UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
West Coast Region
650 Capitol Mall, Suite 5-100
Sacramento, California 95814-4700

Refer to File No.: WCRO-2020-00798

August 14, 2020

MEMORANDUM FOR: Incidental Take Permit #23264 file
(151422-WCR2020-SA00016)

FROM: Cathy Marcinkevage A. Catherine Marcinkevage
Acting Assistant Regional Administrator
California Central Valley Office

SUBJECT: Documentation of Endangered Species Act Section 7 Consultation (WCRO-2020-00798) for the Issuance of Section 10(a)(1)(B) Incidental Take Permit for the Calaveras River Habitat Conservation Plan authorizing take of Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*), Central Valley spring-run Chinook salmon (*O. tshawytscha*), and California Central Valley steelhead (*Oncorhynchus mykiss).*

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

Issuance of Incidental Take Permit for Calaveras Habitat Conservation Plan

NMFS Consultation Number: WCRO-2020-00798

Action Agency: NMFS

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?
California Central Valley steelhead (*Oncorhynchus mykiss*)	Threatened	Yes	No	Yes	No
Sacramento River winter-run Chinook salmon (*O. tshawytscha*)	Endangered	Yes	No	N/A	N/A
Central Valley spring-run Chinook salmon (*O. tshawytscha*)	Threatened	Yes	No	N/A	N/A

Fishery Management Plan That Identifies EFH in the Project Area	Does Action Have an Adverse Effect on EFH?	Are EFH Conservation Recommendations Provided?
Pacific Coast Salmon	Yes	Yes

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

A. Catherine Marcinkevage

Issued By:

Cathy Marcinkevage
Acting Assistant Regional Administrator

Date: *August 14, 2020*

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LIST OF ACRONYMS

AF	Acre-feet
°C	degrees Celsius
CCV	California Central Valley
Cfs	cubic feet per second
CHCP	Calaveras Habitat Conservation Plan
CRTRG	Calaveras River Technical Review Group
CV	Central Valley
dB	deciBels
DQA	Data Quality Act
DPS	Distinct Population Segment
DWR	California Department of Water Resources
EA	Environmental Assessment
EFH	Essential Fish Habitat
EPA	Environmental Protection Agency
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
°F	degrees Fahrenheit
FFC	Fishery Foundation of California
FHWG	Fisheries Hydroacoustic Working Group
FONSI	Finding of No Significant Impacts
FWCA	Fish and Wildlife Coordination Act
HAPCs	Habitat Areas of Particular Concern
HCP	Habitat Conservation Plan
HIS	Habitat Suitability Indices
IS	Initial Study
ITP	Incidental Take Permit
ITS	Incidental Take Statement
m	meters
M&I	Municipal & Industrial
μpa	micro-pascal
MSA	Magnuson Stevens Fishery Conservation and Management Act
NEPA	National Environmental Policy Act
NMFS	National Marine Fisheries Service
NTU	nephelometric turbidity units
Opinion	Biological Opinion
PAHs	polycyclic aromatic hydrocarbons
PBF	Physical or biological features
PCE	Primary constituent element
PHI	physical habitat index
PHABSIM	Physical Habitat Simulation
PFMC	Pacific Fishery Management Council
RM	River Mile
RMA	Routine Maintenance Agreement
RMS	root mean square
RPM	Reasonable and Prudent Measures

SEL	sound exposure level
SEWD	Stockton East Water District
SDC	Stockton Diverting Canal
SJRRP	San Joaquin River Restoration Project
USACE	United States Army Corps of Engineers
WSEP	Water Supply Enhancement Project
WTP	Water Treatment Plant
WUA	Weighted Usable Area
YOY	Young-of-the-Year

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.

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

Section 10(a) of the ESA provides exceptions to the section 9 prohibitions on take of listed species via two kinds of permits (16 U.S.C. § 1531 et seq.). Section 10(a)(1)(A) permits authorize the take of listed species for scientific purposes or to enhance the propagation or survival of listed species. Section 10(a)(1)(B) permits authorize the incidental take of listed species caused by otherwise lawful activities.

Section 10(a)(2)(A) of the ESA, allows an applicant to develop a habitat conservation plan (HCP) that meets specific requirements identified in section 10(a)(2)(A) of the ESA. Any habitat conservation plan must specify: (i) the impact which will likely result from such taking; (ii) what steps the applicant will take to minimize and mitigate such impacts, and the funding that will be available to implement such steps; (iii) what alternative actions to such taking the applicant considered and the reasons why such alternatives are not being utilized; and (iv) such other measures that the Secretary may require as being necessary or appropriate for purposes of the plan.

If these requirements are met, then the applicant can apply to NMFS for an Incidental Take Permit (ITP) pursuant to section 10(a)(1)(B), that would allow for the incidental take of ESA-listed species, while carrying out an otherwise lawful activity. Under section 10(a)(1)(B), if the Secretary finds, after opportunity for public comment, with respect to a permit application and the related conservation plan that: (i) the taking will be incidental; (ii) the applicant will, to the maximum extent practicable, minimize and mitigate the impacts of such taking; (iii) the applicant will ensure that adequate funding for the plan will be provided; (iv) the measures, if any, required under subparagraph (A)(iv) will be met; and he has received such other assurances as he may require that the plan will be implemented, the Secretary shall issue the permit. As described in the permitting provisions of the ESA, the permit shall contain such terms and conditions as the Secretary deems necessary or appropriate to carry out the purposes of this paragraph, including, but limited to, such reporting requirements as the Secretary deems necessary for determining, whether such terms and conditions are being complied with.

In August 2019, the Stockton East Water District (SEWD) submitted an Incidental Take Permit (ITP) application with their Calaveras River Habitat Conservation Plan (CHCP) for the long-term operations and maintenance of their diversion facilities on the Calaveras River. In September, 2019, in accordance with the National Environmental Policy Act (NEPA), NMFS issued a draft Environmental Assessment/ Initial Study (EA/IS) to evaluate the effects of the proposed action of issuing an ITP under Section 10(a)(1)(B) of the ESA. NMFS solicited public comments on the draft EA/IS until November 2019, and have addressed comments in the final Finding of No Significant Impact (FONSI) that is being issued along with this biological opinion.

When considering issuance of an ITP, NMFS must consult internally under Section 7 of the ESA to ensure that issuance of the permit, and subsequent implementation of the HCP, does not appreciably reduce the likelihood of survival and recovery of ESA-listed species. In compliance with section 7(a)(2) of the ESA, in this opinion, NMFS analyzed the effects of the issuance of an ITP for the Calaveras River Habitat Conservation Plan, exempting incidental take of ESA-listed Sacramento River winter-run Chinook salmon, Central Valley (CV) spring-run Chinook salmon, and California Central Valley steelhead (CCV steelhead), henceforth referred to as ESA-listed salmonids.

California Central Valley fall-run and late fall-run Chinook salmon do not currently have protective federal regulations against take, and no Federal permit is needed to incidentally take them, but there may be a change in listing status during the permit period. If fall-run and late fall-run Chinook salmon, henceforth referred to as non ESA-listed salmonids, are listed as threatened or endangered in the future, then the ITP would become effective immediately for these species.

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

We completed pre-dissemination review of this document using standards for utility, integrity, and objectivity in compliance with applicable guidelines issued under the Data Quality Act (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 California Central Valley Office.

1.1. Background

The Calaveras River, a tributary to the San Joaquin River, serves as an important source of water for agricultural and municipal uses in Calaveras and San Joaquin counties. The Calaveras River has been subject to impoundment since 1930, when Hogan Dam (76,000 acre-feet [AF] capacity) was constructed for flood control near the town of Valley Springs, California, which is about 28 miles east of the city of Stockton. Prior to 1949, there were no outlet controls on Hogan Dam and flows were not regulated in the lower river. In 1949, outlet control were installed at the Dam and the Stockton and East San Joaquin Water Conservation District (now SEWD), together with the City of Stockton, began operating the Dam to provide water for irrigation purposes. In 1964, immediately below Hogan Dam, the United States Army Corps of Engineers (USACE) completed the construction of the New Hogan Dam. New Hogan Dam increased storage capacity of the reservoir to 317,000 AF at gross pool, with up to 165,000 AF of flood control storage space during the flood season, and a minimum (inactive) pool of 15,000 AF for sediment storage, fish and incidental uses. The New Hogan Project is operated by USACE during the flood control season, for flood control, municipal and industrial water supply, irrigation, and recreation purposes.

