located near river mile (RM) 7 along the Snake River near Burbank, Washington (Figure 1). The existing intake screens do not to meet NMFS

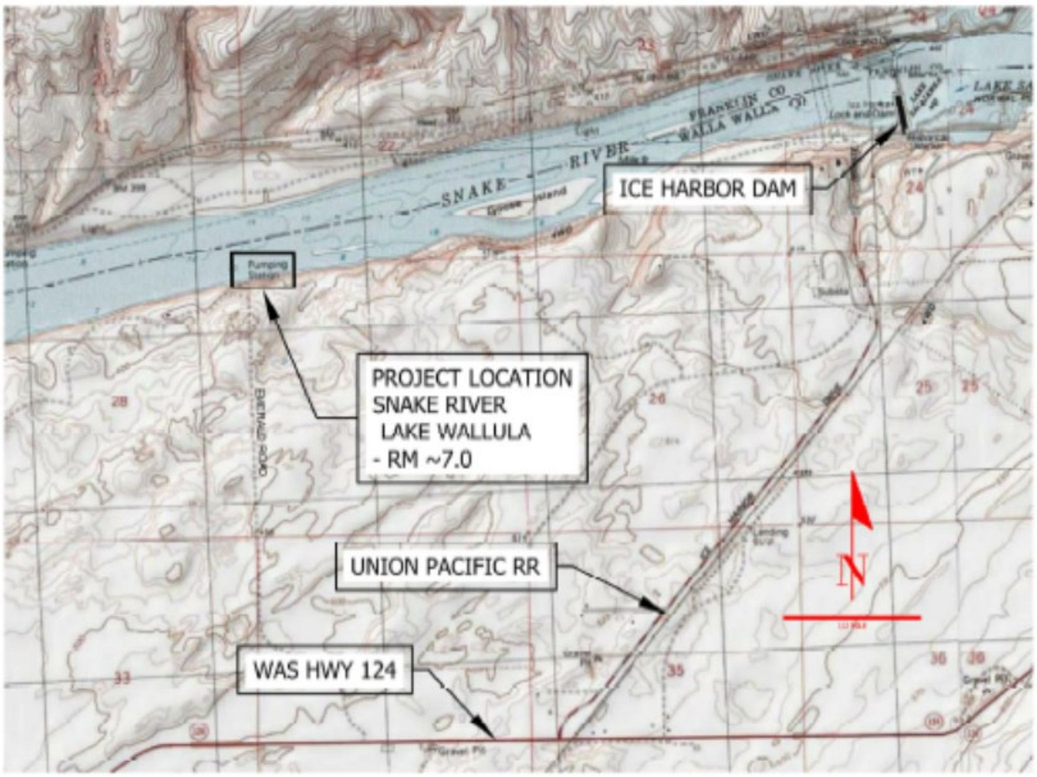

Figure 1. Location of the proposed action on the McNary pool, Snake River, Washington.

criteria for fish screens with both mesh size and approach velocities exceeding the criteria. The purpose of the proposed project is to replace and relocate the existing pumping station intake further from shoreline to ensure continued intake operation, to meet NMFS fish passage and screening criteria, and to reduce long-term maintenance. All work conducted below the ordinary high water level (OHW) of the Snake River will occur between December 15 and February 28, in compliance with the Washington Department of Fish and Wildlife (WDFW) winter work window and in order to complete the work outside of the irrigation season. The proposed project will require approximately 4 to 6 weeks of in-water work. As stated above, the Corps' authorities for permitting this action are derived from Section 10 of the Rivers and Harbors Act (33 U.S.C. 403) and Section 404 of the Clean Water Act (33 U.S.C. 1344).

The pumping station was originally constructed in the 1970s to provide irrigation water to local farms and is currently owned and operated by KAL Farms, LLC. The pumping station as a whole consists of five vertical turbine pumps, with a combined design capacity of 14,800 gallons per minute (gpm) (32.96 cubic feet per second [cfs]), and supplies water to approximately 1,500 acres (ac) of irrigated farmland. The Water Right Certificates allows for a maximum combined flow rate of 14,793 gpm (32.96 cfs). The proposed project will not increase the existing design capacity or maximum certificated flow rates.

The existing pumping station turbine pumps are suspended over the water on a concrete pump station deck (Figure 2). This structure currently has course screen material/panels on two sides (front face and downstream end) which are difficult to remove and clean in place. The placement of the proposed new sections of sheet pile wall will create a sump separated from the river.

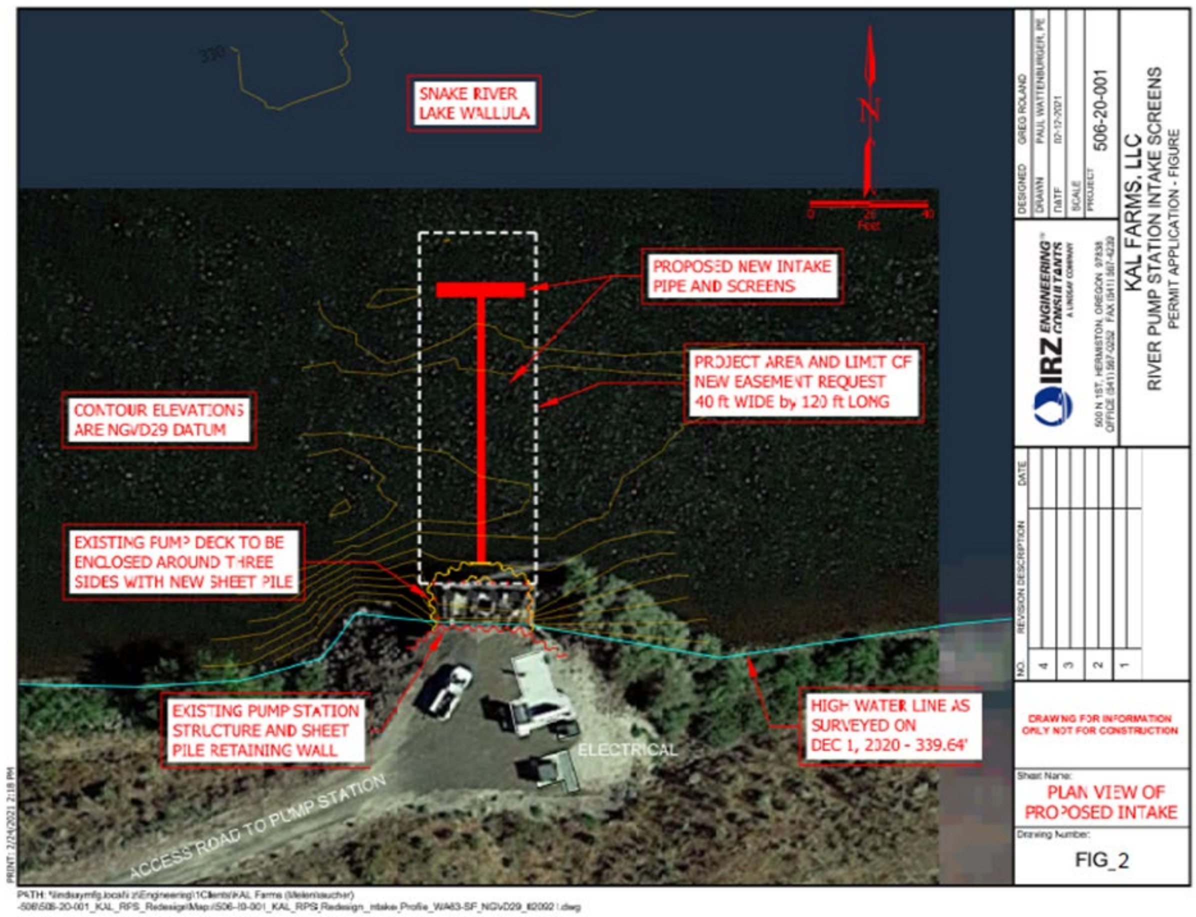

Figure 2. Photograph of existing pumping station and proposed location of 90 ft of new intake pipe and screens.

Each turbine pump currently has a cylindrical screen (3 feet in diameter by 8 feet tall), with a fine mesh opening, which appear to exceed the 0.09-inch minimum opening size required by NMFS. As such, the approach velocity exceeds the passive screen criteria of 0.2 feet per second (fps).

The new intake screens will be relocated to deeper water (approximately 100 away from the shoreline) and will be designed to meet current NMFS fish passage and intake screening criteria.

The proposed intake replacement will include the installation of a new 42-inch diameter intake pipe with two new half-barrel screens mounted over a 42-inch half-pipe manifold in a tee configuration. The new half-barrel tee screens will each measure 5 feet in diameter by 15 feet long and contain internal flow equalization baffles. The new tee screens will be affixed with NMFS-approved, slotted fish screen with 1.75 mm openings to ensure juvenile salmonids are not impinged or entrained onto the pump intake. The screens will be equipped with an airburst system that will actively clean the screens every 30 minutes to maintain an approach velocity of 0.2 fps, in compliance with NMFS criteria.

In order to reach the appropriate depth for the new tee screens and provide the proper hydraulic head, the majority of the 42-inch diameter intake pipe (approximately 90 feet) will be buried below the substrate. All excavated material for the intake pipe trench (consisting primarily of sand and rock) will be side-cast along the downstream side of the trench and then used to backfill over the new intake pipe. All in-water substrates temporarily disturbed during excavation will be restored to their pre-construction grade using the existing side-cast substrate material. The new intake screens and manifold at the end of the pipe will be supported on cradles anchored with two pairs of 12-inch diameter steel pilings (four pilings total).

The proposed project will also include installation of approximately 72 linear feet of new sheet pile around the three wet sides of the existing pump deck to create a sump and replace the existing screens around the pump deck. The top of this sheet pile wall will be level with the existing pump deck or about 15 feet above OHW. The wall will be as close to the upstream and downstream sides of the existing pump deck as possible, but will extend out approximately 6 feet at the center of the front of the pump deck. The new 42-inch intake pipe will penetrate the sheet pile wall at the center of the north side. An additional 8-foot section of sheet pile will be placed at the north face of the existing structure, but inside of the new wall and in line with the new 42-in intake pipe. This shorter wall will serve as an energy dissipater and flow diffuser to evenly distribute the flow to the existing five turbine pumps.

The riverbed material inside the sheet pile wall will be excavated to a level approximately 1- foot below the intake (328 feet NGVD29). The excavated material (river substrates) will be deposited in a slight depression in the riverbed located just northwest of the pump deck (see Figure 2). The pumps currently have cylindrical screens around the intake bell of each individual pump. These screens will be removed, and the pumps intakes will be dropped to the level of the bottom of the new intake pipe. These screens will be left to serve as baffling, and pumps will be lowered to the level of the bottom of the new intake pipe.

The total estimated volume of in-water excavation will be approximately 254 cubic yards (143 cubic yards from under the existing pump deck and 111 cubic yards for the trench to install the new intake pipe). It is anticipated that the Corps will grant a no-test exclusion for sediment within the excavation area based on the coarseness of the material (sand and rock), volume of material to be excavated (approximately 254 cubic yards), and the distance of the project area from potential sources of contamination.

All work conducted below the OHW of the Snake River will occur between December 15 and February 28, in order to complete the work outside of the irrigation season. The proposed project will require approximately 4 to 6 weeks of in-water work. All heavy equipment (i.e., crane and excavator) will access the project site via existing roadways, parking areas, disturbed upland areas, and floating barges. In-water work will be conducted from a barge using an excavator for trenching/excavation and a crane for placing the steel pilings, pipe, manifold, and screens. All steel pilings and sheet pile will be installed approximately 15 feet (or to refusal) into the substrate with a vibratory hammer.

It is anticipated that each pile will require approximately 30 minutes or less of vibratory hammer use for installation. In the event that the vibratory hammer cannot fully embed the piles to the required depth due to obstructions below the substrate, a few strikes from an impact hammer may be required to seat the pilings. The contractor will implement appropriate sound attenuation methods (i.e., "soft-start" procedures and use of a bubble curtain) as outlined in the conservation measures below. The proposed project may require temporary placement of two spud piles to stabilize the barge during piling installation.

Divers will direct the in-water work and carry out all required welding or bolting. Given the inwater depth of excavation (approximately 10 feet below Normal High Water level [340 feet]), it will not be feasible to completely isolate the in-water work area during proposed excavation activities. No upland ground disturbance or vegetation removal will be required. Upon project completion, the intake pumps will be operated consistent with state water rights and will typically be in operation during the months of April through October. As mentioned above, the existing maximum allowable water withdrawal rate for the pumping station is 14,793 gpm (32.96 cfs). The actual amount pumped during any given season is dependent on the water requirements during that year. There will be no changes made to the existing pump capacities at these stations and there will be no increase in current allowable operational withdrawal rates.

The proposed project will result in approximately 57 cubic yards of permanent, net fill within the reservoir (i.e., below the OHW of the Snake River) associated with installation of the new intake pipe, manifold, tee screens, sheet pile and steel pilings. The vast majority of this new fill (over 80%) will occur below the existing riverbed, and will be covered with native substrates.

Appropriate conservation measures have been incorporated into the proposed project design to minimize and avoid adverse effects to ESA-listed species, their designated critical habitat elements, and EFH. These measures will include the following:

- All work conducted below the OHW will occur between December 15 and February 28; a period when ESA-listed species are less likely to be present within the vicinity of the project area. The WDFW designated winter in-water work period for this reach of the Snake River is December 15 to February 28.

- All heavy equipment (i.e., crane and excavator) will access the project site via existing roadways, parking areas, disturbed upland areas, and/or floating barges.

- All sheet piling and new steel pilings will be installed with a vibratory hammer. In the event that the vibratory hammer cannot fully embed the piles to the necessary depth, the contractor will use an impact hammer to seat the piles. Use of an impact hammer will be limited to daylight hours between 7 a.m. and 7 p.m.

- During the use of an impact hammer, a multi-level bubble curtain will be installed to reduce sound pressure levels. The bubble curtain system shall conform to the following:

  - If water velocity is greater than 1.6 feet per second, surround the piling being driven by a confined bubble curtain (e.g., a bubble ring surrounded by a fabric or non-metallic sleeve) that will distribute air bubbles around 100% of the piling perimeter for the full depth of the water column.

  - Piling shall be completely engulfed in bubbles over the full depth of the water column at all times when an impact pile driver is in use. Bubbles are not required during vibratory pile driving.

- The contractor will initiate daily "soft-start" procedures to provide a warning and/or give species near piling/sheet pile installation activities a chance to leave the area prior to a vibratory hammer or impact driver operating at full capacity; thereby, exposing fewer species to loud underwater and airborne sounds.

  - A soft-start procedure will be used at the beginning of in-water piling installation, or any time piling installation has ceased for more than 30 minutes.

  - For vibratory hammer operation, the contractor will initiate noise from vibratory hammers for 15 seconds at reduced energy followed by a 30-second waiting period. The procedure shall be repeated two additional times.

  - For impact pile driving (if necessary), the contractor will provide an initial set of strikes from the impact hammer at reduced energy, followed by a 30-second waiting period, then two subsequent sets. (The reduced energy of an individual hammer cannot be quantified given the variations between individual drivers. In addition, the number of strikes will vary at reduced energy given that raising the hammer at less than full power and then releasing it results in the hammer bouncing as it strikes the pile, resulting in multiple strikes).

- All excavated materials and leave surface will be suitable for in-water disposal.

- A Pollution Control Plan (PCP) will be prepared by the contractor and carried out commensurate with the scope of the project that includes the following:

  - Best management practices (BMPs) to confine, remove, and dispose of construction waste.

  - Procedures to contain and control a spill of any hazardous material.

  - Steps to cease work under high flow conditions.

- All conditions of Washington Department of Ecology (WDOE's) 401 Water Quality Certification will be followed.

- Only enough supplies and equipment to complete the project will be stored on site.

- All equipment will be inspected daily for fluid leaks, any leaks detected will be repaired before operation is resumed.

- Before operations begin, and as often as necessary during operation, all equipment that will be used below the OHW will be steam cleaned until all visible oil, grease, mud, and other visible contaminates are removed.

- Stationary power equipment operated within 150 feet of the Snake River will be diapered to prevent leaks.

- The new cylindrical tee screens will be affixed with NMFS-approved slotted fish screen to ensure juvenile salmonids are not impinged or entrained onto the pump intake.

- All new pilings will be fitted with devices to prevent perching by piscivorous birds.

- The new intake screens will be equipped with a self-monitoring system that will measure hydraulic head and reduce intake velocities as necessary to maintain an approach velocity of 0.2 feet per second (fps), in compliance with NMFS criteria.

- The new intake screens will also be equipped with an airburst system that will actively clean the screens to maintain an approach velocity of 0.2 fps, in compliance with NMFS criteria.

We considered, under the ESA, whether or not the proposed action would cause any other activities and determined that it would not cause any interrelated activities. As discussed above, the purpose of the proposed project is to replace the existing irrigation intake with new cylindrical tee screens and relocate them to deeper water (approximately 100 feet out from the existing pumping station), in order to ensure continued intake operation, meet current NMFS fish passage and screening criteria, and reduce maintenance needs. This action does not include any change in the amount of water withdrawn by KAL Farms; there will be no change in the farm's existing water rights.

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 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.

2.1. Analytical Approach

This 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 opinion 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 (species) use(s) the term primary constituent element (PCE) or essential features. The 2016 critical habitat regulations (50 CFR 424.12) replaced these terms 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 opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

The 2019 regulations define effects of the action using the term "consequences" (50 CFR 402.02). As explained in the preamble to the regulations (84 FR 44977), that definition 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 in the action area.
- 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 (RPA) to the proposed action.

2.2. Rangewide Status of the Species and Critical Habitat

This opinion examines the status of each species that would be adversely affected by the proposed action. The status is determined by the level of extinction risk that the listed species face, based on parameters considered in documents such as recovery plans, status reviews, and listing decisions. This informs the description of the species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The opinion also examines the condition of critical habitat throughout the designated area, evaluates the conservation value of the various watersheds that make up the designated area, and discusses the function of the PBFs that are essential for the conservation of the species. The Federal Register notices and notice dates for the species and critical habitat listings considered in this opinion are included in Table 1.

Table 1. Listing status, status of critical habitat designations and protective regulations, and relevant Federal Register decision notices for ESA-listed species considered in this opinion.

Species	Listing Status	Critical Habitat	Protective Regulations
Chinook salmon *(Oncorhynchus tshawytscha)*			
Snake River spring/summer-run	T 6/28/05; 70 FR 37160	10/25/99; 64 FR 57399	6/28/05; 70 FR 37160
Snake River fall-run	T 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	6/28/05; 70 FR 37160
Sockeye salmon *(O. nerka)*			
Snake River	E 6/28/05; 70 FR 37160	12/28/93; 58 FR 68543	ESA section 9 applies
Steelhead (*O. mykiss*)			
Snake River Basin	T 1/05/06; 71 FR 834	9/02/05; 70 FR 52630	6/28/05; 70 FR 37160

Note: Listing status 'T' means listed as threatened under the ESA; 'E' means listed as endangered.

The status of each species and designated critical habitats are described further in Sections 2.2.1 and 2.2.3, respectively. One factor affecting the status of ESA-listed species considered in this Opinion, and aquatic habitat at large, is climate change. The impact of climate change on species and their designated critical habitat is discussed on Section 2.2.3.

2.2.1.Status of the Species

This section describes the present condition of the Snake River spring/summer Chinook salmon, Snake River fall Chinook salmon, and Snake River sockeye salmon evolutionarily significant units (ESUs), and the Snake River basin steelhead distinct population segment (DPS). NMFS expresses the status of a salmonid ESU or DPS in terms of likelihood of persistence over 100 years (or risk of extinction over 100 years). NMFS uses McElhany et al.'s (2000) description of a viable salmonid population (VSP) that defines "viable" as less than a 5 percent risk of extinction within 100 years and "highly viable" as less than a 1 percent risk of extinction within 100 years. A third category, "maintained," represents a less than 25 percent risk within

100 years (moderate risk of extinction). To be considered viable, an ESU or DPS should have multiple viable populations so that a single catastrophic event is less likely to cause the ESU/DPS to become extinct and so that the ESU/DPS may function as a metapopulation that can sustain population-level extinction and recolonization processes (ICTRT 2007). The risk level of the ESU/DPS is built up from the aggregate risk levels of the individual populations and major population groups (MPGs) that make up the ESU/DPS.

Attributes associated with a VSP are: (1) abundance (number of adult spawners in natural production areas); (2) productivity (adult progeny per parent); (3) spatial structure; and (4) diversity. A VSP needs sufficient levels of these four population attributes in order to: safeguard the genetic diversity of the listed ESU or DPS; enhance its capacity to adapt to various environmental conditions; and allow it to become self-sustaining in the natural environment (ICTRT 2007). These viability attributes are influenced by survival, behavior, and experiences throughout the entire salmonid life cycle, characteristics that are influenced in turn by habitat and other environmental and anthropogenic conditions. The present risk faced by the ESU/DPS informs NMFS' determination of whether additional risk will appreciably reduce the likelihood that the ESU/DPS will survive or recover in the wild.

The following sections summarize the status and available information on the species and designated critical habitats considered in this opinion based on the detailed information provided by the ESA Recovery Plan for Snake River Spring/Summer Chinook salmon & Snake River Basin Steelhead (NMFS 2017a), ESA Recovery Plan for Snake River Fall Chinook salmon (NMFS 2017b), ESA Recovery Plan for Snake River sockeye salmon (NMFS 2015), Status review update for Pacific salmon and steelhead listed under the Endangered Species Act: Pacific Northwest (NWFSC 2015), and 2016 5-year review: Summary and evaluation of Snake River sockeye salmon, Snake River spring-summer Chinook, Snake River fall-run Chinook, Snake River Basin steelhead (NMFS 2016)]. These five documents are incorporated by reference here. Additional information (e.g., abundance estimates) has become available since the latest status review (NMFS 2016) and its technical support document (NWFSC 2015). This latest information represents the best scientific and commercial data available and is also summarized in the following sections.

2.2.1.1. Snake River Spring/Summer Chinook Salmon

The Snake River spring/summer Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Large portions of historical habitat were blocked in 1901 by the construction of Swan Falls Dam, on the Snake River, and later by construction of the three-dam Hells Canyon Complex from 1955 to 1967. Dam construction also blocked and/or hindered fish access to historical habitat in the Clearwater River basin as a result of the construction of Lewiston Dam (removed in 1973 but believed to have caused the extirpation of native Chinook salmon in that subbasin). The loss of this historical habitat substantially reduced the spatial structure of this species. The production of SR spring/summer Chinook salmon was further affected by the development of the eight Federal dams and reservoirs in the mainstem lower Columbia/Snake River migration corridor between the late 1930s and early 1970s (NMFS 2017a).

Several factors led to NMFS' conclusion that Snake River spring/summer Chinook salmon were threatened: (1) abundance of naturally produced Snake River spring and summer Chinook runs had dropped to a small fraction of historical levels; (2) short-term projections were for a continued downward trend in abundance; (3) hydroelectric development on the Snake and Columbia Rivers continued to disrupt Chinook runs through altered flow regimes and impacts on estuarine habitats; and (4) habitat degradation existed throughout the region, along with risks associated with the use of outside hatchery stocks in particular areas (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History. Snake River spring/summer Chinook salmon are characterized by their return times. Runs classified as spring Chinook salmon are counted at Bonneville Dam beginning in early March and ending the first week of June; summer runs are those Chinook salmon adults that pass Bonneville Dam from June through August. Returning adults will hold in deep mainstem and tributary pools until late summer, when they move up into tributary areas and spawn. In general, spring-run type Chinook salmon tend to spawn in higher-elevation reaches of major Snake River tributaries in mid- through late August, and summer-run Chinook salmon tend to spawn lower in Snake River tributaries in late August and September (although the spawning areas of the two runs may overlap).

Spring/summer Chinook spawn follow a "stream-type" life history characterized by rearing for a full year in the spawning habitat and migrating in early to mid-spring as age-1 smolts (Healey 1991). Eggs are deposited in late summer and early fall, incubate over the following winter, and hatch in late winter and early spring of the following year. Juveniles rear through the summer, and most overwinter and migrate to sea in the spring of their second year of life. Depending on the tributary and the specific habitat conditions, juveniles may migrate extensively from natal reaches into alternative summer-rearing or overwintering areas. Snake River spring/summer Chinook salmon return from the ocean to spawn primarily as 4- and 5-year-old fish, after 2 to 3 years in the ocean. A small fraction of the fish return as 3-year-old "jacks," heavily predominated by males (Good et al. 2005).

Spatial Structure and Diversity. The Snake River ESU includes all naturally spawning populations of spring/summer Chinook in the mainstem Snake River (below Hells Canyon Dam) and in the Tucannon River, Grande Ronde River, Imnaha River, and Salmon River subbasins (57 FR 23458), as well as the progeny of 13 artificial propagation programs (85 FR 81822). The hatchery programs include the McCall Hatchery (South Fork Salmon River), South Fork Salmon River Eggbox, Johnson Creek, Pahsimeroi River, Yankee Fork Salmon River, Panther Creek, Sawtooth Hatchery, Tucannon River, Lostine River, Catherine Creek, Lookingglass Creek, Upper Grande Ronde River, and Imnaha River programs. The historical Snake River ESU likely also included populations in the Clearwater River drainage and extended above the Hells Canyon Dam complex.

Within the Snake River ESU, the Interior Columbia Technical Recovery Team (ICTRT) identified 28 extant and 4 extirpated or functionally extirpated populations of spring/summer-run Chinook salmon, listed in Table 2 (ICTRT 2003; McClure et al. 2005). The ICTRT aggregated these populations into five MPGs: Lower Snake River, Grande Ronde/Imnaha Rivers, South

Fork Salmon River, Middle Fork Salmon River, and Upper Salmon River. For each population, Table 2 shows the current risk ratings that the ICTRT assigned to the four parameters of a VSP (spatial structure, diversity, abundance, and productivity).

Spatial structure risk is low to moderate for most populations in this ESU (NWFSC 2015) and is generally not preventing the recovery of the species. Spring/summer Chinook salmon spawners are distributed throughout the ESU albeit at very low numbers. Diversity risk, on the other hand, is somewhat higher, driving the moderate and high combined spatial structure/diversity risks shown in Table 2 for some populations. Several populations have a high proportion of hatchery-origin spawners—particularly in the Grande Ronde, Lower Snake, and South Fork Salmon MPGs—and diversity risk will need to be lowered in multiple populations in order for the ESU to recover (ICTRT 2007; ICTRT 2010; NWFSC 2015).