Stockton East Water District (SEWD) manages the water resources of the Calaveras River during non-flood control periods for its constituents. SEWD provides approximately 50,000 AF of surface water annually to its agricultural service area. In addition to supplying agricultural water, SEWD provides approximately 50-57,000 AF of treated surface water annually to its urban contactors, including the City of Stockton, the County of San Joaquin, and the California

Water Service Company. The urban contractors serve over 300,000 residents and thousands of businesses in San Joaquin County.

In March 2000, the USACE made flood control releases from New Hogan Reservoir to the Calaveras River in response to storm events. As the storm inflow tapered off, the USACE ramped down flood control release flows in a manner which stranded CCV steelhead and rainbow trout (both *Oncorhynchus mykiss*). According to reports of local anglers, of the 21 *O. mykiss* that were observed to be stranded, 13 were reported to have been relocated to deeper water by local anglers and 8 were found dead. This event occurred just months prior to NMFS's completion and official publication of the first 4(d) rule (65 FR 42422) which established protective regulations to threatened species under the Endangered Species Act, including CCV steelhead. The fish stranding resulted in public and regulatory concern for the protection of CCV steelhead within the Calaveras River basin. On December 5, 2002, NMFS issued a biological opinion for the Operations of the New Hogan Dam and Lake Project by USACE (NMFS 2002). Subsequently, beginning in 2003 and 2004, SEWD began collaboration with regulatory agencies to develop the CHCP for its non-flood control operations within the Calaveras River basin. In August 2019, SEWD submitted the final version of the CHCP as part of their application for an ITP to NMFS. In general, the biological goals of the CHCP are to: (1) maintain a viable population of *O. mykiss* within the conservation area; and (2) maintain adequate habitat conditions upstream of Bellota for fall, late-fall, spring, or winter-run Chinook salmon that may opportunistically migrate into the conservation area, but are not expected to maintain a viable population based on both pre-dam and current conditions.

1.2. Consultation History

On March 4, 2020, NMFS requested information to help clarify some components of the HCP from Stockton East Water District's fishery consultants, FishBio.

On April 3, 2020, NMFS received the requested information, and determined there was a complete initiation package and initiated formal consultation with itself for the issuance of an ITP for the CHCP.

On April 9, 2020, and April 24, 2020, NMFS requested additional information to help clarify other components of the HCP, as well as information for effects analysis.

From May 6 – 8, 2020, NMFS received the requested information from FishBio.

On June 2, 2020, NMFS requested clarification on the Fisheries Monitoring Program.

On June 4, 2020, NMFS received the requested clarification from FishBio via a telephone call.

1.3. Proposed Federal Action

Under 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). Under MSA, Federal action means any action authorized, funded, or undertaken, or proposed to be authorized, funded, or undertaken by a Federal Agency (50 CFR 600.910). We also considered whether or not the proposed action would cause any other activities and determined that it would not.

The proposed action is the issuance of an ESA ITP by NMFS. The ITP would require implementation of the CHCP, which contains a series of conservation strategies to minimize and mitigate to the maximum extent practicable the District's Calaveras River Operations effects on Covered Species during the duration of the ITP. The term of the proposed ITP is 50 years, unless the Permit is terminated prior to the expiration in accordance with applicable regulations.

The ITP would allow incidental take of the following listed and non-listed species (referred collectively as the "Covered Species"): threatened CCV steelhead, threatened CV spring-run Chinook salmon; endangered Sacramento River winter-run Chinook salmon; and non ESA-listed CV fall-run and late fall-run Chinook salmon. Fall-run and late fall-run Chinook salmon do not currently have any protective regulations against take and no Federal permit is needed to incidentally take them, but there could be a change in listing status during the permit period. If fall-run and late fall-run Chinook salmon are listed as threatened or endangered in the future, then the ITP would become effective immediately for these species.

The ITP would allow incidental take of the Covered Species resulting from the following covered actions: (1) activities described in the CHCP that are necessary to operate and maintain the Project facilities during the ITP duration ("Covered Activities"); and (2) activities associated with conservation strategies identified in the District's CHCP (SEWD and FishBio 2019), in accordance with the statutory and regulatory requirements of the ESA.

1.3.1. Covered Activities

The Covered Activities are those necessary to operate and maintain Project facilities during the ITP duration, and are categorized by activity type (e.g., reservoir impoundment, controlled release, water withdrawals, and activities within the stream channel) in Table 1. Descriptions of the covered activities are incorporated by reference from Chapter 6 and Appendix C of the CHCP (SEWD and FishBio 2019; publicly available online at: https://www.fisheries.noaa.gov/action/calaveras-river-habitat-conservation-plan-and-environmental-assessment).

Table 1. Covered Activities that are necessary to operate and maintain (OM) Project facilities during the ITP duration, categorized by activity type.

Covered Activity	New Hogan Impoundment	New Hogan Controlled Releases	Water Withdrawal-Diversions	Activities within stream channel
OM1. New Hogan Reservoir Water Impoundment and Non-Flood Control Operations	SEWD controls volume during non-flood control season	New Hogan releases serve municipal and irrigation (M&I) and agricultural customers through OM2 to OM5; and provide groundwater recharge through OM3; typical releases range from Apr-Oct: 75-250 cfs; and Oct-May: 20-86 cfs – non-flood control releases	--	--

Covered Activity	New Hogan Impoundment	New Hogan Controlled Releases	Water Withdrawal-Diversions	Activities within stream channel
OM2. SEWD Old Calaveras River Headworks Facility Operations	--	See OM1	Diversion controlled by slide gates: closed to prevent flooding; opened to provide water for agricultural customers, and during periods when natural flows are available for groundwater recharge (Nov-Jun)	--
OM3. SEWD Bellota Diversion Facility Operations	--	See OM1. Reduced several days annually, as required for flashboard dam installation/ removal	Diversion year-round to provide water for M&I water treatment plant and to augment irrigation supply for agricultural customers and for groundwater recharge	Install and remove 8-foot & 2-foot weirs/ fish ladders – start and finish of irrigation season*
OM4. Artificial Instream Structures and SEWD Small Instream Dam Operations	--	See OM1	Water diverted into channels (Mormon Slough/Stockton Diverting Canal, Old Calaveras River, Mosher Creek, Bear Creek, and Potter Creek) impounded by small dams and used by agricultural customers	--
OM5. Privately Owned Diversion Facilities Operated within the District's Service Areas (Technical Assistance and Education)	--	See OM1	Water diverted by agricultural customers primarily downstream of Jenny Lind	--

Covered Activity	New Hogan Impoundment	New Hogan Controlled Releases	Water Withdrawal-Diversions	Activities within stream channel
OM6. SEWD Channel Maintenance for Instream Structures	--	Reduced up to 5 days annually, as required for maintenance activities concurrent with flashboard dam installation in mid-April	Dewatering during rebuilding of earthen dams	Maintenance (debris removal, vegetation erosion control, repair of previous erosion work, riprap placement using heavy equipment)
OM7. Fisheries Monitoring Program	--	--	--	Check and clear all traps of fish and debris daily

*Once the conservation strategies for OM3 are completed, this covered activity within the stream channel will no longer be implemented.

1.3.1.1. Fisheries Monitoring Program

The Fisheries Monitoring Program aims to identify the temporal and spatial distributions of migrating and holding CCV steelhead, and includes both resident and anadromous life histories of *O. mykiss*. In addition, the Fisheries Monitoring Program would collect data on any runs of Chinook salmon that may migrate into the Calaveras River basin. This data would help ensure that suitable flows, water temperatures, and passage conditions are being provided when and where the fish are in the Calaveras River.

Fisheries monitoring has been conducted since 2002 by SEWD, and will continue throughout the term of the ITP in order to improve understanding of salmonids, particularly *O. mykiss*, within the Calaveras River. Different sampling methods will be used to obtain different types of information, such as abundances of rearing juveniles during the spring and summer months, and abundances of spawning adults during the fall and winter months. Monitoring information will inform water management decisions on the Calaveras River, and inform about the effectiveness of conservation strategies once implemented.

Since the completion and submission of the CHCP to NMFS, monitoring activities that would be implemented under the CHCP have been updated with more details. Appendix D-3, D-4, D-5, and D-6 of the CHCP provide details for the Fisheries Monitoring Program as they were known at the time of writing of the CHCP. SEWD's current fishery consultant, FishBio have since submitted updated details on the Fisheries Monitoring Program (FishBio 2020). The following descriptions of monitoring activities provide more details about specific activities that may occur under the Fisheries Monitoring Program that is outlined in the CHCP. Not all monitoring activities described below would occur each year, and would be dependent on annual monitoring needs and funding. Additionally, annual monitoring needs would be determined through the adaptive management process that is outlined in the CHCP. However, at a minimum, rotary screw trapping, fish ladder monitoring, and carcass surveys would occur to determine the overall effectiveness of the CHCP, as well as to document compliance with activities under the CHCP.