Abundance and Productivity. Historically, the Snake River drainage is thought to have produced more than 1.5 million adult spring/summer Chinook salmon in some years (Matthews and Waples 1991), yet in 1994 and 1995, fewer than 2,000 naturally produced adults returned to the Snake River (ODFW and WDFW 2019). From the mid-1990s and the early 2000s, the population increased dramatically and peaked in 2001 at 45,273 naturally produced adult returns. Since 2001, the numbers have fluctuated between 32,324 (2003) and 4,425 (2017), and the trend for the most recent 5 years (2016–2020) has been generally downward (ODFW and WDFW 2021). Furthermore, the most recent returns indicate that all populations in the ESU were below replacement for the 2013 brood year (Felts et al. 2019)[1] which reduced abundance across the ESU. Although most populations in this ESU have increased in abundance since listing, 27 of the 28 extant populations remain at high risk of extinction due to low abundance/productivity, with one population (Chamberlin Creek) at moderate risk of extinction (NWFSC 2015). All currently extant populations of Snake River spring/summer Chinook salmon will likely have to increase in abundance and productivity in order for the ESU to recover (Table 2).

Table 2. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River spring/summer Chinook salmon evolutionarily significant unit (NWFSC 2015).

Major Population Group	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
South Fork Salmon River (Idaho)	Little Salmon River	*Insuf. data*	Low	High Risk
	South Fork Salmon River mainstem	High	Moderate	High Risk
	Secesh River	High	Low	High Risk
	East Fork South Fork Salmon River	High	Low	High Risk
Middle Fork Salmon River (Idaho)	Chamberlain Creek	Moderate	Low	Maintained
	Middle Fork Salmon River below Indian Creek	*Insuf. data*	Moderate	High Risk
	Big Creek	High	Moderate	High Risk
	Camas Creek	High	Moderate	High Risk
	Loon Creek	High	Moderate	High Risk
	Middle Fork Salmon River above Indian Creek	High	Moderate	High Risk

[1] The return size is not known until 5 years after the brood year. Preliminary results for the 2019 redd counts indicate that the 2014 brood year will be below replacement for the vast majority (possibly all) of the populations in the Snake River spring/summer Chinook salmon ESU.

Major Population Group	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
	Sulphur Creek	High	Moderate	High Risk
	Bear Valley Creek	High	Low	High Risk
	Marsh Creek	High	Low	High Risk
Upper Salmon River (Idaho)	North Fork Salmon River	*Insuf. data*	Low	High Risk
	Lemhi River	High	High	High Risk
	Salmon River Lower Mainstem	High	Low	High Risk
	Pahsimeroi River	High	High	High Risk
	East Fork Salmon River	High	High	High Risk
	Yankee Fork Salmon River	High	High	High Risk
	Valley Creek	High	Moderate	High Risk
	Salmon River Upper Mainstem	High	Low	High Risk
	Panther Creek			***Extirpated***
Lower Snake (Washington)	Tucannon River	High	Moderate	High Risk
	Asotin Creek			***Extirpated***
Grande Ronde and Imnaha Rivers (Oregon/ Washington)	Wenaha River	High	Moderate	High Risk
	Lostine/Wallowa River	High	Moderate	High Risk
	Minam River	High	Moderate	High Risk
	Catherine Creek	High	Moderate	High Risk
	Upper Grande Ronde River	High	High	High Risk
	Imnaha River	High	Moderate	High Risk
	Lookingglass Creek			***Extirpated***
	Big Sheep Creek			***Extirpated***

2.2.1.2. Snake River Fall-run Chinook Salmon

The Snake River fall Chinook salmon ESU was listed as threatened on April 22, 1992 (57 FR 14653). This ESU occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Snake River fall Chinook salmon have substantially declined in abundance from historic levels, primarily due to the loss of primary spawning and rearing areas upstream of the Hells Canyon Dam complex (57 FR 14653). Additional concerns for the species have been the high percentage of hatchery fish returning to natural spawning grounds and the relatively high aggregate harvest impacts by ocean and in-river fisheries (Good et al. 2005). On May 26, 2016, in the agency's most recent 5-year status review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History. Snake River fall Chinook salmon enter the Columbia River in July and August, and migrate past the lower Snake River mainstem dams from August through November. Fish spawning takes place from October through early December in the mainstem of the Snake River, primarily between Asotin Creek and Hells Canyon Dam, and in the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers (Connor and Burge 2003; Ford 2011). Spawning has occasionally been observed in the tailrace areas of the four-mainstem dams (Dauble et al. 1999; Dauble et al. 1995; Dauble et al. 1994; Mueller 2009). Juveniles emerge from the gravels in March and April of the following year.

Until relatively recently, Snake River fall Chinook were assumed to follow an "ocean-type" life history (Dauble and Geist 2000; Good et al. 2005; Healey 1991; NMFS 1992) where they migrate to the Pacific Ocean during their first year of life, normally within 3 months of emergence from spawning substrate as age-0 smolts, to spend their first winter in the ocean. Ocean-type Chinook salmon juveniles tend to display a "rear as they go" rearing strategy in which they continually move downstream through shallow shoreline habitats their first summer and fall until they reach the ocean by winter (Connor and Burge 2003; Coutant and Whitney 2006). Tiffan and Connor (2012) showed that subyearling fish favor water less than six feet deep.

Several studies have shown that another life history pattern exists where a significant number of smaller Snake River fall Chinook juveniles overwinter in Snake River reservoirs prior to outmigration. These fish begin migration later than most, arrest their seaward migration and overwinter in reservoirs on the Snake and Columbia Rivers, then resume migration and enter the ocean in early spring as age-1 smolts (Connor and Burge 2003; Connor et al. 2002; Connor et al. 2005; Hegg et al. 2013). Connor et al. (2005) termed this life history strategy "reservoir-type." Scale samples from natural-origin adult fall Chinook salmon taken at Lower Granite Dam have indicated that approximately half of the returns overwintered in freshwater (Ford 2011).

Spatial Structure and Diversity. The Snake River fall Chinook salmon ESU includes one extant population of fish spawning in the mainstem of the Snake River and the lower reaches of several of the associated major tributaries including the Tucannon, Grande Ronde, Clearwater, Salmon, and Imnaha Rivers. The ESU also includes four artificial propagation programs: Lyons Ferry Hatchery, Fall Chinook Acclimation Ponds, Nez Perce Tribal Hatchery, and Idaho Power Program (85 FR 81822). Historically, this ESU included one large additional population spawning in the mainstem of the Snake River upstream of the Hells Canyon Dam complex, an impassable migration barrier (NWFSC 2015). Four of the five historic major spawning areas in the Lower Snake population currently have natural-origin spawning. Spatial structure risk for the existing ESU is therefore low and is not precluding recovery of the species (NWFSC 2015).

There are several diversity concerns for Snake River fall Chinook salmon, leading to a moderate diversity risk rating for the extant Lower Snake population. One concern is the high proportion of hatchery fish spawning across the major spawning areas within the population (NWFSC 2015; NMFS 2017b). Between 2000 and 2014, the 5-year average proportion of hatchery-origin fish has ranged from 38 percent (1990-1994) to 69 percent (2010-2014) (NWFSC 2015). The moderate diversity risk is also driven by changes in major life history patterns; shifts in phenotypic traits; high levels of genetic homogeneity in samples from natural-origin returns; selective pressure imposed by current hydropower operations; and cumulative harvest impacts (NWFSC 2015). Diversity risk will need to be reduced to low in order for this population to be considered highly viable, a requirement for recovery of the species. Low diversity risk would require that one or more major spawning areas produce a significant level of natural-origin spawners with low influence by hatchery-origin spawners (NWFSC 2015).

Abundance and Productivity. Historical abundance of Snake River fall Chinook salmon is estimated to have been 416,000 to 650,000 adults (NMFS 2006), but numbers declined drastically over the 20th century, with only 78 natural-origin fish (WDFW and ODFW 2020) and

306 hatchery-origin fish (FPC 2019) passing Lower Granite Dam in 1990. Artificial propagation of fall Chinook salmon occurred from 1901 through 1909 and again from 1955 through 1973, but those efforts ultimately failed and, by the late 1970s, essentially all Snake River fall Chinook salmon were natural-origin. The large-scale hatchery effort that exists today began in 1976, when Congress authorized the Lower Snake River Compensation Plan to compensate for fish and wildlife losses caused by the construction and operation of the four lower Snake River dams. The first hatchery fish from this effort returned in 1981 and hatchery returns have comprised a substantial portion of the run every year since.

After 1990, abundance increased dramatically, and in 2014 the 5-year geometric mean (2010–2014) was 11,855 natural-origin adult returns (WDFW and ODFW 2021). This is well above the minimum abundance of 4,200 natural-origin spawners needed for highly viable status. However, the productivity estimate for the 1990–2009 brood years is 1.5, which is below the 1.7 minimum needed for highly viable status. The best available scientific and commercial data available with respect to the adult abundance of this species indicates a substantial downward trend in the abundance of natural-origin spawners from 2013 to 2020. Five-year geometric means in the numbers of natural-origin spawners through 2020 have ranged from a high of 14,343 in 2016 to a low of 7,393 in 2020 (WDFW and ODFW 2021). Even with this decline, the overall abundance has remained higher than before 2005, and appear to remain above the minimum abundance threshold. NMFS will evaluate the viability risk of these more recent returns in the upcoming 5-year status review, expected in late 2021.

2.2.1.3. Snake River Sockeye Salmon

This ESU includes all anadromous and residual sockeye salmon from the Snake River basin in Idaho, as well as artificially propagated sockeye salmon from the Redfish Lake captive propagation and Snake River sockeye salmon hatchery programs (85 FR 81822). The ESU was first listed as endangered under the ESA in 1991, and the listing was reaffirmed in 2005 (70 FR 37160). Reasons for the decline of this species include high levels of historic harvest, dam construction including hydropower development on the Snake and Columbia Rivers, water diversions and water storage, predation on juvenile salmon in the mainstem river migration corridor, and active eradication of sockeye from some lakes in the 1950s and 1960s (56 FR 58619; ICTRT 2003). On May 26, 2016, in the agency’s most recent 5-year status review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as endangered (81 FR 33468).

Life History. Snake River sockeye salmon adults enter the Columbia River primarily during June and July, and arrive in the Sawtooth Valley peaking in August. The Sawtooth Valley supports the only remaining run of Snake River sockeye salmon. The adults spawn in lakeshore gravels, primarily in October (Bjornn et al. 1968). Eggs hatch in the spring between 80 and 140 days after spawning. Fry remain in the gravel for three to five weeks, emerge from April through May, and move immediately into the lake. Once there, juveniles feed on plankton for 1 to 3 years before they migrate to the ocean, leaving their natal lake in the spring from late April through May (Bjornn et al. 1968). Snake River sockeye salmon usually spend 2 to 3 years in the Pacific Ocean and return to Idaho in their 4^{th} or 5^{th} year of life.

Spatial Structure and Diversity. Within the Snake River ESU, the ICTRT identified historical sockeye salmon production in five Sawtooth Valley lakes, in addition to Warm Lake and the Payette Lakes in Idaho and Wallowa Lake in Oregon (ICTRT 2003). The sockeye runs to Warm, Payette, and Wallowa Lakes are now extinct, and the ICTRT identified the Sawtooth Valley lakes as a single MPG for this ESU. The MPG consists of the Redfish, Alturas, Stanley, Yellowbelly, and Pettit Lake populations (ICTRT 2007). The only extant population is Redfish Lake, supported by a captive broodstock program. Hatchery fish from the Redfish Lake captive propagation program have also been outplanted in Alturas and Pettit Lakes since the mid-1990s in an attempt to reestablish those populations (Ford 2011).

With such a small number of populations in this MPG, increasing the number of populations would substantially reduce the risk faced by the ESU (ICTRT 2007). The Northwest Fisheries Science Center (NWFSC) (2015) reports some evidence of very low levels of early-timed returns in some recent years from outmigrating naturally-produced Alturas Lake smolts, but the ESU remains at high risk for spatial structure.

Currently, the Snake River sockeye salmon run is highly dependent on a captive broodstock program operated at the Sawtooth Hatchery and Eagle Hatchery. Although the captive brood program rescued the ESU from extinction, diversity risk remains high without sustainable natural production (Ford 2011; NWFSC 2015).

Abundance and Productivity. Prior to the turn of the 20th century (ca. 1880), around 150,000 sockeye salmon ascended the Snake River to the Wallowa, Payette, and Salmon River basins to spawn in natural lakes (Evermann 1896, as cited in Chapman et al. 1990). The Wallowa River sockeye run was considered extinct by 1905, the Payette River run was blocked by Black Canyon Dam on the Payette River in 1924, and anadromous Warm Lake sockeye in the South Fork Salmon River basin may have been trapped in Warm Lake by a land upheaval in the early 20th century (ICTRT 2003). In the Sawtooth Valley, the Idaho Department of Fish and Game eradicated sockeye from Yellowbelly, Pettit, and Stanley Lakes in favor of other species in the 1950s and 1960s, and irrigation diversions led to the extirpation of sockeye in Alturas Lake in the early 1900s (ICTRT 2003), leaving only the Redfish Lake sockeye. From 1991 to 1998, a total of just 16 wild adult anadromous sockeye salmon returned to Redfish Lake. These 16 wild fish were incorporated into a captive broodstock program that began in 1992 and has since expanded so that the program currently releases hundreds of thousands of juvenile fish each year in the Sawtooth Valley (Ford 2011).

Even with the increase in hatchery production, adult returns to Sawtooth Valley have varied. The highest returns were seen in 2010, 2011, and 2014, ranging from 1,099 to 1,516 during these years (Johnson et al. 2020). The general increases observed in the number of adult returns during 2008-2014 is likely due to a number of factors, including increases in hatchery production and favorable marine conditions. The highest number of adults (1,516) returned in 2014, but numbers have generally declined since that time to a low of 17 in 2019 (Johnson et al. 2020). The total number of returning adults documented in the Sawtooth Valley in 2020 was 152 (Dan Baker, IDFG, email sent to Chad Fealko, NMFS, November 2, 2021 regarding 2020 sockeye returns). The recent general decline is in part due to poor survival and growth in the ocean.

The increased abundance of hatchery reared Snake River sockeye reduces the risk of immediate loss, yet levels of naturally produced sockeye returns remain extremely low (NWFSC 2015). The ICTRT's viability target is at least 1,000 naturally produced spawners per year in each of Redfish and Alturas Lakes and at least 500 in Pettit Lake (ICTRT 2007). Very low numbers of adults survived upstream migration in the Columbia and Snake Rivers in 2015 due to unusually high water temperatures. The implications of this high mortality for the recovery of the species are uncertain and depend on the frequency of similar high water temperatures in future years (NWFSC 2015).

The species remains at high risk across all four risk parameters (spatial structure, diversity, abundance, and productivity). Although the captive brood program has been highly successful in producing hatchery *O. nerka*, substantial increases in survival rates across all life history stages must occur in order to reestablish sustainable natural production (NWFSC 2015). In particular, juvenile and adult losses during travel through the Salmon, Snake, and Columbia River migration corridor continue to present a significant threat to species recovery (NMFS 2015).

2.2.1.4. Snake River Basin Steelhead

The Snake River basin steelhead was listed as a threatened ESU on August 18, 1997 (62 FR 43937), with a revised listing as a DPS on January 5, 2006 (71 FR 834). This DPS occupies the Snake River basin, which drains portions of southeastern Washington, northeastern Oregon, and north/central Idaho. Reasons for the decline of this species include substantial modification of the seaward migration corridor by hydroelectric power development on the mainstem Snake and Columbia Rivers, loss of habitat above the Hells Canyon Dam complex on the mainstem Snake River, and widespread habitat degradation and reduced streamflows throughout the Snake River basin (Good et al. 2005). Another major concern for the species is the threat to genetic integrity from past and present hatchery practices, and the high proportion of hatchery fish in the aggregate run of Snake River basin steelhead over Lower Granite Dam (Good et al. 2005; Ford 2011). On May 26, 2016, in the agency's most recent 5-year status review for Pacific salmon and steelhead, NMFS concluded that the species should remain listed as threatened (81 FR 33468).

Life History. Adult Snake River basin steelhead enter the Columbia River from late June to October to begin their migration inland. After holding over the winter in larger rivers in the Snake River basin, steelhead disperse into smaller tributaries to spawn from March through May. Earlier dispersal occurs at lower elevations and later dispersal occurs at higher elevations. Juveniles emerge from the gravels in 4 to 8 weeks, and move into shallow, low-velocity areas in side channels and along channel margins to escape high velocities and predators (Everest and Chapman 1972). Juvenile steelhead then progressively move toward deeper water as they grow in size (Bjornn and Rieser 1991). Juveniles typically reside in fresh water for 1 to 3 years, although this species displays a wide diversity of life histories. Smolts migrate downstream during spring runoff, which occurs from March to mid-June depending on elevation, and typically spend 1 to 2 years in the ocean.

Spatial Structure and Diversity. This species includes all naturally-spawning steelhead populations below natural and manmade impassable barriers in streams in the Snake River basin of southeast Washington, northeast Oregon, and Idaho, as well as the progeny of six artificial propagation programs (85 FR 81822). The artificial propagation programs include the Dworshak National Fish Hatchery, Salmon River B-run, South Fork Clearwater B-run, East Fork Salmon River Natural, Tucannon River, and the Little Sheep Creek/Imnaha River programs. The Snake River basin steelhead listing does not include resident forms of *O. mykiss* (rainbow trout) co-occurring with steelhead.

The ICTRT identified 24 extant populations within this DPS, organized into five MPGs (ICTRT 2003). The ICTRT also identified a number of potential historical populations associated with watersheds above the Hells Canyon Dam complex on the mainstem Snake River, a barrier to anadromous migration. The five MPGs with extant populations are the Clearwater River, Salmon River, Grande Ronde River, Imnaha River, and Lower Snake River. In the Clearwater River, the historic North Fork population was blocked from accessing spawning and rearing habitat by Dworshak Dam. Current steelhead distribution extends throughout the DPS, such that spatial structure risk is generally low. For each population in the DPS, Table 3 shows the current risk ratings for the parameters of a VSP (spatial structure, diversity, abundance, and productivity).

The Snake River basin DPS steelhead exhibit a diversity of life-history strategies, including variations in fresh water and ocean residence times. Traditionally, fisheries managers have classified Snake River basin steelhead into two groups, A-run and B-run, based on ocean age at return, adult size at return, and migration timing. A-run steelhead predominantly spend 1 year in the ocean; B-run steelhead are larger with most individuals returning after 2 years in the ocean. New information shows that most Snake River populations support a mixture of the two run types, with the highest percentage of B-run fish in the upper Clearwater River and the South Fork Salmon River; moderate percentages of B-run fish in the Middle Fork Salmon River; and very low percentages of B-run fish in the Upper Salmon River, Grande Ronde River, and Lower Snake River (NWFSC 2015). Maintaining life history diversity is important for the recovery of the species.

Diversity risk for populations in the DPS is either moderate or low. Large numbers of hatchery steelhead are released in the Snake River, and the relative proportion of hatchery adults in natural spawning areas near major hatchery release sites remains uncertain. Moderate diversity risks for some populations are thus driven by the high proportion of hatchery fish on natural spawning grounds and the uncertainty regarding these estimates (NWFSC 2015). Reductions in hatchery-related diversity risks would increase the likelihood of these populations reaching viable status.

Table 3. Summary of viable salmonid population (VSP) parameter risks and overall current status for each population in the Snake River basin steelhead distinct population segment (NWFSC 2015). Risk ratings with "?" are based on limited or provisional data series.

Major Population Group	Population	VSP Risk Parameter		Overall Viability Rating
		Abundance/ Productivity	Spatial Structure/ Diversity	
Lower Snake River	Tucannon River	High?	Moderate	High Risk?
	Asotin Creek	Moderate?	Moderate	Maintained?
Grande Ronde River	Lower Grande Ronde	N/A	Moderate	Maintained?
	Joseph Creek	Very Low	Low	**Highly Viable**
	Wallowa River	N/A	Low	Maintained?
	Upper Grande Ronde	Low	Moderate	**Viable**
Imnaha River	Imnaha River	Moderate?	Moderate	Maintained?
Clearwater River (Idaho)	Lower Mainstem Clearwater River*	Moderate?	Low	Maintained?
	South Fork Clearwater River	High?	Moderate	High Risk?
	Lolo Creek	High?	Moderate	High Risk?
	Selway River	Moderate?	Low	Maintained?
	Lochsa River	Moderate?	Low	Maintained?
	North Fork Clearwater River			*Extirpated*
Salmon River (Idaho)	Little Salmon River	Moderate?	Moderate	Maintained?
	South Fork Salmon River	Moderate?	Low	Maintained?
	Secesh River	Moderate?	Low	Maintained?
	Chamberlain Creek	Moderate?	Low	Maintained?
	Lower Middle Fork Salmon River	Moderate?	Low	Maintained?
	Upper Middle Fork Salmon River	Moderate?	Low	Maintained?
	Panther Creek	Moderate?	High	High Risk?
	North Fork Salmon River	Moderate?	Moderate	Maintained?
	Lemhi River	Moderate?	Moderate	Maintained?
	Pahsimeroi River	Moderate?	Moderate	Maintained?
	East Fork Salmon River	Moderate?	Moderate	Maintained?
	Upper Mainstem Salmon River	Moderate?	Moderate	Maintained?
Hells Canyon	Hells Canyon Tributaries			*Extirpated*

*Current abundance/productivity estimates for the Lower Clearwater Mainstem population exceed minimum thresholds for viability, but the population is assigned moderate risk for abundance/productivity due to the high uncertainty associated with the estimate.

Abundance and Productivity. Historical estimates of steelhead production for the entire Snake River basin are not available, but the basin is believed to have supported more than half the total steelhead production from the Columbia River basin (Mallet 1974, as cited in Good et al. 2005). The Clearwater River drainage alone may have historically produced 40,000 to 60,000 adults (Ecovista et al. 2003), and historical harvest data suggests that steelhead production in the Salmon River was likely higher than in the Clearwater (Hauck 1953). In contrast, at the time of listing in 1997, the 5-year geomean abundance for natural-origin steelhead passing Lower Granite Dam, which includes all but one population in the DPS, was 11,462 adults (Ford 2011). Abundance began to increase in the early 2000s, with the single year count and the 5-year geomean both peaking in 2015 at 45,789 and 34,179, respectively (ODFW and WDFW 2021). Since 2015, the numbers have declined steadily with only 9,634 natural-origin adult returns counted for the 2020-run year (ODFW and WDFW 2021).

Population-specific abundance estimates exist for some but not all populations. Of the populations for which we have data, three (Joseph Creek, Upper Grande Ronde, and Lower Clearwater) were meeting minimum abundance/productivity thresholds based on information included in the 2015 status review; however, since that time, abundance has substantially decreased. Only the 5-year (2014-2018) geometric mean of natural-origin spawners of 1,786 for the Upper Grande Ronde population appears to remain above the minimum abundance threshold established by the ICTRT (Williams 2020). The status of many of the individual populations remains uncertain, and four out of the five MPGs are not meeting viability objectives (NWFSC 2015). In order for the species to recover, more populations will need to reach viable status through increases in abundance and productivity.

2.2.2.Status of Critical Habitat

In evaluating the condition of designated critical habitat, NMFS examines the condition and trends of PBFs, which are essential to the conservation of the ESA-listed species because they support one or more life stages of the species. Proper function of these PBFs is necessary to support successful adult and juvenile migration, adult holding, spawning, incubation, rearing, and the growth and development of juvenile fish. Modification of PBFs may affect freshwater spawning, rearing or migration in the action area. Generally speaking, sites required to support one or more life stages of the ESA-listed species (i.e., sites for spawning, rearing, migration, and foraging) contain PBF essential to the conservation of the listed species (e.g., spawning gravels, water quality and quantity, side channels, or food) (Table 4).

Table 4. Types of sites, essential physical and biological features (PBFs), and the species life stage each PBF supports.

Site	Essential Physical and Biological Features	Species Life Stage
Snake River basin steelhead[a]		
Freshwater spawning	Water quality, water quantity, and substrate	Spawning, incubation, and larval development
Freshwater rearing	Water quantity and floodplain connectivity to form and maintain physical habitat conditions	Juvenile growth and mobility
	Water quality and forage[b]	Juvenile development
	Natural cover[c]	Juvenile mobility and survival
Freshwater migration	Free of artificial obstructions, water quality and quantity, and natural cover[c]	Juvenile and adult mobility and survival
Snake River spring/summer Chinook salmon, fall Chinook, and sockeye salmon		
Spawning and juvenile rearing	Spawning gravel, water quality and quantity, cover/shelter (Chinook only), food, riparian vegetation, space (Chinook only), water temperature and access (Sockeye only)	Juvenile and adult
Migration	Substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food[d], riparian vegetation, space, safe passage	Juvenile and adult

[a] Additional PBFs pertaining to estuarine, nearshore, and offshore marine areas have also been described for Snake River steelhead and Middle Columbia steelhead. These PBFs will not be affected by the proposed action and have therefore not been described in this opinion.
[b] Forage includes aquatic invertebrate and fish species that support growth and maturation.
[c] Natural cover includes shade, large wood, log jams, beaver dams, aquatic vegetation, large rocks and boulders, side channels, and undercut banks.
[d] Food applies to juvenile migration only.

Table 5 describes the geographical extent within the Snake River of critical habitat for each of the four ESA-listed salmon and steelhead species. Critical habitat includes the stream channel and water column with the lateral extent defined by the ordinary high-water line, or the bankfull elevation where the ordinary high-water line is not defined. In addition, critical habitat for the three salmon species includes the adjacent riparian zone, which is defined as the area within 300 feet of the line of high water of a stream channel or from the shoreline of standing body of water (58 FR 68543). The riparian zone is critical because it provides shade, streambank stability, organic matter input, and regulation of sediment, nutrients, and chemicals.

Table 5. Geographical extent of designated critical habitat within the Snake River for ESA-listed salmon and steelhead.