Fish monitoring activities as part of the Calaveras River Fisheries Monitoring Program would utilize multiple gear types and methodologies that range from direct sampling to observation type surveys, depending on the targeted salmonid life stage and study needs:

1.3.1.1.1. *Juvenile and Yearling Salmonid Monitoring Activities*

Rotary Screw Trapping (RST)

To estimate abundances of migrating juvenile salmonids, rotary screw trapping will occur from October 15 through July 31 of each year. Downstream migrating salmonids will be captured in a 5 to 8 foot diameter RST manufactured by E.G. Solutions (Eugene, OR), depending on flow. The trap is located at Shelton Road (river mile [RM] 28 or 28.5, depending on size used) and typically operates as frequently as 5 days each week, as long as flow conditions allow for it. When operating, the RST will be checked daily, and cleaned at least once per day, and more frequently as needed based on debris loading and fish abundance. Fish will be carefully removed from the live box with 3/16inch cloth mesh (or finer) long handled dip nets and placed into 5-gallon aerated buckets containing fresh river water. The temperature of the water in the bucket will be monitored to ensure it remains within 2 degrees of the river temperature. RST monitoring may be conducted in river temperatures up to 70 degrees Fahrenheit (°F). During processing, all fish will be separated by size class in an effort to reduce the risk of predation. Should an adult *O. mykiss* be captured in the RST, size separators will be placed in the live box to assist smaller fish in avoiding predation.

During handling, fish are lightly sedated using dissolved sodium bicarbonate tablets to minimize stress from handling and injury that may result from struggling. All fish handled are allowed to recover in a bucket of fresh, aerated river water and gently returned to the river once processed. All personnel will be trained to minimize adverse effects of sampling on animals handled.

Seining

To estimate abundances of rearing juvenile salmonids, seining would occur from June through May of each year. The frequency of seining would be monthly from June through November, and bi-weekly from December through May. Field staff using a beach seine will be trained with current accepted seining and fish handling techniques. To reduce fish injury, seines will be inspected prior to each use for any debris left in the net. Sites with minimal debris levels will be selected for seining. Three (non-replicated) seine hauls will be conducted at each of the ten sampling sites using a 20 to 30-foot by 4-foot 1/8-inch mesh nylon seine. The seine will be set by 2 crew members in a round haul fashion by fixing one end on the beach while the other end is deployed wading upstream and returning to shore in a half circle. Once the lead line approaches the shore it will be withdrawn more than the cork line until fish are corralled in the bag and the lead line is on the beach. Each haul is expected to take approximately 5 minutes. Fish will be kept submerged in the water until they are transferred to a holding container with dip nets. Fish from each haul will be kept separate and placed in aerated 5-gallon buckets prior to processing. Seining would not be conducted in water temperatures conditions exceeding 70°F. To minimize impacts of handling, fish would be anesthetized prior to being handled and then measured. Fish will not be tagged, nor tissue or scale samples will be collected, and no individuals will be directly lethally taken.

Backpack Electrofishing

To supplement estimates of rearing salmonid abundances, and to collect data specifically on life history strategies of *O. mykiss*, backpack electrofishing would be used in habitats where seining is ineffective. In general, electrofishing would be used infrequently and only in situations where other monitoring methods are ineffective. Backpack electrofishing would occur from January through December up to a bi-weekly basis. During spawning season, all efforts will be made to avoid potential spawning areas using electrofishing. In an effort to clarify where electrofishing may occur and reduce concerns regarding impacts to spawning areas, backpack electrofishing will not be utilized in reaches above the Bellota Weir (RM 25) between October and May, which is the primary spawning times for CCV steelhead, CV fall-run and late fall-run Chinook salmon.

Field supervisors and crewmembers with appropriate training and experience using electrofishing techniques will conduct three-pass electrofishing using a Smith-Root backpack electrofisher. The setting will adhere to NMFS 2000 Electrofishing Guidelines for all electrofishing activities to minimize impacts; as such only the minimum setting necessary to generate efficient results will be used. Electrofishing would not occur if temperatures exceed approximately 64°F. Stream sections will be roughly 50 to 100 feet in length and will be sampled systematically in a zigzag pattern. Block nets will be used to delineate the sample area and to capture stunned fish that may drift downstream. The sampling crew will consist of three people, one electro-fisher operator and two netters. Stunned fish will be collected using one-quarter inch nylon nets and held in flow-through in-stream live cars. Fish will be separated by size class to avoid predation and will be held outside the sampling zone. Dip-nets may be used in small stream pools to allow identification of larval and juvenile fish species that do not respond effectively to electrofishing.

Fyke Net Trapping

When fyke nets are used they would consist of a 4-foot by 5-foot by 30-foot fyke net, with 1/4in and 1/8 in mesh panels, and would be operated at flow velocities of less than 5 feet per second. The fyke nets would be used at the outfall of some flashboard dams. Dependent on flow conditions, flow conveyance openings (i.e., notches measuring one square foot square) may be installed about 3-4 feet above the base of up to 20 individual flashboard dams during April-October. The flow will direct fish into the mouth of the fyke net (diameter of opening measuring 1 foot) and will be channeled into a live box at the rear of the trap. Traps will be checked at least daily and more frequently if adult *O. mykiss* are observed in or near the trap. The fyke nets will be operated intermittently and are dependent on the installation of the flashboard dams that are being monitored. When the dams are installed, the fyke nets are expected to be operated 3 to 5 days a week for the duration of the installation. The live box at the end of the fyke net will be standing in roughly 1-2 feet of water downstream of the flashboard dam. During fyke net checks, all fish will be removed from the trap using appropriate dip nets and placed in holding buckets containing fresh stream water for processing. Fyke netting would not be conducted in water temperatures exceeding 70°F.

Snorkel Surveys

During July through September, a team of two or more snorkelers will be used in sections of the Calaveras River to estimate over summering abundance and distribution of juvenile Chinook salmon and *O. mykiss*. The number of people needed for a snorkel survey is dependent on the width of the stream but is chosen to ensure complete visual coverage of the stream during upstream snorkeling. If the survey requires more than two divers, parallel dive lanes will be randomly assigned prior to snorkeling. Care will be taken to minimize disturbance of fish prior to sampling each unit. The divers will enter at the downstream border of the survey reach and count fish within their respective lanes as they proceed upstream in unison. Counts will be recorded on a wrist mounted dive slate, and assign a size category to each observation. Visibility will be recorded at the conclusion of each dive. If visibility is deemed too poor (less than two feet of visibility), an alternative site will be randomly selected and sampled. At least one pass, and no greater than four passes will be made at each randomly selected site. Measures taken to limit negative effects from snorkeling on fish include: following standard snorkel survey protocols, wearing drab colored dry suits to reduce snorkeler visibility, and moving in a slow, deliberate fashion to limit the amount of disturbance the snorkeler makes in the water.

Prior to snorkeling, habitats are to be surveyed on foot and categorized into habitat units based on four-category classification (riffle, run, pool, and cascade). Global Positioning System (GPS) waypoints are taken at the boundaries of each habitat unit during subsequent surveys. The length and width of each unit will be measured with a laser rangefinder, and maximum water depth of each unit will be determined with a stadia rod. Survey sites are expected to range between 30 and 450 yards depending on habitat type and location. The water temperature at the downstream end of each unit, dominant substrate and cover, and presence of large woody debris will be noted during the survey.

1.3.1.1.2. *Adult Salmonid Monitoring Activities*

Fish Ladder Monitoring

Adult monitoring would be conducted by observation only, by utilizing a live video monitoring system installed at the exit of the upstream interim fish ladder at the Bellota Intake Facility during the spawning season. The actual months live video monitoring would occur would be determined through the adaptive monitoring program, which is outlined in the CHCP. Additionally, observational spawning surveys on foot (walking in the river or on the bank) or by boat and conducted in the river reaches upstream of Bellota. Currently, a live video monitoring system is deployed at Bellota in an effort to enumerate adult salmonids as they pass through the fish ladder. In the future, a VAKI Riverwatcher will be built into a permanent fish ladder as part of the implementation of the Bellota Intake and Diversion Facility under the CHCP.

Effects to species observed via the fish ladder are anticipated to be minimal to none as both methods constitute observation only. Some individuals may exhibit an avoidance response to lights utilized by the video monitoring system, however, previous experience with weir monitoring utilizing both live video and Riverwatcher technologies in the San Joaquin Basin demonstrates this to be a minor affect.

Adults observed during spawning surveys may display a flight response as field staff move through the sampling reaches via boat or by foot, however, previous survey experience has shown that this response is minimal and that holding salmonids often immediately return to their redds after the crews have passed (SEWD and FishBio 2019).