Evolutionarily Significant Unit (ESU)/ Distinct Population Segment (DPS)	Designation	Geographical Extent of Critical Habitat
Snake River sockeye salmon	58 FR 68543; December 28, 1993	Snake and Salmon Rivers; Alturas Lake Creek; Valley Creek, Stanley Lake, Redfish Lake, Yellowbelly Lake, Pettit Lake, Alturas Lake; all inlet/outlet creeks to those lakes.
Snake River spring/summer Chinook salmon	58 FR 68543; December 28, 1993 64 FR 57399; October 25, 1999	All Snake River reaches upstream to Hells Canyon Dam; all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Salmon River basin; and all river reaches presently or historically accessible to Snake River spring/summer Chinook salmon within the Hells Canyon, Imnaha, Lower Grande Ronde, Upper Grande Ronde, Lower Snake–Asotin, Lower Snake–Tucannon, and Wallowa subbasins.
Snake River fall Chinook salmon	58 FR 68543; December 28, 1993	Snake River to Hells Canyon Dam; Palouse River from its confluence with the Snake River upstream to Palouse Falls; Clearwater River from its confluence with the Snake River upstream to Lolo Creek; North Fork Clearwater River from its confluence with the Clearwater River upstream to Dworshak Dam; and all other river reaches presently or historically accessible within the Lower Clearwater, Hells Canyon, Imnaha, Lower Grande Ronde, Lower Salmon, Lower Snake, Lower Snake–Asotin, Lower North Fork Clearwater, Palouse, and Lower Snake–Tucannon subbasins.
Snake River Basin steelhead	70 FR 52630; September 2, 2005	Specific stream reaches are designated within the Lower Snake, Salmon, and Clearwater River basins. Table 21 in the Federal Register details habitat areas within the DPS's geographical range that are excluded from critical habitat designation.

Spawning and rearing habitat quality in tributary streams in the Snake River varies from excellent in wilderness and roadless areas to poor in areas subject to intensive human land uses (NMFS 2015; NMFS 2017a). Critical habitat throughout much of the Interior Columbia (which includes the Snake River and the Middle Columbia River) has been degraded by intensive agriculture, alteration of stream morphology (i.e., channel modifications and diking), riparian vegetation disturbance, wetland draining and conversion, livestock grazing, dredging, road construction and maintenance, logging, mining, and urbanization. Reduced summer streamflows, impaired water quality, and reduction of habitat complexity are common problems for critical habitat in non-wilderness areas. Human land use practices throughout the basin have caused streams to become straighter, wider, and shallower, thereby reducing rearing habitat and increasing water temperature fluctuations.

In many stream reaches designated as critical habitat in the Snake River basin, streamflows are substantially reduced by water diversions (NMFS 2015; NMFS 2017a). Withdrawal of water, particularly during low-flow periods that commonly overlap with agricultural withdrawals, often increases summer stream temperatures, blocks fish migration, strands fish, and alters sediment transport (Spence et al. 1996). Reduced tributary streamflow has been identified as a major limiting factor for Snake River spring/summer Chinook and Snake River basin steelhead in particular (NMFS 2017a).

Many stream reaches designated as critical habitat for these species are listed on the Clean Water Act 303(d) list for impaired water quality, such as elevated water temperature (IDEQ 2020). Many areas that were historically suitable rearing and spawning habitat are now unsuitable due to high summer stream temperatures, such as some stream reaches in the Upper Grande Ronde. Removal of riparian vegetation, alteration of natural stream morphology, and withdrawal of water for agricultural or municipal use all contribute to elevated stream temperatures. Water quality in spawning and rearing areas in the Snake River has also been impaired by high levels of sedimentation and by heavy metal contamination from mine waste (e.g., IDEQ and USEPA 2003; IDEQ 2001).

The construction and operation of water storage and hydropower projects in the Columbia River basin, including the eight run-of-river dams on the mainstem lower Snake and lower Columbia Rivers, have altered biological and physical attributes of the mainstem migration corridor. Hydrosystem development modified natural flow regimes, resulting in warmer late summer and fall water temperature. Changes in fish communities led to increased rates of piscivorous predation on juvenile salmon and steelhead. Reservoirs and project tailraces have created opportunities for avian predators to successfully forage for smolts, and the dams themselves have created migration delays for both adult and juvenile salmonids. Physical features of dams, such as turbines, have delayed migration for both adults and juveniles. Turbines and juvenile bypass systems have also killed some out-migrating fish. However, some of these conditions have improved. The Bureau of Reclamation and U.S. Army Corps of Engineers have implemented measures in previous Columbia River System hydropower consultations to improve conditions in the juvenile and adult migration corridor including 24-hour volitional spill, surface passage routes, upgrades to juvenile bypass systems, and predator management measures. These measures are ongoing and their benefits with respect to improved functioning of the migration corridor PBFs will continue into the future.

Critical Habitat for the four Snake River steelhead and salmon species includes the Snake River within the action area. The PBF's for these species within the action area include juvenile and adult migration corridors, substrate, water quality and quantity, water temperature, water velocity, cover/shelter, food, riparian vegetation, space and safe passage (58 FR 68543).

2.2.3. Climate Change Implications for ESA-listed Species and their Critical Habitat

One factor affecting the rangewide status of Snake River salmon and steelhead, and aquatic habitat at large is climate change. The U.S. Global Change Research Program (USGCRP) reports average warming in the Pacific Northwest of about 1.3ºF from 1895 to 2011, and projects an increase in average annual temperature of 3.3ºF to 9.7ºF by 2070 to 2099 (compared to the period 1970 to 1999), depending largely on total global emissions of heat-trapping gases (predictions based on a variety of emission scenarios including B1, RCP4.5, A1B, A2, A1FI, and RCP8.5 scenarios). The increases are projected to be largest in summer (Melillo et al. 2014, USGCRP 2018). The 5 warmest years in the 1880 to 2019 record have all occurred since 2015, while 9 of the 10 warmest years have occurred since 2005 (Lindsey and Dahlman 2020).

Several studies have revealed that climate change has the potential to affect ecosystems in nearly all tributaries throughout the Snake River (Battin et al. 2007; ISAB 2007). While the intensity of effects will vary by region (ISAB 2007), climate change is generally expected to alter aquatic habitat (water yield, peak flows, and stream temperature). As climate change alters the structure and distribution of rainfall, snowpack, and glaciations, each factor will in turn alter riverine hydrographs. Given the increasing certainty that climate change is occurring and is accelerating (Battin et al. 2007), NMFS anticipates salmonid habitats will be affected. Climate and hydrology models project significant reductions in both total snow pack and low-elevation snow pack in the Pacific Northwest over the next 50 years (Mote and Salathé 2009). These changes will shrink the extent of the snowmelt-dominated habitat available to salmon and may restrict our ability to conserve diverse salmon life histories.

In the Pacific Northwest, most models project warmer air temperatures, increases in winter precipitation, and decreases in summer precipitation. Average temperatures in the Pacific Northwest are predicted to increase by 0.1 to 0.6°C (0.2°F to 1.0°F) per decade (Mote and Salathé 2009). Warmer air temperatures will lead to more precipitation falling as rain rather than snow. As the snow pack diminishes, seasonal hydrology will shift to more frequent and severe early large storms, changing stream flow timing, which may limit salmon survival (Mantua et al. 2009). The largest driver of climate-induced decline in salmon populations is projected to be the impact of increased winter peak flows, which scour the streambed and destroy salmon eggs (Battin et al. 2007).

Higher water temperatures and lower spawning flows, together with increased magnitude of winter peak flows are all likely to increase salmon mortality. The Independent Scientific Advisory Board (ISAB) (2007) found that higher ambient air temperatures will likely cause water temperatures to rise. Salmon and steelhead require cold water for spawning and incubation. As climate change progresses and stream temperatures warm, thermal refugia will be essential to persistence of many salmonid populations. Thermal refugia are important for providing salmon and steelhead with patches of suitable habitat while allowing them to undertake migrations through or to make foraging forays into areas with greater than optimal temperatures. To avoid waters above summer maximum temperatures, juvenile rearing may be increasingly found only in the confluence of colder tributaries or other areas of cold water refugia (Mantua et al. 2009).

Climate change is expected to make recovery targets for salmon and steelhead populations more difficult to achieve. Climate change is expected to alter critical habitat by generally increasing temperature and peak flows and decreasing base flows. Although changes will not be spatially homogenous, effects of climate change are expected to decrease the capacity of critical habitat to support successful spawning, rearing, and migration. Habitat action can address the adverse impacts of climate change on salmon. Examples include restoring connections to historical floodplains and freshwater and estuarine habitats to provide fish refugia and areas to store excess floodwaters, protecting and restoring riparian vegetation to ameliorate stream temperature increases, and purchasing or applying easements to lands that provide important cold water or refuge habitat (Battin et al. 2007; ISAB 2007).

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). For the purposes of this analysis, the project action area includes all areas directly or indirectly affected by the proposed project. The action area is not limited to the actual project footprint, but also includes all staging areas, as well as other areas that could experience temporary effects relative to water quality and hydroacoustic sound pressure. As such, based on the proposed project activities and conservation measures described above; the project action area includes an area of approximately 2,800 feet around proposed in-water excavation and piling and sheet pile installation.

The additional in-water extent of the action area beyond the project footprint is based on the potential for minor downstream turbidity and sedimentation associated with excavation, piling, and sheet pile installation. The action area boundary also encompasses the maximum calculated distance for which behavioral effects, such as foraging disruption and delayed migration, could occur to ESA-listed fish species from sound pressure associated with potential piling installation activities. This distance was calculated using the widely accepted NMFS Pile Driving Calculation spreadsheet, which is used to correlate physical and behavioral impacts to fish resulting from underwater sound pressure associated with pile driving.

2.4. Environmental Baseline

The "environmental baseline" refers to the condition of the listed species or its designated critical habitat in the action area, without the consequences to the listed species or designated critical habitat caused by the proposed action. The environmental baseline includes the past and present impacts of all Federal, State, or private actions and other human activities in the action area, the anticipated impacts of all proposed Federal projects in the action area that have already undergone formal or early section 7 consultations, and the impact of State or private actions which are contemporaneous with the consultation in process. The consequences to listed species or designated critical habitat from ongoing agency activities or existing agency facilities that are not within the agency's discretion to modify are part of the environmental baseline (50 CFR 402.02).

The project site is located on the southern shoreline of the Snake River in the McNary pool, approximately 2.5 miles downstream of the Ice Harbor Dam. The McNary pool is hydrologically controlled by McNary Dam, and OHW at the project site is based on the Normal Full Pool elevation of 340 feet NGVD29 (ACOE 2021). The existing pump station facilities include the elevated pumps, a concrete pump station deck, electrical control panels on concrete pads, and a gravel access road.

Current conditions within much of the mainstem Snake River are degraded relative to historical conditions, a reflection of a multitude of actions whose effects frame the environmental baseline in the action area. The action area includes the footprint of in-water construction along the shoreline, and within shallow waters and upland areas of the mainstem Snake River. The general topography within the vicinity of the project site consists of relatively level uplands, that transition to areas of steep sloping, riprap-armored bank along the immediate shoreline. Vegetation surrounding the project site is dominated by species typical of the sagebrush-steppe vegetation community in eastern Washington. The Snake River shoreline, shallow water habitat, and natural vegetation is altered with in-water structures, rock, and riprap. Consequently, the potential for normal riparian processes (e.g., litterfall, channel complexity, and large wood recruitment) to occur is diminished and aquatic habitat has become simplified. Furthermore, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by invasive, non-native plant species. The riparian system is fragmented, poorly connected, and provides inadequate protection of habitats and refugia for sensitive aquatic species.

Shoreline developments and alterations have reduced rearing habitat suitability (e.g., less habitat complexity, reduced forage base), reduced spring water velocities (which hampers downstream migration by smolts), disconnecting the Snake River from historical floodplain rearing areas, and created better habitat for juvenile salmonid predators (e.g., birds, and native and non-native fish). These factors further limit habitat function by reducing cover, attracting predators and reducing foraging efficiency for juvenile salmonids.

The Snake River within the action area is on the Washington Department of Ecology's Water Quality Atlas 303(d) list for temperature and is listed as water quality limited for total dissolved gas and dioxin (WDOE 2021). Many factors have contributed to decreases in water quality, but they are primarily related to land-use practices, including dams, channel simplification and widening, and vegetation removal. There has also been an incremental loss of wetlands and increases in groundwater withdrawals which have contributed to lower base-stream flows, and which in turn contribute to lower overall water quality.). In addition, excess nutrients, low levels of dissolved oxygen, heavy metals, and changes in pH have all directly affected the water quality for salmon and steelhead both as adults and juveniles as these fish migrate both downstream and upstream between spawning grounds and rearing areas. Impoundments created by the dams have resulted in higher water temperatures. Increased water temperatures have occurred throughout the basin, including the action area, and have a significant effect on salmonid metabolism, growth rate, disease resistance, timing of juvenile and adult migrations, fry emergence, and smoltification (ISAB 2007).

The hydropower system has greatly modified natural flow and altered the hydrograph of the Snake River. The volume of water discharged by the Snake River varies seasonally according to runoff, snowmelt, and hydrosystem demands. Water management activities have reduced flows in the Snake River, measured at Ice Harbor Dam, from April through July and eliminated peak-flow events. Additionally, flow management for hydropower has increased flows measured at Ice Harbor Dam during winter months. Maximum flows on the Snake River occur in May, June, and July as a result of snowmelt in headwater regions. Minimum flows occur from September to March, with periodic peaks due to winter rains. Interannual variability in stream flow is strongly correlated with two recurrent climate phenomena, the El Nino/Southern Oscillation and the Pacific Decadal Oscillation. Upstream and downstream dams alter the movement of sediment through the action area. The loss of high spring flows and reduced velocities from backwatering from the downstream dam create a channel that is predominantly cobble and sand substrates with few accumulations of suitable spawning gravels. The relatively high levels of fine substrate (i.e. sand) composition within the action area results in low quality benthic prey production. Travel times of migrating smolts increase as they pass through the reservoirs (compared to a free-flowing river), increasing exposure to both native and nonnative predators.