Hook and Line Sampling

To collect data on the life history strategies of *O. mykiss*, hook and line sampling will occur from January through March up to a biweekly basis, and from the fourth Saturday in May through December 31 up to a biweekly basis as well. Two to three anglers will target *O. mykiss* from shore. Tackle will be limited to fly fishing rods and reels with artificial lures with single barbless hooks. Sampling will take place during the day during legal angling hours. Standard fishing regulations will be followed (e.g., season and gear). The reach of the Calaveras River downstream of New Hogan Dam to the Stockton Diverting Canal is open for fishing from the fourth Saturday in May through March 31 and only allows for artificial lures with barbless hooks. Therefore, there will be no hook and line sampling conducted in April.

Hook and line surveys will be largely selective for *O. mykiss* that can be specifically targeted with types of flies used and habitats sampled. Barbless hooks will be used to minimize injury. Additionally, fish will be landed in rubber or mesh handling nets to minimize injuries and loss of protective slime. In order to collect measurement data, and/or collect tissue or scale samples, and /or tag fish, fish will be anesthetized one at a time, unless processing crew is capable of handling two fish; if a fish is captured other nearby crew will suspend sampling to help will processing until complete. Unmarked fish in good condition will be held for no longer than 1 hour in in-stream live cars until processing. Hook and line sampling would not occur if temperatures exceed 70°F.

<u>Carcass Surveys</u>

Carcass surveys will be conducted weekly during the typical fall/winter spawning period between September 1 and January 31. Generally, carcasses will be collected using a long (approximately10 to 15-foot) wooden pole with a five-pronged gig attached to one end or a similarly constructed gaff. The following data will also be recorded after collecting the carcass:

1. Adipose fin absent (hatchery-origin), present (natural-origin), or unknown (inconclusive; poorly cut or deteriorated).

2. Sex – male, female, or unknown

3. Freshness (recently died; clear eyes) or non-fresh (decayed)

4. Spawned or not spawned (eggs present in females)

5. Fork length, and whether or not a tissue sample and scales were taken (depending on carcass freshness)

6. Location (river mile and GPS coordinates)

A fresh carcass is classified by one having one clear and/or red/pink gills. Depending on flow conditions and survey reach, the surveys will either be conducted on foot (walking in the river or bank) or by kayak by a team of two or three individuals. Spawn condition will be noted for female carcasses only. Female carcasses will be classified as spawned if few eggs remained in the carcass and the caudal (tail) fin was worn from redd construction. Unspawned females typically are those with unworn caudal fins indicating they had not yet constructed a redd or those where numerous eggs remained in the carcass after it had died. Carcasses will be measured for fork length to determine age structure of the population. Additionally, scales and a tissue sample may be collected (depending on carcass freshness) to provide additional information regarding the genetics, age structure of the population as well as potential growth rate information of returning adults.

The removal of portions of the carcasses may result in a reduced amount of food availability to other species within and near the Calaveras River. Only the minimum amount of tissues will be collected to limit the impact of this important food source. The remainder of the carcasses will be returned to the portion of the stream in which it was initially observed.

Redd Surveys

Annual surveys of redds would be performed to evaluate Chinook salmon and steelhead/rainbow trout spawning preferences. A field crew composed of generally two fishery consultant staff would document the temporal and geographic distribution of redds using boat and foot surveys, and measure stream conditions such as river flow velocity, water temperature, depth, and substrate type. Upon encountering a redd, surveyors would identify the locations of the pot and tailspill as described in Gallagher et al. (2007). In addition, the crew will mark the redd by recording a minimum of 10 GPS points at the upstream end of the tailspill (i.e., egg pocket) with a Trimble GeoXH 6000 (Trimble Navigation Limited, Sunnyvale, California, USA), resulting in location accuracy of approximately 30 centimeters (cm), on average. For a subset of redds (those that had no fish on or near them), a suite of measurements would be recorded (to the nearest 3 cm) using a stadia rod, including pot length, pot width, tail spill length, and tail spill width.

If multiple redds are observed in the same location with no clear boundaries, then the total dimensional area would be recorded by taking multiple GPS points around the border of the disturbed substrate. However, for a given polygon, estimated counts of new/old/incomplete redds from previous surveys would be used to establish accurate redd counts in subsequent surveys. To distinguish newly constructed redds (in between survey intervals), visual characteristics of each redd would be used. A new redd would be defined as having freshly disturbed substrate and presence of a Chinook salmon digging or guarding the redd. An old redd would be defined as having substrate with fine sediment accumulation (e.g., sand), growth of algae, and no freshly disturbed substrate. Superimposition will be determined in the field by the presence of a new redd that was constructed on top of a visible older redd, or a previously documented older redd, and typically this would include the presence of a Chinook salmon digging or guarding the new redd. When possible, crews will record the redd from above via a boat to minimize the disturbance of substrates. If this is not possible, crews will make every effort to avoid foot travel near the redd pocket.

1.3.1.1.3. *Procedures for Monitoring Juvenile and Yearling Salmonids and Adult O. mykiss*

Anesthetic

All fish captured will be anesthetized to allow for identification to species. Fish will be closely observed in an anesthetic bath of Alka –Seltzer Gold (aspirin free) brand sodium bicarbonate (NaHCO3) until loss of equilibrium is achieved but operculum movement is still present. The lowest concentration of sodium bicarbonate that will permit safe handling will be used and will range from 1 to 2 tablets per gallon of fresh river water depending on fish size and water temperature. The bicarbonate material will be allowed to completely dissolve before fish are added to the anesthetic bath. Fry will be anesthetized in groups of approximately 10 fish, and larger parr and smolts will be anesthetized in groups of 2 fish. Fish would be handled after 1 to 2 minutes in the anesthetic bath and will be processed immediately following loss of equilibrium. A product called Stress Coat will be added to the recovery bucket as needed to combat stress from loss of the protective slime layer during handling. Fish will be allowed to recover in 5-gallon buckets of aerated fresh river water until normal behavior is observed. Water temperature in the recovery bucket will be monitored and maintained to be within 2 degrees of the ambient river temperature.

Length and Weight Measurements

While anesthetized, all fish (salmonids and other species) would be individually placed onto a wetted measuring board and measured to the nearest mm length (forklength, standard length, and total length). Also while anesthetized, fish (salmonids and other species, unless hook and line sampling, then only non-salmonids) would be transferred into a small bowl filled with fresh river water and weighed to the nearest 0.1gram (g) using an electronic scale.

Scale Sampling

When taking scale samples, collection method includes use of tweezers. The number of scales collected should be no greater than 10 per fish. Scales will be put into a small coin envelope labeled with the sample date, location, and additional physical data collected (i.e. fork/total length, body depth, sex, and adipose fin presence). The scales will be returned to the FISHBIO Oakdale office (or other future fishery consultants for SEWD) to be cataloged and archived for future analysis.

Tissue Samples (Fin Clips)

Fin clips will be taken with sharp dissection scissors cleaned between each use in 70 percentage (%) ethanol. Fin clips will not exceed 2 millimeter (mm) by 2mm. Upper caudal fin clips will be taken from fish 50-130 mm in forklength (FL) and fish greater than (>)400 mm FL and pectoral fin clips will be taken from fish 130-400 mm FL. Fin clips will not be taken from fish <50mm FL. Samples will be placed in sterile chromatography paper and kept in an envelope labeled with the sample number, species, location, date, and fork length.

PIT Tagging

Depending on the needs and objectives of specific monitoring and each study identified through the adaptive management process under the CHCP, some fish may be tagged with a Passive Integrated Transponder (PIT) tag. Generally, anesthetized *O. mykiss* that are >70 mm FL will be implanted with Biomark (12.5mm 134.2 kHz ISO) PIT tags using pre-loaded single use 12-gauge hypodermic needles (HPT12 PLT) fitted onto an implant device (MK-25). The needle will be inserted posterior to the tips of the pectoral fins (when the fins are laid along the side of the fish) on the abdomen to the right or left of the mid-ventral line at the tips of the pleural ribs. The needle will be directed posteriorly at an approximately 10-20-degree angle with the needle bevel against the fish. All tags will be scanned prior to insertion to verify proper function.

External Mark

Mark-recapture studies will occur when feasible, to test the efficiency of the RST. Fall-run Chinook salmon and/or *O. mykiss* (>30 mm) will be photonic dye marked using either a MadaJet (MADA Equipment Co., Inc., Carlstadt, NJ) or a Pow'r-ject injector (NewWest Technologies, Santa Rosa, CA) and Day-Glo Color Corporation (Cleveland, OH) tag solution. The photonic dye marking method will be used because of the high quality of marks and the ability to use marking equipment in rapid succession, thus minimizing the time and impacts of fish being processed. The method will use a marker tip placed against the caudal (top or bottom lobe), dorsal, or anal fin and dye injected into the fin rays. One mark will be applied to each fish and all fish in the group will receive the mark. The mark location and/or color will change between groups so each group can be uniquely identified. Several different photonic dye colors can be used to differentiate the group including blue, orange, yellow, and green. Mark location and color will be coordinated with a biologist for the California Department of Fish and Wildlife prior to beginning the work.