The mainstem dams and reservoirs, such as the McNary pool (where the project is located), continue to substantially alter the mainstem migration corridor habitat. The reservoirs have increased the cross-sectional area of the river, reduced water velocity, altered the food web, and created habitat for native and non-native species that are predators, competitors, or food sources for migrating juvenile salmon and steelhead. Additional impacts include increased rates of avian predation on juvenile salmon and steelhead, altered fish passage, and shoreline development, which has reduced natural vegetation, disconnected floodplains, and reduced available off-channel refugia.

The Snake River within the action area serves as a migration corridor for adult and juvenile SR spring/summer and fall-run Chinook salmon, SRB steelhead, and SR sockeye salmon. Generally, out-migrating juveniles do not overwinter in the lower Snake River reservoirs; however, Connor et al. (2005) has found that some SR fall Chinook will overwinter in the lower Snake River reservoirs. Project activities will occur during winter when adults and most juveniles do not typically occupy the project area. However, relatively small numbers of adult steelhead could be present year round in the main stem Snake River, including the action area. The condition of the listed species and designated critical habitats in the action area are described further below.

2.5. Effects of the Action

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

2.5.1. Effects to Species

Short term effects to ESA-listed species as a consequence of the proposed project may include entrainment or impingement during excavation activities, degraded water quality and alteration of substrates associated with excavation and piling and sheet pile installation, hydroacoustic impacts associated with vibratory or impact hammer use, chemical contamination due to spills or leaks from machinery, increased cover and, consequently, predation due to the presence of the working barge, and sage passage. The long-term effects of the proposed project is impingement of juvenile ESA-listed species on the newly installed fish screens while the pumps are in operation, and loss of 143 square feet of near-shore habitat that will be enclosed by the new sheet pile wall.

Entrainment/Impingement by Machinery
The new pipe and screens will be placed by excavating 254 cubic yards of sediment over 631 square feet of the Snake River stream channel. Entrainment/impingement may occur if fish are trapped in the bucket of the excavator during excavation of in-water substrates. The potential for entrainment is largely dependent on the likelihood of fish occurring within the excavation area, the scope and scale of the excavation activity, and the life stage of the fish. Given the proposed timing of in-water work (December 15 – February 28), location of proposed excavation activities (i.e., near the shoreline), use of an open bucket excavator, and relatively slow speed of excavation; it is reasonably certain that the risk of injury or lethal take of juvenile ESA-listed fish species from proposed excavation activities will be minimal. Adult salmonids (if present) will likely avoid the excavation area.

Turbidity
Short-term, localized project-related increases in background turbidity levels will likely occur as a result of proposed excavation and piling and sheet pile installation activities below the OHW. In the short-term, increases in turbidity can reduce forage quantity for salmonids, and disrupt behavioral patterns such as feeding and sheltering. Exposure duration is a critical determinant of physical or behavioral turbidity effects. Salmonids have evolved in systems that periodically experience short-term pulses (days to weeks) of high suspended sediment loads, often associated with flood events, and are adapted to such seasonal high pulse exposures (NMFS 2011a). Total time for excavating the trench for the new pipe and to deepen the pump basin is four to eight days. Given the existing substrate conditions (primarily cobble and sand), proposed side-casting of excavated substrates, timing of in-water work (December 15 – February 28), and proposed conservation measures, including use of a vibratory hammer for piling and sheet pile installation; it is anticipated the any project related increases in background turbidity will be limited and highly localized. We expect the action area will return to background turbidity within one day following in-water excavation and pile driving. Because the action area is not a depositional area and lacks fine sediment, we expect turbidity plumes will be small and short-lived; therefore, we expect juvenile salmon and steelhead will be able to return to normal rearing and migrating activities very quickly following the in-water work and any behavioral effects will be negligible.

Chemical contamination
Equipment operating near and over the river channel within the action area may be a source of chemical contamination. There is the potential for accidental spills of petroleum products or other hazardous materials into the river from this equipment. Petroleum-based contaminants, such as fuel, oil, and some hydraulic fluids, contain polycyclic aromatic hydrocarbons (PAHs), which can kill salmon at high concentrations, and can cause sublethal, adverse effects at lower concentrations (Meador et al. 2006). Development and implementation of a Pollution Control Plan (PCP) that will include containment measures and spill response for construction-related

chemical hazards will significantly reduce the likelihood for chemical releases within the action area. Based on recent experience, when action agencies implement a strong PCP, the risk of a spill and exposure is small. Project proponents will implement BMPs to minimize the risk of a spill occurring and minimize the consequence of a spill (through appropriate spill response) so that the risk of injury or death of salmonids is negligible.

Sedimentation/Substrate/Forage
Proposed activities will require approximately 254 cubic yards of in-water excavation over a 631 square foot area of the channel. All excavated material from the new intake pipe trench (consisting primarily of sand and rock) will be side-cast along the downstream side of the trench and then used to backfill over the new intake pipe. All in-water substrates temporarily disturbed during excavation for the installation of the new intake pipe will be restored to their pre-construction grade using the existing side-cast substrate material. The river substrates excavated from below the existing pump deck will be deposited in a slight depression in the riverbed located just northwest of the pump deck.

Forage quantity for juvenile fish may be temporarily reduced within the immediate in-water work area as benthic organisms become disturbed by piling installation and excavation. Cover provided by larger substrates within the work area would also be inaccessible to juvenile fish during construction. However, it is expected that few, if any, individual juvenile fall Chinook salmon would be present in the work area during the work window and fish that were present would flee to nearby similar habitat once construction activities commenced. Recolonization of benthic organisms will likely occur within a month following project completion (NMFS 2009).

Installation of the new sheet pile wall will result in a loss of 143 square feet of near-shore habitat, as the area inside the wall will be excavated and no longer accessible to fish. Given that this area is predominantly riprap, has low habitat quality and an abundance of similar type habitat is nearby, the long-term loss of this area is negligible.

In general, the environmental baseline within the project action area provides very little habitat complexity for juvenile and adult salmonids. As such, given the existing baseline conditions, proposed timing of in-water work (outside the peak migration stages), relative size of the action area, and proposed side-cast and backfill; it is reasonably certain that the proposed alteration of existing substrates will not result in adverse effects to ESA-listed fish species.

Sound/Pressure
As discussed above, the use of a vibratory hammer is proposed for the installation of all sheet pile and steel pilings. Compared to impact hammers, vibratory hammers produce sounds of lower intensity, with a rapid repetition rate and longer duration, and with more energy in the lower frequencies (15-26 Hertz) (Carlson et al. 2001, and Nedwell et al. 2003, as cited in NMFS 2008). NMFS's current pile driving thresholds for "physical injury" to fish include a peak pressure of 206 dB and an accumulated SEL of 187 dB for fish greater than 2 grams, and 183 dB for fish less than 2 grams. In addition, a 150 dB RMS "harassment" threshold is applied for potential behavioral effects. Peak sound levels associated with vibratory hammer use can exceed 150 decibels, however, the increase in decibels is relatively slow causing nearby fish to flee rather than habituate to these sounds, even after exposure (Dolat 1997, and Knudsen et al. 1997,

as cited in NMFS 2008). Hydroacoustic monitoring conducted for a prior project utilizing a vibratory hammer for pile driving along the Columbia River near Boardman (river mile 271.3), showed that the sound level did not exceed 132 dB when measured a few feet from the pile (Pers. comm. with Paul Wattenburger, PE, March 19, 2014).

Given the low frequencies and short-term and intermittent nature of the vibratory hammer use (likely up to 2 to 4 hours per day, over the course of an 8-to-10-hour day) and proposed conservation measures (i.e., timing of in-water work and daily "soft-start" procedures); relatively few juvenile ESA-listed fish should be present in the action area while the vibratory hammer is in use and those fish present should flee prior to peak sound levels. Therefore, the risk of injury or adverse behavioral effects from vibratory hammer use are expected to be adverse but limited to a few individual fish.

In the event that the vibratory hammer cannot fully embed the piles due to obstructions below the substrate, a few strikes from an impact hammer may be required to seat the pilings to the required depth. Given the amount of time it takes to set the crane barge, center each pile, and switch between the vibratory hammer and impact hammer (if required), it is anticipated that installation of the four steel piles and sheet pile wall will require two days of work, with a potential need of up to 100 pile strikes. The contractor will be required to implement appropriate sound attenuation methods (i.e., "soft-start" procedures and use of a bubble curtain). It is assumed that proper use of the bubble curtain will result in 10 dB attenuation (NMFS 2011a, ICF Jones & Stokes and Illingworth & Rodkin 2009). However, it is possible that proper use of a bubble curtain can result in up to 20 dB attenuation depending on site-specific conditions (ICF Jones & Stokes and Illingworth & Rodkin 2009).

The level of underwater noise generated by impact pile driving depends on a number of factors, including the type and size of pile, characteristics of the substrate, depth of water, type of hammer, and effective implementation of attenuation. Pile driving can generate intense underwater sound pressure that results in acute and sometimes fatal effects to fish such as damage to auditory receptors and rupture of the swim bladder (ICF Jones & Stokes and Illingworth & Rodkin 2009, Hastings and Popper 2005). Behavioral effects to fish resulting from pile driving noise may include avoidance, changes in migratory routes, delayed migration, or interruption of spawning. Juvenile salmonids and other fish species may move away from protected shoreline habitat because of increased noise, making them more susceptible to predation (Hastings and Popper 2005). As discussed above, NMFS's pile driving thresholds for "physical injury" to fish include a peak pressure of 206 dB and an accumulated SEL of 187 dB for fish greater than 2 grams, and 183 dB for fish less than 2 grams. In addition, a 150 dB RMS "harassment" threshold is applied for potential behavioral effects.

Distances associated with the onset of physical injury and harassment were calculated for the project using the NMFS Pile Driving Calculation spreadsheet. These calculations were made starting with baseline single strike levels of 207 dB peak, 173 dB SEL, and 189 dB RMS for a 12-inch diameter steel piling measured at 10 meters (WSDOT 2016), and then applying a 10 dB attenuation and a default transmission loss constant of 15 meters, with an estimated 100 pile strikes. Based on these calculations, the onset of physical injury would occur at a maximum distance of 16 feet (5 meters) from the piling for fish greater than 2 grams, and 33 feet (10 meters) for fish less than 2 grams. Fall Chinook salmon are the only juvenile ESA-listed fish species with the potential to be in the action area at the time of project implementation. Tiffan et al. (2012) reported that weights of juvenile fall Chinook salmon collected from the Lower Granite pool ranged from 76 to 84 grams; therefore, the limit of physical injury to ESA-listed fish is expected to be within 16 feet of the piling. Potential behavioral effects (i.e., harassment) may occur at a distance of approximately 2,815 feet (858 meters). However, as stated above, it is possible that proper use of a bubble curtain can result in up to 20 dB attenuation depending on site-specific conditions, which would reduce the behavioral distance to 607 feet (185 meters).

Ambient Light/Shading/Predation
The presence of an approximately 30-foot wide by 90-foot long barge for up to 4 to 6 weeks of construction will temporarily alter ambient light conditions below the barge; and may provide overhead cover and velocity refuge that can attract salmonid predators such as Northern pikeminnow (*Ptychocheilus oregonensis*), smallmouth bass (*Micropterus dolomieui*), and largemouth bass (*M. salmoides*). The barge, while present at the work site, will provide cover for predators. However, predation on ESA-listed juveniles is expected to be relatively low; existing baseline habitat conditions lack complexity so the existing numbers of predators and juvenile salmon is expected to be low. Also, crews and equipment will likely scare off fish when working on the barge. Although predation is expected to be limited, it is anticipated that the potential effects of the temporary overwater structures on salmonid predation will result in injury and death to some juvenile fish. Therefore, the barge will be removed from the action area as soon as in-water construction is complete. It is not possible to quantify the number of fish exposed to these predator effects caused by the action during the 6 weeks that barge will be in place because we don't know how many fish will be rearing or migrating through the action area at that time.

Once construction is complete, the new structures may affect ESA-listed fish species by increasing the area of existing in-water structures and potentially providing additional refuge for salmonid predators. Furthermore, given the lack of complex habitat structure within the action area, introduction of these new in-water or overwater structures may provide overhead cover and velocity refuge that can attract salmonid predators. However, the environmental baseline within the project action area likely provides very little foraging and shoaling habitat for juvenile salmonids. In addition, the majority (90%) of the pipe will be buried beneath the substrate (not allowing for overhead cover) and is unlikely to provide ambush cover for potential predators. Also, the exposure of near-shore migrating juvenile ESA-listed fish is likely to me minimal since the above-substrate section of the intake structure with fish screens will be located approximately 100 feet from the shoreline. The increased risk of predation associated with the new structures is low for individual fish; however, since the structures are long-term fixtures, it is likely that a few fish will be killed or injured by predators using the new structures as cover.

Intake Entrainment/ Impingement during project operation
As discussed above, the proposed new intake pipe will extend approximately 100 feet from the shoreline of the existing pumping station. However, approximately ninety percent of the new intake pipe will be buried below the substrate, while the remainder of the pipe and the intake screens will be located along the bottom of the river channel. The new intake screens will be affixed with NMFS-approved, slotted fish screens to help ensure juvenile salmonids are not impinged or entrained in the intake during pumping operations. The intake screens will also be

equipped with an airburst system to facilitate the cleaning of the screens and maintain the appropriate approach velocity in compliance with NMFS criteria. In addition, the proposed distance of the intake screens from the shoreline (approximately 100 feet) should make it less likely to expose and affect migrating juvenile salmonids, which tend to stay nearer to the shore. However, since the new intake pipe and screens will be operating for a long time period, it is expected that a few individual fish will be injured or killed by entrainment into the intake and/or impingement on the screens/pumping structure.

Relevance of Effects on Individual Fish to Salmonid Population Viability

To determine whether the effects to individual fish are meaningful, we analyze the effect to VSP at the scale of the population: abundance, population growth rate (productivity), spatial structure, and diversity. While these characteristics are described as unique components of population dynamics, each characteristic exerts significant influence on the others. For example, declining abundance can reduce spatial structure of a population, and when habitats are less varied, then life history diversity within a population can decline.

Abundance. Due to the small footprint of the excavation and the use of the in-water work period when few individuals are present, very small numbers of juveniles of salmon and steelhead of any of the DPS/ ESUs in this opinion will be injured or killed during excavation or backfilling of the trench. Subyearling Chinook salmon are the most likely to be present during this season. The action will result in a short-term small, localized reduction in prey availability. We expect these organisms to recolonize quickly so that there will be little effect on prey by the time juveniles are present and little effect on fish condition or survival. Other effects of the action (short-term increases in fine sediments and turbidity) will modify the behavior of individuals in the action area, but are not likely to affect survival. Risk of mortality or physical injury from pile driving is low as the soft start procedures should cause fish to flee prior to experiencing lethal sound pressure levels. Adverse behavioral effects from pile driving should be minimal because displaced fish can flee to nearby similar habitats. Although some mortality is expected, the loss of a few juvenile fish in any population will not meaningfully change its abundance.

Productivity. A few adult steelhead may be displaced during in-water construction, but no adults are expected to be killed or harmed. No more than a few juveniles of any population is expected to be injured or killed. These effects will not alter the productivity of any of the populations.

Spatial structure. NMFS does not expect the proposed project to affect the spatial structure of any of the affected populations because the proposed action will not affect the distribution of any populations nor block access to habitat.

Diversity. The projects related activities are not likely to affect more than a few individuals of any population or DPS/ ESU due to the use of the in-water work window when very few individuals of any population will be present in the action area. Any individual juveniles in the vicinity that encounter effects would be a very small proportion of each of the species' populations that will be exposed to project-related activities or long-term operations.

2.5.2. Effect to Critical Habitat

The critical habitat PBFs most likely to be affected are substrate, water quality, forage, and safe passage.

Substrate

Approximately 631 square feet of near-shore, shallow-water benthic habitat will be disrupted by trench excavation and intake pipe installation during in-water construction. Approximately 254 cubic yards of native substrate and material will be removed; most will be used as fill to cover the installed intake pipes but 57 cubic yards will be placed in a small depression within the action area. Increased turbidity from project activities will result in sediment deposition downstream of the in-water work area, which has the potential to adversely affect primary and secondary productivity (Spence et al. 1996) for a short time period during and immediately following in-water work. Excess fine sediment in the action area is expected to occur over a small area and is likely to be transient, as daily and seasonal increases in water velocity associated with dam operations remobilize and redeposit these sediments in slower moving portions of the reservoir. The scale of impact will be minimal relative to the rearing habitat in the action area, and will not meaningfully change the conservation value of the substrate PBF.

Water Quality

The proposed action will have a short-term (4-6 weeks) negative effect on water quality by increasing suspended sediment and turbidity during construction. The size, velocity, and naturally high turbidity of the river in the McNary pool results in relatively homogenous physical, chemical, and biological characteristics. Thus, any turbidity pulse will quickly become mixed with the river and be indistinguishable from background levels. NMFS anticipates any excess turbidity will dilute and disperse with the river current and not be distinguishable from background levels 500 feet downstream of the proposed action.

The use of heavy equipment may result in very small amounts of pollutants entering waterways as discussed above. However, the project will use conservation measures (storage and fueling or lubricants, fuels in designated areas, hazardous and spill containment booms) to limit effects of chemical contamination reducing water quality. Through the use of these measures, it is unlikely chemical contamination will have more than a minimal effect to water quality. Given the proposed BMPs, erosion control methods, a Spill Prevention, Containment, and Control plan, and the use of the in-water work window NMFS believes that the effects to water quality will not meaningfully decrease the function of this PBF in the action area.

Forage

The proposed action will have a short-term negative effect on benthic macroinvertebrates by crushing, covering, or displacing them during excavation and installation of the intake pipes in an area approximately 631 square feet (0.014 acres). We expect nearby benthic macroinvertebrates will begin to recolonize within several days to weeks, and will fully recolonize the area within a few months after project completion. The alteration of this amount of habitat could have some localized effects to forage for out-migrating and rearing juvenile salmonids and steelhead that use this nearshore area during construction, and for up to several months after project completion. However, we do not anticipate the localized reduction in available forage will have long-term impact to the quality of habitat. Given the size of the reservoir, the amount of available local nearshore habitat, and the short-term nature of the effect, NMFS does not anticipate that this project will change the conservation value of the forage PBF.

Safe Passage
The proposed action will not alter PBFs for passage, except during the four to eight day period required to excavate and install the pipeline trench. This construction will occur at a time when very few fish of any species will be migrating either upstream or downstream and will occupy only a small footprint, around which migration in either direction will be unimpeded. Fish present in the action area will likely be impeded from migrating through or utilizing the habitat within the area during times of active construction; activities will likely cause any fish present to flee. When construction activities are ceased (e.g. during the night), predators may use the barge as cover posing a risk of injury or death to juvenile salmonids present near the work site. The action will not appreciably alter the safe passage PBF after construction.

2.5.3. Summary of Effects

Based on the species life stages and the activities described above, the proposed project is likely to result in short-term adverse effects to ESA-listed fish species within the action area from entrainment/impingement by equipment, hydroacoustic impacts, and increased predation by providing short term cover (barge) for predators. In addition, the proposed installation of the new intake pipe and screens may potentially provide additional long-term refuge for salmonid predators and long-term operation of the pumping system may cause injury or mortality due to entrainment/impingement on the new screens.

As described above, the proposed action will have effects on substrate, water quality, forage, and safe passage during construction and for perhaps as long as several months after construction is complete. The proposed actions will likely result in adverse effects to critical habitat within the action area. The function of these PBFs will return following construction. Therefore, the proposed action will not reduce the conservation value of critical habitat in the action area.

2.6. Cumulative Effects

"Cumulative effects" are those effects of future State or private activities, not involving Federal activities, that are reasonably certain to occur within the action area of the Federal action subject to consultation [50 CFR 402.02 and 402.17(a)]. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA.

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

During this consultation, NMFS searched for information on future state, tribal, local, or private actions that were reasonably certain to occur in the action area. However, we are not aware of site-specific plans for such activities in the future. Resource-based activities such as timber harvest, agriculture (including substantial irrigation withdrawals affecting both tributary and mainstem Snake River flows), mining, shipping, and energy development are likely to continue to exert an influence on the quality of freshwater habitat in the action area. Irrigation of farmlands contributes to large amounts of in-stream water withdrawals throughout the basin. Applications of pesticides and chemicals for agricultural production contribute to pollutant inputs and accumulate to degrade water quality. Additional effects to the lower Snake River are anticipated with population growth, urban development, and increases in recreational use of the Columbia River. The population of Walla Walla County, Washington, grew 6.5% from 2010 to 2019. NMFS assumes the population for Walla Walla County will continue to grow for the foreseeable future. As the human population in the action area grows, demand for agricultural, commercial and residential development, and recreation is likely to increase as well. Industrial and commercial development often contribute to increases in shoreline riprap, altered landscapes and increases in impermeable surfaces. The effects of new development are likely to reduce the conservation value of the habitat within the action area. However, the magnitude of the effect is difficult to predict and is dependent on many social and economic factors. NMFS is not aware of any specific future non-federal activities within the action area that would cause greater effects to a listed species or designated critical habitat than presently occur.

Although development is ongoing and likely to continue in the future, the future rate of development will depend on whether there are economic, administrative, and legal factors that can either support or restrict development (or in the case of contaminants, safeguards). Therefore, although NMFS finds it likely that, the cumulative effects of these activities will have adverse effects commensurate to those of similar past activities; it is not possible to quantify these effects. Some of these future activities will require a Federal permit, and thus will undergo ESA consultation. Many future state or tribal actions would likely have some form of Federal funding or authorization and therefore would be reviewed by NMFS. This limits the scope of cumulative effects that can be factored in this analysis.

Based on the analysis above, the cumulative effects of future state and private activities will have a continued negative effect on ESA-listed fish and their habitats.

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 opinion as to whether the proposed action is likely to: (1) reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminish the value of designated or proposed critical habitat as a whole for the conservation of the species.

The environmental baseline is characterized by degraded floodplain and channel structure, altered sediment routing, altered hydrology, and altered water quality. Within the action area the major sources of impacts to salmon and steelhead, are hydropower dam systems as well as the continued development and maintenance of the shoreline including marinas, docks, roads, railroads, and riprap. Dams and reservoirs within the migratory corridor have altered the river environment and affected fish passage. The operation of water storage projects has altered the natural hydrograph of the Snake River. Water impoundment and dam operations affect downstream water quality characteristics. Salmon and steelhead are exposed to high rates of natural predation during all life stages from fish, birds, and marine mammals. Avian and introduced fish predation on salmonids has been exacerbated by environmental changes associated with river developments. Shoreline development has reduced the quality of nearshore salmon and steelhead habitat by eliminating native riparian vegetation, displacing shallow water habitat with fill materials and by further disconnecting the Snake River from historic floodplain areas. Further, riparian species that evolved under the environmental gradients of riverine ecosystems are not well suited to the present hydraulic setting of the action area (i.e., static, slackwater pools), and are thus often replaced by non-native species. The riparian system provides inadequate protection of habitats and refugia for sensitive aquatic species. The cumulative effects of state and private actions within the action area are anticipated to continue to have negative effects on ESA-listed salmonids.

Climate change is likely to affect the abundance and distribution of the ESA-listed species considered in the opinion. The exact effects of climate change are both uncertain, and unlikely to be spatially homogeneous and the ability of listed-species to adapt is uncertain. Most of the effects of the action are short term, and thus will not exacerbate the effects on species and habitat caused by climate change. The long-term effects of impingement at the new screen is likely to be small as long as the screen is maintained, and this effect will not be altered by climate change. There is no change in the amount of water withdrawn by this action, and flows in the Snake River will continue to be controlled by hydropower operations into the future.

2.7.1.Species

The action area is used by SR sockeye salmon, SRB steelhead, SR spring/summer-run Chinook salmon, and SR fall-run Chinook salmon. SR sockeye salmon are listed as endangered and have an overall viability rating of high risk. The other three species are listed as threatened, and while some populations are viable, most populations within these ESU/DPSs remain at moderate or high risk.

NMFS anticipates the proposed action will affect primarily fall Chinook juveniles within the active in-water work area. Smaller juvenile fish that are less likely to flee could be killed or injured by working equipment (i.e. impingement), exposure to sound/pressure produced by pile driving, impingement on the new screens, or predation. The work area is relatively small and will affect only a few individuals of any population. SRB steelhead are likely to be the only adults of the listed species in the McNary pool during the winter work window; they are highly likely to avoid the disturbance caused by the construction. Juvenile fall Chinook salmon and adult steelhead are migrating or holding in the reservoir in the winter, and the avoidance behaviors are not expected to reduce their fitness because there is other similar habitat in the vicinity.

In addition to these short-term effects, there are likely to be long-term consequences of the proposed action. The screens on the new intake pipe will comply with NMFS's screening criteria to prevent entrainment of juveniles into the pipe. However, even with proper maintenance a small number of juveniles may become impinged or scrape along the screen, which could result in injury or death. Additionally, the new structures could provide refuge for salmonid predators. Although the structures are located in marginal habitat and located away from near-shore migratory routes, some juvenile salmonids are likely to encounter predators, resulting in injury or death.

Considering the effects of the action in conjunction with the existing condition of the environmental baseline and the small level of potential cumulative effects, NMFS has determined that the loss of a very small number of juvenile salmon and steelhead that may be caused by the proposed action will not be substantial enough to negatively influence VSP criteria at the population scale and will not appreciably reduce the likelihood of any population maintaining its current status. Because the effects will not be substantial enough to negatively influence VSP criteria at the population scale, the viability of MPGs, ESUs, and DPSs are also not expected to be reduced. The effects of the proposed action are not likely to appreciably reduce survival of any of the four species considered in this opinion, nor is the action likely to reduce the likelihood of recovery of these species.