Fish Capture-Relocation Activities

In addition to all of the methods and procedures described above, FISHBIO (or other future fishery consultant for SEWD) would assist SEWD during construction and maintenance activities by providing fish rescue and/or relocation services. A typical fish rescue method/procedure is described as follows:

If fish are believed to be stranded as a result of SEWD's regular operations, maintenance, or construction activities, then any ponded areas upstream or downstream would be seined to document fish presence, and captured fish would be relocated to the nearest suitable habitat. Block nets would be deployed at the upstream and downstream ends of each "unit" prior to seining to ensure that fish do not move out of the sample area. Seining will continue until a pass results in no catch. Any fish collected will be identified to species, and lengths, weights, and smolt index will be obtained from a subsample of up to 25 *O. mykiss* or Chinook salmon. If unintentional mortalities occur, then biological data will be collected from each fish, and NOAA Fisheries and CDFW will be notified. Carcass(es) will be delivered to CDFW for ongoing studies if requested by NOAA Fisheries.

If unintentional mortality of live salmonids is believed to be imminent, rescue operations will occur according to the following protocol. Non-salmonids will not be transported. Rescued salmonids will be placed into a 250-gallon insulated and aerated fish hauling tank containing clean water obtained from the Calaveras River at Bellota. Young-of-the-year (YOY) *O. mykiss* (<100 mm) and adult *O. mykiss* (>300 mm) will be released upstream at Shelton Road, taking precaution to acclimate the fish to the cooler water. Age 1+ *O. mykiss* (100-300 mm) that are exhibiting characteristics of smoltification and all juvenile Chinook salmon will be released within the Calaveras River in suitable habitat near the confluence with the San Joaquin River , again taking precaution to acclimate the fish to the temperature at the release site as it is expected to differ from the temperature at the collection site.

When salmonids are removed from stranded pools by seining or scooping with a long-handled dip net they will be temporarily placed in buckets to carry to the fish hauling tank. Buckets will utilize battery powered bubblers (air pump with diffuser stone) and fish will remain in buckets only long enough to empty the seine net which is usually less than five minutes. One 5-gallon bucket will contain no more than 20 YOY *O. mykiss* (<100 mm), or 10 age 1+ *O. mykiss* (100-300 mm) or one adult *O. mykiss* (>300 mm).

Introducing fish to broad changes in water temperature with no acclimation period can create stress or thermal shock. To safeguard against any potential behavioral changes or physiological shock, the following acclimation protocol was developed. First, temperature will be measured at both the collection and release sites. If the release site water temperature is within 5°F of the collection site temperature fish will be released immediately. However, differences in temperatures above the 5-degree range will warrant an acclimation period of 10 minutes per 1°F. Acclimation will be accomplished by slowly introducing release site water into the transport tank until the water temperature in the tank is equal to the release site temperature. If at any time during the acclimation period individual fish appear lethargic or are not able to maintain their equilibrium, the acclimation period will be extended as needed. During acclimation fish will be held no longer than one hour to limit accumulated stress resulting from long holding periods.

1.3.2. Conservation Strategies/ Mitigation Measures

As part of the CHCP, the District will implement a Conservation Program which includes conservation strategies corresponding to each of the Covered Activities, and which are summarized in Table 2. In general, the conservation strategies were designed to achieve the biological goals of the CHCP, which are to: (1) maintain a viable population of *O. mykiss* within the conservation area; and (2) maintain adequate habitat conditions upstream of Bellota for fall, late-fall, spring, or winter-run Chinook salmon that may opportunistically migrate into the conservation area, but are not expected to maintain a viable population based on both pre-dam and current conditions. Descriptions of the Conservation Program and the biological goals are incorporated by reference from Chapter 7 of the CHCP (publicly available online at: https://www.fisheries.noaa.gov/action/calaveras-river-habitat-conservation-plan-and-environmental-assessment).

Table 2. Summary of proposed activities under the CHCP and the associated type of action.

Proposed Activities	Associated Conservation Program Activities	Type of Action
New Hogan Reservoir Water Impoundment and Non-Flood Control Operations	1. Minimum Instream Flow Commitment 2. Non-Dedicated Fall Storage Management Strategy 3. Flood Control Release Coordination with, and Advisory Support to, the USACE 4. Agriculture and Municipal Conservation Programs	• Long-term operations and maintenance
SEWD Old Calaveras River Headworks Facility Operations	1. Temporary Fish Barrier at Old Calaveras River Headworks Facility 2. Old Calaveras River Headworks Facility Improvement 3. Non-Entraining Upstream Passage Barrier Near Confluence of Old Calaveras River/ SDC	• Long-term operations and maintenance • Construction
SEWD Bellota Diversion Facility Operations	1. Temporary Fish Ladders at the Bellota Diversion Facility 2. Temporary Fish Screens at the Bellota Diversion Facility 3. Bellota Diversion Facility Improvement	• Long-term operations and maintenance • Construction

Proposed Activities	Associated Conservation Program Activities	Type of Action
Artificial Instream Structures and SEWD Small Instream Dam Operations	1. Artificial Instream Structures Improvements 2. Fall Flashboard Dam Removal Operations 3. Flashboard Dam Notches 4. Supervisory Control and Flow Data Acquisition System	• Long-term operations and maintenance • Construction
Privately Owned Diversion Facilities Operated within the District's Service Area (Technical assistance and education)	1. Fish Screens for Privately Owned Diversions (Technical assistance and education) 2. Stakeholder Education Program regarding Fishery Issues	• Support and Education (No physical activities in or near the water)
SEWD Channel Maintenance for Instream Structures	1. Timing Restrictions 2. Best management Practices Mitigation Measures	• Long-term operations and maintenance
Fisheries Monitoring Program	1. Protocols for capture and handling of fish, including communication and reporting protocols	• Fish capture and handling

1.3.2.1. Construction Activities

1.3.2.1.1. *Bellota Diversion Facility Improvements*

Oversight of the design, construction, and operation of fish passage and protection facilities will be provided by SEWD with recommendations integrated from NMFS and interested stakeholders including, but not limited to, individual members of the Calaveras River Technical Review Group (CRTRG). Initiation of construction will be subject to SEWD's ability to fund, gain the necessary permits, and complete the necessary NEPA and California Environmental Quality Act (CEQA) review process as described above. Until construction begins, SEWD will continue to voluntarily implement some CHCP conservation measures, including installing and operating temporary fish ladders and temporary fish screens at Bellota Diversion Facility.

Construction activities for improvements at the Bellota Diversion Facility are expected to take up to nine months to complete with only six months of activity conducted within the river channel from mid-April and mid-October. This timeframe allows instream activities to occur when there is no danger of flood control releases exceeding the capacity of the cofferdam.

During construction activities, no more than 5 acres (up to 1.25 acres, instream) will be disturbed as a result of staging and implementation. The completed project footprint is expected to be 4 acres and no riparian vegetation is expected to be removed. A sheetpile cofferdam will be installed and dewatered prior to construction to route water and any aquatic species around the project activity. The cofferdam will span between one-third to one-half of the channel, leaving the remainder of the channel functional for upstream and downstream fish passage. The cofferdam will be constructed starting at the upstream end and ending at the downstream end so that fish have an opportunity to disperse downstream. Prior to dewatering the cofferdam, any fish remaining behind the cofferdam will be captured and relocated downstream of the project site by qualified fish biologists according to NMFS approved methods. Less than 10,000 cubic yards of material will be removed and only a concrete screen housing and screen will be added (no fill) using heavy equipment (e.g., dump truck, backhoe, crane, excavator).

1.3.2.1.2. *Construction for Other Conservation Strategies*

The specific details and timing for future implementation of two conservation program activities: the Old Calaveras River Headworks Facility Operations, and SEWD Artificial Instream Structures, are unknown and not described in the CHCP. However, based on the general proposed activities, NMFS can reasonably anticipate certain construction activities to occur. Therefore, in this opinion, NMFS has described anticipated construction activities and their associated effects on the Covered Species. Generally, construction activities that are reasonably certain to occur include pile driving, turbidity-inducing activities, use of hazardous contaminants (i.e., fluids for heavy machinery), dewatering behind a cofferdam and associated fish relocation. These effects to the Covered Species are described in section 2.5 of this opinion.

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 non-discretionary reasonable and prudent measures (RPMs) and terms and conditions to minimize such impacts.

2.1. Analytical Approach

This biological opinion includes both a jeopardy analysis and an adverse modification analysis. The jeopardy analysis relies upon the regulatory definition of "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 CFR402.02). Therefore, the jeopardy analysis considers both survival and recovery of the species.

This biological opinion relies on the definition of "destruction or adverse modification", which "means a direct or indirect alteration that appreciably diminishes the value of critical habitat 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 this term with physical or biological features (PBFs). The shift in terminology does not change the approach used in conducting a ''destruction or adverse modification'' analysis, which is the same regardless of whether the original designation identified PCEs, PBFs, or essential features. In this biological opinion, we use the term PBF to mean PCE or essential feature, as appropriate for the specific critical habitat.

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

2.2. Rangewide Status of the Covered Species and Critical Habitat

The ITP would allow incidental take of the following listed and non-listed species (referred collectively as the "Covered Species"): threatened CCV steelhead, threatened CV spring-run Chinook salmon; endangered Sacramento River winter-run Chinook salmon; and CV fall-run and late fall-run Chinook salmon. Central Valley spring-run and Sacramento winter-run Chinook salmon and their designated critical habitat currently do not occur within the Calaveras River watershed and their historic presence is unlikely. Nonetheless, they are included as Covered Species under the ITP for the CHCP as there is a potential that they could be observed in the future and be affected by CHCP in-water activities.

This biological opinion examines the status of each Covered Species that would be adversely affected by the proposed action (summarized in Table 3). 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 listed species' likelihood of both survival and recovery. The species status section also helps to inform the description of the species' current "reproduction, numbers, or distribution" as described in 50 CFR 402.02. The biological opinion also examines the condition of critical habitat throughout the designated area, evaluates the value of the various watersheds and coastal and marine environments that make up the designated area, and discusses the current function of the essential PBFs that help to form that value for the conservation of the listed species.

Table 3. Description of the Covered Species that would be affected by the proposed action, current Endangered Species Act (ESA) listing classifications, and summary of species status.

Covered Species	Listing Classification and Federal Register Notice	Status Summary
California Central Valley steelhead DPS	Threatened, 71 FR 834; January 5, 2006	According to the NMFS 5-year species status review (NMFS 2016a), the status of CCV steelhead appears to have remained unchanged since the 2011 status review that concluded that the DPS was in danger of extinction. Most natural-origin CCV populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to natural-origin fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.
Sacramento River winter-run Chinook salmon ESU	Endangered, 70 FR 37160; June 28, 2005	According to the NMFS 5-year species status review (NMFS 2016c), the status of the winter-run Chinook salmon ESU, the extinction risk has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments. Based on the Lindley *et al.* (2007) criteria, the population is at high extinction risk in 2019. High extinction risk for the population was triggered by the hatchery influence criterion, with a mean of 66 percent hatchery origin spawners from 2016 through 2018. Several listing factors have contributed to the recent decline, including drought, poor ocean conditions, and hatchery influence. Thus, large-scale fish passage and habitat restoration actions are necessary for improving the winter-run Chinook salmon ESU viability.

Covered Species	Listing Classification and Federal Register Notice	Status Summary
Central Valley spring-run Chinook salmon ESU	Threatened, 70 FR 37160; June 28, 2005	According to the NMFS 5-year species status review (NMFS 2016b), the status of the CV spring-run Chinook salmon ESU, until 2015, has improved since the 2010 5-year species status review. The improved status is due to extensive restoration, and increases in spatial structure with historically extirpated populations (Battle and Clear creeks) trending in the positive direction. Recent declines of many of the dependent populations, high pre-spawn and egg mortality during the 2012 to 2016 drought, uncertain juvenile survival during the drought are likely increasing the ESU's extinction risk. Monitoring data showed sharp declines in adult returns from 2014 through 2018 (CDFW 2018).
Late Fall-Run Chinook salmon	Listing was found not warranted and the species were designated as a candidate species in 1999 (64 FR 50394). In 2004, the Central Valley fall-/late fall-run Chinook salmon ESU was re-classified as a Species of Concern (69 FR 19975) due to specific risk factors.	CDFW's Grand Tab (CDFW Grand Tab dated 5/7/2019) compilation of escapement estimates for late fall-run Chinook salmon in the Sacramento River watershed generally indicates a declining trend. There are no escapement or population estimates for late fall-fun Chinook salmon in the San Joaquin watershed.
Fall-Run Chinook salmon	Listing was found not warranted and the species were designated as a candidate species in 1999 (64 FR 50394). In 2004, the Central Valley fall-/late fall-run Chinook salmon ESU was re-classified as a Species of Concern (69 FR 19975) due to specific risk factors.	According to CDFW's Grand Tab (CDFW Grand Tab dated 5/7/2019) compilation of escapement for estimates for fall-run Chinook salmon, the status of fall-run Chinook in the Sacramento and San Joaquin watersheds seems to decline and rebound based on water year types. Recent trends for the Sacramento River populations show a decline in recent years as result of drought years (i.e. 2014 -2015). The past five years have seen a declining trend for escapement in the Sacramento River watershed (excluding hatchery escapement abundances). In the San Joaquin River watershed, fall-run Chinook salmon escapement estimates have remained relatively stable, and general trends show an increase in escapement estimates into the San Joaquin tributaries (excluding hatchery escapement).

Table 4. Description of critical habitat that would be affected by the proposed project, Listing, and Status Summary.

Critical Habitat	Designation Date and Federal Register Notice	Description
California Central Valley steelhead DPS	September 2, 2005; 70 FR 52488	Critical habitat for CCV steelhead includes stream reaches of the Feather, Yuba and American rivers, Big Chico, Butte, Deer, Mill, Battle, Antelope, and Clear creeks, the Sacramento River, as well as portions of the northern Delta. The lower Calaveras River downstream of New Hogan Dam is designated critical habitat for CCV steelhead. Designated critical habitat for CCV steelhead includes the Calaveras River from New Hogan Dam downstream to Bellota, Mormon Slough from Bellota to the mouth, the SDC, the Old Calaveras River channel downstream of Bellota to the SDC, and the Calaveras River from the SDC to the mouth. Critical habitat includes the stream channels in the designated stream reaches and the lateral extent as defined by the ordinary high-water line. In areas where the ordinary high-water line has not been defined, the lateral extent will be defined by the bankfull elevation. PBFs considered essential to the conservation of the species include: Spawning habitat; freshwater rearing habitat; freshwater migration corridors; and estuarine areas. Although the current conditions of PBFs for CCV steelhead critical habitat in the Central Valley are significantly limited and degraded, the habitat remaining is considered highly valuable.

2.2.1 Recovery Plan

In July 2014, NMFS released a final Recovery Plan for endangered Sacramento River winter-run Chinook salmon evolutionarily significant unit (ESU, *Oncorhynchus tshawytscha*), threatened Central Valley spring-run Chinook salmon ESU (*O. tshawytscha*), and CCV steelhead (Recovery Plan; NMFS 2014). The Recovery Plan identifies recovery goals for the San Joaquin River Basin populations of CCV steelhead and CV spring-run Chinook salmon whose range includes the proposed action area. Recovery efforts focus on addressing several key stressors that are vital to both CCV steelhead and CV spring-run Chinook salmon: (1) elevated water temperatures affecting adult migration and holding; (2) low flows and poor fish passage facilities, affecting attraction and migratory cues of migrating adults; and (3) possible catastrophic events (e.g., fire or volcanic activity).

2.2.2 Global Climate Change

One major factor affecting the rangewide status of the threatened and endangered anadromous fish in the Central Valley and aquatic habitat at large is climate change. Warmer temperatures associated with climate change reduce snowpack and alter the seasonality and volume of seasonal hydrograph patterns (Cohen *et al.* 2000). Central California has shown trends toward warmer winters since the 1940s (Dettinger and Cayan 1995). Projected warming is expected to affect Central Valley Chinook salmon. Because the runs are restricted to low elevations as a result of impassable rim dams, if climate warms by 5°C (9°F), it is questionable whether any Central Valley Chinook salmon populations can persist (Williams 2006).