2.7.2. Critical Habitat

The proposed action has the potential to affect several PBFs within the action area. Those PBFs include water quality (turbidity, and chemical contamination), substrate, safe passage, and forage. The primary effects of the action will be short-term, localized increases in background turbidity and minor alterations of the substrate. NMFS expects insignificant effects to the above PBFs from the reduced water quality, temporary disturbance of the substrate and shallow-water benthic habitat, which will cause a temporary change to prey availability in the disturbed area. It is reasonably certain that these actions will not result in long-term adverse effects to substrates, water quality, migratory habitat, food base, or other PBF's within the action area given the proposed conservation and mitigation measures discussed above. The proposed project actions are not expected to result in any net change in function of the in-stream habitat.

Benthic disturbance in the excavation area will reduce prey availability. The prey invertebrates will start to recolonize as soon as construction is done. Recolonization will occur over a couple of months. The disturbed area is a small fraction of similar quality, shallow habitat area available for use in the McNary pool.

Based on our analysis that considers the current status of PBFs, adverse effects from the proposed action will cause an insignificant, temporary, and localized decline in the quality and function of PBFs in the action area. Because of the small scale and extent of the effects to PBFs, we do not expect a reduction in the conservation value of critical habitat in the action area. As we scale up from the action area to the designation of critical for each species, the proposed action is not expected to appreciably reduce the conservation value of the designated critical habitat.

2.8. Conclusion

After reviewing and analyzing the current status of the listed species and critical habitat, the environmental baseline within the action area, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of SR sockeye salmon, SR spring/summer Chinook salmon, SR fall Chinook salmon, or SRB steelhead or destroy or adversely modify their respective designated critical habitat.

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). On an interim basis, NMFS interprets “Harass” to mean “create the likelihood of injury to wildlife by annoying it to such an extent as to significantly disrupt normal behavioral patterns, which include but are not limited to, breeding, feeding, or sheltering.” “Incidental take” is defined by regulation as takings that result from, but are not the purpose of, carrying out an otherwise lawful activity conducted by the Federal agency or applicant (50 CFR 402.02). Section 7(b)(4) and section 7(o)(2) provide that taking that is incidental to an otherwise lawful agency action is not considered to be prohibited taking under the ESA if that action is performed in compliance with the terms and conditions of this ITS.

2.9.1. Amount or Extent of Take

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows: (1) behavioral changes and possibly a few fish injured or killed due to sound pressure from pile driving; (2) increased injury or death from predation; (3) mechanical injury or death from in-water work equipment; and (4) injury or death of fish from impingement/entrainment on fish screens/intake structure over the life of these facilities. NMFS is reasonably certain the incidental take described here will occur because: (1) recent and historical surveys indicate ESA-listed species are known to occur in the action area; and (2) the proposed action includes in-water activities that are reasonably certain to harm or kill juvenile steelhead and salmon.

Incidental Take from Sound/Pressure
NMFS expects the proposed action will temporarily displace salmon and steelhead by exposure to hydroacoustic sound/pressure during vibratory and impact pile-driving activities. Salmon and steelhead experience behavior modifications (harm) through reduced feeding success and altered migration from avoiding elevated sound pressure during vibratory pile driving. The modifications may result in reduced fitness and survival to any juvenile steelhead or salmon present. Any fish present within 16 feet of the steel pile while impact driving can result in injury or death. Estimating the specific number of animals injured or killed by pile driving is not possible because of the range of responses that individual fish will have, and because the numbers of fish present, is highly variable. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the duration of the pile-driving activities to which fish will be exposed is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, the duration of vibratory pile-driving (excess of 8 hours) or the number of strikes (100 daily) by an impact pile driver represents the extent of take associated with hydroacoustic sound/pressure during impact pile-

driving activities. The proposed surrogate is linked to anticipated take because it described conditions that will cause take due to fish experiencing behavioral modifications during either vibratory pile driving, or injury or death from impact pile driving during the in-water pile installation activities. Specifically, NMFS will consider the extent of take exceeded if construction includes over 8 hours of vibratory pile driving, or exceeds 100 strikes per day by an impact pile driver.

Incidental Take from Increased Predation
NMFS expects the proposed action will result in harm, harassment, injury or death to salmon and steelhead by increases in exposure to piscine predators. Salmon and steelhead experience behavior modifications (harm) through reduced feeding success, altered migration from avoiding predators (harassment). The modifications may result in reduced fitness and survival to any juvenile steelhead or salmon present. We expect injury or death of juvenile salmon and steelhead from increased predators due to the temporary reduction in ambient light and shade from the presence of the temporary barge.

Estimating the specific number of animals injured or killed by increased predation is not possible because of the range of responses that individual fish will have, and because the numbers of fish present, is highly variable. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the duration of the temporary habitat change to which fish will be exposed is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, the duration of the temporary habitat modified by the presence of the barge during in-water work represents the extent of take exempted from increased predation in this ITS. The proposed surrogate is linked to anticipated take because it described the duration of changes in habitat conditions will cause take due to increases in predator habitat. Also, this clearly quantifiable measure can easily be measured to determine if take might be exceeded. Specifically, NMFS will consider the extent of take exceeded if the presence of the temporary barge at the project in-water work site exceeds 42 days.

Incidental Take from Mechanical Injury or Death
NMFS anticipates the proposed action will result in injury or death as a result of in-water excavation and fill. Estimating the specific number of animals injured or killed by interactions with heavy equipment is not possible because of the range of responses that individual fish will have, and because the numbers of fish present at any time is highly variable. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the extent of habitat altered by excavation and installation of the in-water pipeline is readily discernible and presents a reliable measure of the extent of take that can be monitored and tracked. Therefore, the estimated extent of habitat encompassed by trench excavation and filling represents the extent of take associated with mechanical injury and death. The proposed surrogate is causally linked to anticipated take because it describes conditions that will cause take due to in-water work. Specifically, NMFS will consider the extent of take exceeded if the limits of excavation and filling exceed 631 square feet.

Incidental Take from Entrainment or Screen Impingement
NMFS anticipates the proposed action will result in injury or death as a result of entrainment or impingement at screens at the intake pump station over the many years of presence and operation

of these structures. Estimating the specific number of animals injured or killed at intake screens is not possible because of the range of responses that individual fish will have, and because the numbers of fish present at any time is highly variable. While this uncertainty makes it impossible to quantify take in terms of numbers of animals injured or killed, the rate of water withdrawal at the intake screens is readily discernible and presents a reliable surrogate measure of the extent of take that can be monitored and tracked. Therefore, the estimated rate of the water withdrawal while pumping at the intakes represents the extent of take associated with entrainment or impingement. Specifically, NMFS will consider the extent of take exceeded if the pumping rate exceeds 32.96 cfs.

The surrogates described above are measurable, and thus can be monitored and reported. For this reason, the surrogates function as effective reinitiation triggers.

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

"Reasonable and prudent measures" are measures that are necessary or appropriate to minimize the impact of the amount or extent of incidental take (50 CFR 402.02).

1. Avoid or minimize take from sound/pressure.
2. Avoid or minimize take from habitat disturbance and mechanical injury.
3. Avoid or minimize take from increased predation.
4. Avoid or minimize take from injury or death from entrainment or impingement.
5. Conduct sufficient monitoring to ensure that the project is implemented as proposed, and the amount and extent of take is not exceeded.

NMFS believes that full application of conservation measures included as part of the proposed action, together with use of the RPMs and terms and conditions described below, are necessary and appropriate to minimize the likelihood of incidental take of listed species due to completion of the proposed action.

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 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 RPM 1:

    a. Pile driving shall be limited to a maximum of 8 hours of vibratory pile driving and 100 strikes per day by an impact pile driver.

2) The following terms and conditions implement RPM 2:

    a. Conduct all work below the OHWM within as short a period as possible between December 15 and February 28.
    b. Confine excavation to the minimum area necessary to achieve project goals, no larger than 631 square feet.

3) The following terms and conditions implement RPM 3.

    a. The Corps (or applicant) shall remove the barge from the action area as soon as in-water construction is complete.

4) The following terms and conditions implement RPM 4.

    a. All intakes pumps and diversions shall have fish screens to avoid juvenile fish entrainment, and impingement and will be operated in accordance with NMFS' current fish screen criteria (NMFS 2011b).

5) The following terms and conditions implement RPM 5.

    a. Track and monitor construction activities to ensure that the conservation measures are meeting the objective of minimizing take.
    b. Submit a completion of project report to NMFS 2 months after project completion. The completion report shall include, at a minimum, the following:
        i. Starting and ending dates for work completed, with in-water work period specified.
        ii. Details of total footprint of disturbed area during in-water excavation and installation of pipeline to ensure meeting the extent of take requirements.
        iii. Summary and details of turbidity monitoring including:
            a. Any daily observed turbidity plume from the in-channel work area to 500 ft. downstream during the in-water construction period. Observations shall occur daily before, during and after commencement of construction activities and compared to observable turbidity.
            b. Description of the visually monitored downstream extent of turbidity plumes resulting from in-water construction and excavation activities, including removal of the sediment curtain.
            c. A summary of pollution and erosion control inspection results, including results of implementing required BMPs, and including a description of any erosion control failure, contaminant release, and efforts to correct such incidence.

iv. Photos of habitat conditions (open water including sediment control measures, shoreline, banks, vegetation, etc.) at the in-water work site before, during, and after project completion. General views and close-ups showing details of the project and project area, including pre- and post-construction. Label each photo with date, time, project name, photographer's name, and the subject.
v. Number and species of any observed injured or dead listed salmon or steelhead found at the in-water work site.

All reports will be sent to:

nmfswcr.srbo@noaa.gov

and/or

National Marine Fisheries Service
Snake Basin Branch
800 E Park Boulevard
Plaza IV, Suite 220
Boise, Idaho 83712-7768

i) Reference to NMFS consultation number WCRO-2021-01271.

d. If the amount or extent of take is exceeded, stop project activities and notify NMFS immediately.

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).

The following conservation recommendations are discretionary measures that NMFS believes are consistent with this obligation and therefore should be carried out by the federal action agency:

1. Work with KAL Farms and other water users in the Snake River Basin including landowners on long-term plans and designs to improve water use and efficiency, and to upgrade and modify other existing pump stations and intakes to prevent injury to fish and aquatic resources.

2.11. Reinitiation of Consultation

This concludes formal consultation for the KAL Farms Irrigation Replacement Project.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by NMFS 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 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 (4) a new species is listed or critical habitat designated that may be affected by the action.

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

Section 305(b) of the MSA directs Federal agencies to consult with NMFS on all actions or proposed actions that may adversely affect EFH. Under the MSA, this consultation is intended to promote the conservation of EFH as necessary to support sustainable fisheries and the managed species' contribution to a healthy ecosystem. For the purposes of the MSA, EFH means "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity", and includes the physical, biological, and chemical properties that are used by fish (50 CFR 600.10). Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) of the MSA also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH. Such recommendations may include measures to avoid, minimize, mitigate, or otherwise offset the adverse effects of the action on EFH [CFR 600.905(b)]

This analysis is based, in part, on the EFH assessment provided by the Corps and descriptions of EFH for Pacific Coast salmon (PFMC 2014); contained in the fishery management plans developed by the Pacific Fishery Management Council (PFMC) and approved by the Secretary of Commerce.

3.1. Essential Fish Habitat Affected by the Project

The action area, as described in Section 2.3 of the above opinion, is also EFH for various life-history stages of Chinook and coho salmon (PFMC 2014). The PFMC designated the following five habitat types as habitat areas of particular concern (HAPCs) for salmon: complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation (PFMC 2014). The proposed action may adversely affect the following HAPCs: complex channel habitat.

3.2. Adverse Effects on Essential Fish Habitat

Based on information provided in the BA and the analysis of effects presented in Section 2 of this document, NMFS concludes that the proposed action will adversely affect EFH designated for Chinook and coho salmon because it will have effects on water quality, benthic communities, and channel substrate.

The proposed project includes excavation of channel substrate, installation of the new intake pipe beneath the substrate of the Snake River, and then covering the new pipe with substrate material removed during excavation. This will alter approximately 1,000 square feet (0.02 acres) of river bottom, altering benthic habitat and macroinvertebrate production. This action will result in short-term effects to water quality and feeding habitat for juvenile salmon.

Specifically, NMFS has determined that the action will adversely affect EFH as follows:

1. The temporary alteration of the near-shore environment substrate, which will temporarily (during construction) affect juvenile rearing and the quality of habitat in the migration corridor.
2. Temporary reduction in prey availability from removal and disturbance of the macroinvertebrate community and as a result of increased fine sediment in stream substrates due to in-water work.
3. Short-term elevation of turbidity and sedimentation within and immediately downstream from the construction area from construction activities.

3.3. Essential Fish Habitat Conservation Recommendations

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

1. Implement RPM 2 and RPM 3 (above), and their terms and conditions described in the ITS in the ESA portion of this document, to minimize adverse effects to EFH due operation of heavy equipment, in-water construction, and sediment disturbance.
2. Implement RPM 5, and its terms and conditions described in the ITS in the ESA portion of this document, to ensure completion of monitoring and reporting to confirm that these terms and conditions are effective for avoiding and minimizing adverse effects to EFH.

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 EFH.

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 timeframes 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 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 users of this opinion are the Corps. Other interested users could include KAL Farms, LLC, Campbell Environmental, LLC, IRZ Consulting, LLC, and the citizens of Walla Walla County. Individual copies of this opinion were provided to the Corps. The document will be available within 2 weeks at the NOAA Library Institutional Repository (https://repository.library.noaa.gov/welcome). 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, if applicable*] contain more background on information sources and quality.

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

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

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