For winter-run Chinook salmon, the embryonic and larval life stages that are most vulnerable to warmer water temperatures occur during the summer, so this run is particularly at risk from climate warming. Spring-run Chinook salmon adults are vulnerable to climate change because they over-summer in freshwater streams before spawning in autumn (Thompson *et al.* 2012). Spring-run Chinook salmon spawn primarily in the tributaries to the Sacramento River, and those tributaries without cold water refugia (usually input from springs) will be more susceptible to impacts of climate change. Steelhead will experience similar effects of climate change as Chinook salmon, since they are also blocked from the vast majority of their historic spawning and rearing habitat. The effects of climate change may be even greater in some cases because juvenile steelhead need to rear in the stream for one to two summers prior to emigrating as smolts. In the Central Valley, summer and fall temperatures below the dams in many streams already exceed the recommended temperatures for optimal growth of juvenile steelhead, which range from 14°C to 19°C (57°F to 66°F).

In summary, observed and predicted climate change effects are generally detrimental to the species (McClure et al. 2013, Wade *et al.* 2013), so unless offset by improvements in other factors, the status of the species and critical habitat is likely to decline over time. The climate change projections referenced above cover the time period between the present and approximately 2100. While there is uncertainty associated with projections, which increases over time, the direction of change is relatively certain (McClure *et al.* 2013).

2.3. Action Area

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

The CHCP boundary encompasses the entirety of the lower Calaveras River and its adjacent riparian zone between New Hogan Dam and the confluence with the San Joaquin River. The extent of effects from the Covered Activities and the associated conservation strategies are not anticipated to extend beyond the CHCP boundaries. The effects of SEWD's facility operations and maintenance, as well as the impacts from construction activities that would occur from the conservation strategies, would not extend past the mouth of the Calaveras River. The action area encompasses those waterways that are potentially accessible to one or more Covered Species within SEWD's service areas, as follows (refer to Figure 1):

1) Lower Calaveras River from New Hogan Dam (RM 42) to the confluence where it enters the San Joaquin Delta (RM 0) via both the Old Calaveras River channel and Mormon Slough/Stockton Diverting Canal (SDC) routes.

2) Potter Creek from the headwaters to its two branches (North and South) and its two confluences with Mormon Slough– North branch enters Mormon Slough at the old Southern Pacific Railroad Bridge and the South branch enters Mormon Slough just upstream of Panella Dam.

3) Mosher Slough/Creek from the headwaters at Mosher Creek Dam to its confluence with Pixley Slough/Bear Creek[1].

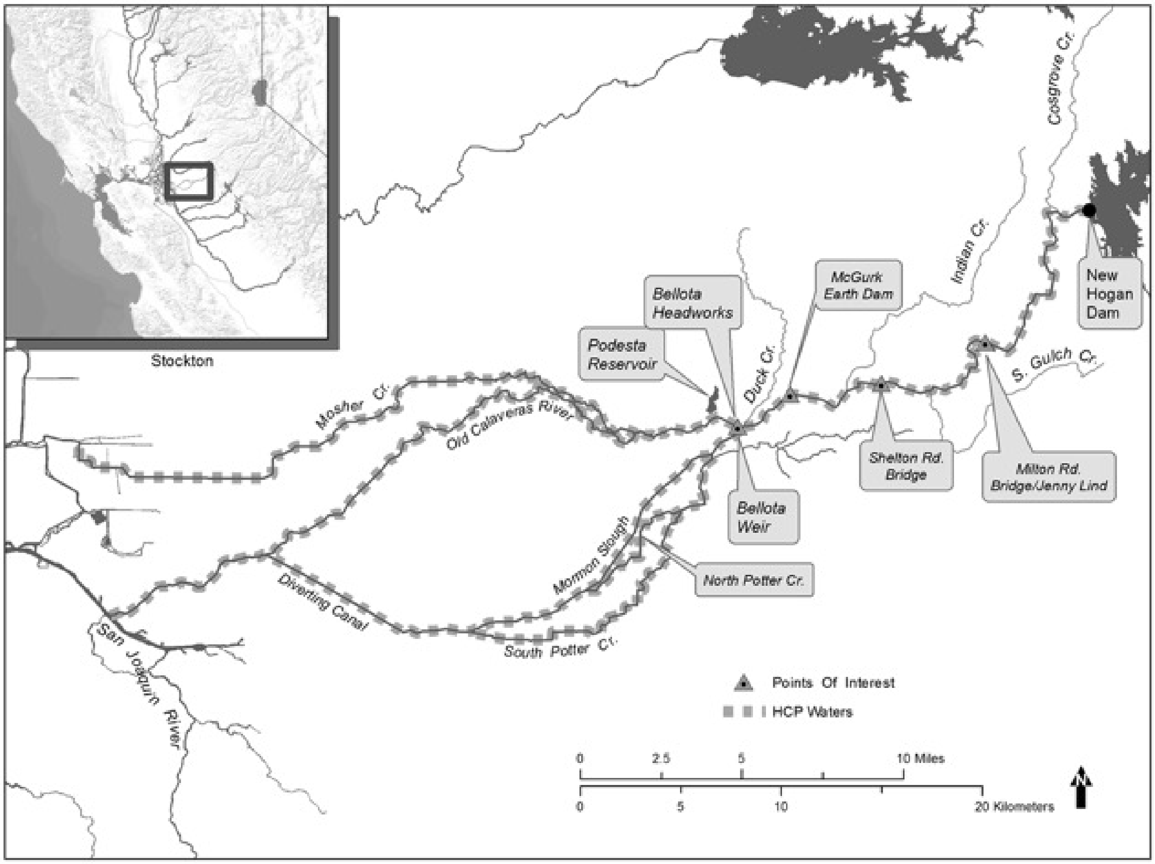

Figure 1. Map of the lower Calaveras River basin, where the Habitat Conservation Plan boundary (action area) is indicated in dashed lines, and include the Lower Calaveras River via both the Old Calaveras River channel and Mormon Slough/Stockton Diverting Canal.

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

[1] During the non-irrigation season (begins on or about October 16 and ends on or about April 14. dependent on weather), the accessibility of Mosher Slough/Creek for adult salmonids is the result of San Joaquin County operations and therefore any potential impacts to adults entering during this period are not considered within the scope of the CHCP. During the irrigation season (i.e., begins on or about April 15 and ends on or about October 15 dependent on weather), there is the potential for juvenile salmonids to enter Mosher Slough/Creek from the Old Calaveras River; therefore; potential impacts during this period are considered within this CHCP.

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).

2.4.1. Characterization of the Environmental Baseline

In the Environmental Baseline section, we summarize the past and present impacts leading to the current status of the listed species, as well as the status of the non-listed species, in the action area, including some of the effects of SEWD operations and facilities to date. This section also describes the future non-project stressors to which the listed and non-listed species and critical habitat will be exposed. Therefore, the pre-consultation environmental baseline is characterized as the combination of effects from: natural environmental variation; human impacts not associated with the proposed action; impacts from past, and currently ongoing SEWD operations and maintenance; and impacts from past, and currently ongoing USACE flood control operations, which were analyzed in a separate biological opinion (NMFS 2002).

Implicit in these definitions of environmental baseline and effects of the actions is a need to anticipate future effects, including the future component of the environmental baseline. Future effects of Federal projects, that have undergone consultation and of contemporaneous State and private actions, as well as future changes due to environmental variations, are part of the future baseline, to which effects of the proposed action are added. Climate change is also included along with environmental variations in order to best characterize the future conditions that the species will encounter.

To consider the effects of the action in the context of environmental baseline conditions, the analysis in this opinion considers future effects of Federal projects that have undergone consultation (i.e. USACE flood control operations), and of contemporaneous State and private actions, as well as future changes due to natural processes, along with the effects of the proposed action. Given the timeline of the proposed action and because it includes an ongoing action (i.e. the future ongoing delivery of water), we analyze the entire suite of project effects (both construction and operations related) along with the environmental baseline conditions in the future, which captures anticipated effects of non-project processes and activities.

2.4.2. Status of the Listed Species and Critical Habitat in the Action Area

The ITP would allow incidental take of the following listed and non-listed species (referred collectively as the "Covered Species"): threatened CCV steelhead, threatened CV spring-run Chinook salmon; endangered Sacramento River winter-run Chinook salmon; and CV fall-run and late fall-run Chinook salmon.

2.4.2.1. Sacramento River Winter-run Chinook Salmon

Sacramento River winter-run Chinook salmon and their designated critical habitat do not currently occur within the Calaveras River watershed. Their potential historic presence in the

Calaveras River is limited to a period between 1972 and 1984. Yoshiyama *et al*. (2000) stated that:

"…we do not regard [this Calaveras River winter-run] as an indigenous natural run because the Calaveras River (a low elevation stream) originally did not have year-round conditions suitable to support the native winter run (Vogel and Marine 1991, Fisher 1994, and Yoshiyama et al. 1998). That stock probably established itself as a result of, and was maintained by, coldwater releases from New Hogan Reservoir, but it was evidently later extirpated by unfavorable environmental conditions."

Nonetheless, Sacramento River winter-run Chinook salmon are included as a Covered Species under the ITP for the CHCP because there is a potential they could opportunistically migrate into the action area, and could be observed in the future and be affected by CHCP activities.

2.4.2.2. Central Valley Spring-run Chinook Salmon

Currently, self-sustaining populations of CV spring-run Chinook salmon do not occur in the San Joaquin River watershed, since they were extirpated from the system decades earlier (Lindley 2007). The CV spring-run Chinook salmon critical habitat designation excludes the San Joaquin River and its tributaries, including the Calaveras River. However, since 2015, the San Joaquin River Restoration Program (SJRRP) has been reintroducing CV spring-run Chinook salmon incrementally back into the San Joaquin River mainstem, near Friant Dam. These actions are to meet a settlement goal that also fulfills a NMFS recovery criteria goal regarding this ESU. According to a final rule under ESA Section 10(j), these reintroduced CV spring-run Chinook salmon are designated as a non-essential experimental population inside of the experimental population area, which is generally in the San Joaquin River from its confluence with the Merced River upstream to Friant Dam (78 FR 79622; December 31, 2013).

The number of CV spring-run Chinook salmon returning to the San Joaquin River in the experimental population area is expected to increase over time, as experimental hatchery release numbers, adult spawning returns, and the number of juveniles produced naturally in the restoration area increases. Detailed information regarding the ESU's life history, and viable salmonid population (VSP) parameters pertaining to the natural populations that occur in tributaries of the Sacramento River Basin can be found in the most recent 5-year status review (NMFS 2016a).

Central Valley spring-run Chinook salmon and their designated critical habitat currently do not occur within the Calaveras River watershed and their historic presence was unlikely. Yoshiyama *et al*. (1996; 2001) indicated that the Calaveras River lacked suitable habitat for Central Valley spring-run Chinook salmon. Nonetheless, CV spring-run Chinook salmon are included as Covered Species under the ITP for the CHCP as there is a potential that they could opportunistically migrate into the action area, and could be observed in the future and be affected by CHCP activities, especially as the San Joaquin River spring-run Chinook salmon experimental population increases over time.

2.4.2.3. Central Valley Steelhead

The lower Calaveras River downstream of New Hogan Dam is within the Central Valley steelhead DPS and designated critical habitat for this species. Designated critical habitat for Central Valley steelhead includes the Calaveras River from New Hogan Dam downstream to

Bellota, Mormon Slough from Bellota to the mouth, the SDC, the Old Calaveras River channel downstream of Bellota to the SDC, and the Calaveras River from the SDC to the mouth (70 FR 52488).

The Recovery Plan outlines actions to restore habitat, access, and improve water quality and quantity conditions in the Calaveras River to promote the recovery of listed salmonids, specifically CCV steelhead. As described in the Recovery Plan, watersheds that are currently occupied by at least one of the listed Chinook salmon and steelhead species have been prioritized among three levels. Of highest priority are core 1 populations, which have been identified based on their known ability or potential to support independent viable populations. Core 1 populations form the foundation of the recovery strategy and must meet the population-level biological recovery criteria for low risk of extinction set out in Table 5- 1 in the Recovery Plan. NMFS believes that core 1 populations should be the first focus of an overall recovery effort. The Calaveras River CCV steelhead population is identified as a Core 1 population for the recovery of the Southern Sierra Diversity Groups and Mainstem San Joaquin River.

The proposed action of issuing the ITP would result in the implementation of several recovery actions contained in the CHCP, which are summarized in Table 5. In addition, all of the conservation strategies described in Chapter 7 of the CHCP would be beneficial towards the recovery of CCV steelhead in the Calaveras River basin.

Table 5. Summary of recovery actions that would be implemented as part of the CHCP.

Recovery Action ID	Recovery Action	Recovery Plan Source Details	Action Priority	Species	Conservation Strategy in CHCP
CAR-1.5	Replace Bellota weir incorporating a permanent fish ladder and screened diversion as recommended in the Calaveras River Fish Screen Facilities Feasibility Study.	Table 5-29, pg. 332	1	CCV Steelhead	SEWD Bellota Diversion Facility Operations
CAR-1.6	Implement a Calaveras River monitoring program to identify the temporal and spatial distributions of migrating and holding steelhead. These data would help ensure that suitable flows, water temperatures, and passage conditions are being provided when and where the fish are in the Calaveras River.	Table 5-29, pg. 332	1	CCV Steelhead	Fisheries Monitoring Program

Recovery Action ID	Recovery Action	Recovery Plan Source Details	Action Priority	Species	Conservation Strategy in CHCP
CAR-2.3	Prioritize and screen unscreened diversions in the Calaveras River including Bellota weir.	Table 5-29, pg. 333	2	CCV Steelhead	• Artificial Instream Structures and SEWD Small Instream Dam Operations • SEWD Bellota Diversion Facility Operations

The PBFs of CCV steelhead designated critical habitat within the action area include freshwater rearing habitat, freshwater spawning habitat, and freshwater migration corridors. The essential features of these PBFs include: water quality and forage, water quantity and floodplain connectivity, water temperature, riparian habitat, natural cover, and access to and from spawning grounds. The intended conservation roles of habitat in the action area are to provide appropriate freshwater rearing flows and migration conditions for juveniles, as well as freshwater spawning flows and unimpeded migration conditions for adults.

Within the action area of the CHCP, in-water work areas are located in designated critical habitat for CCV steelhead. The primary rearing and spawning PBFs for CCV steelhead in the Calaveras River are within the reach between Bellota and New Hogan Dam. CCV steelhead are currently able to access the reach of the Calaveras River between Bellota and New Hogan Dam for spawning whenever adequate naturally occurring migration flows are available and no structural barriers are installed (i.e., flashboard dams). The PBFs for upstream and downstream migration opportunities are currently limited to occasions between November and early April when passage conditions within the action area are created by substantial precipitation events that result in flood control releases from New Hogan Dam, and/or runoff (i.e., freshet) events below the dam. In many years, precipitation events resulting in passage conditions do not begin until December or January because rainfall from initial storm events is generally absorbed into the ground through infiltration and runoff does not occur until the ground becomes saturated.

The lower Calaveras River between New Hogan Dam and Bellota supports an *O. mykiss* fishery due in part to year-round flows provided by the District between New Hogan Dam and Bellota, and the associated suitable temperature conditions created in much of this reach as a result of reservoir operations. In addition, year-round *O. mykiss* rearing has been observed below New Hogan Dam downstream to at least Shelton Road (RM 28; SEWD unpublished data).

A small number of steelhead have been observed in the lower river in recent years, including one confirmed steelhead adult out of three *O. mykiss* carcasses recovered in 2000; another confirmed steelhead adult out of three additional and recently analyzed carcasses; one steelhead adult carcass collected in 2002; and several hundred juvenile trout expressing an anadromous life-history (smolt indices of 4 and 5) captured in a downstream migrant trap in 2002-2015 (SEWD unpublished data). These limited observations indicate that steelhead are able to migrate into the river as adults and spawn within the river when conditions are available and that some progeny of either rainbow trout or steelhead are stimulated to begin the physiological process of smoltification in preparation for an anadromous life-history.

Despite the limited data available for developing population estimates, an initial calculation was conducted for *O. mykiss* using fish density data collected by the Fishery Foundation of California (FFC) during 2002 (FFC 2002). As additional data are compiled over the years, estimates of the viable population of *O. mykiss* will be refined during periodic five-year reviews through the AMP process with the Governing Board, Governmental Resource Agencies, and Science Advisors.

Adult *O. mykiss* (>300 mm) and Age 1+ juvenile *O. mykiss* (100-299 mm) population estimates were derived based on average densities of individuals per 100 m2 observed during baseline snorkel surveys conducted by the FFC in 2002. YOY (<100 mm) population estimates were derived based on a formula created for the Sacramento River (Hallock 1989). The FFC conducted bi-weekly snorkel surveys in three different areas during 2002 (i.e., Hogan reach, Canyon reach, and Jenny Lind site). Fish densities generally increased throughout the year until the last survey conducted in mid-October. Densities of adult and Age 1+ *O. mykiss* in the three surveyed areas during mid-October were approximated from FFC graphs (FFC 2002; Table 11 in the CHCP). The FFC was only able to sample a very limited portion of the Jenny Lind reach (i.e., Jenny Lind site); however, this reach is known to support adult and juvenile rearing. Since this latter reach is similar in physical characteristics to the Jenny Lind site that was surveyed, fish densities in this reach were also assumed to be similar to the Jenny Lind site and estimates for the entire reach was included in the population estimates. Table 11 in the CHCP also shows the estimated area (meters squared) for individual reaches based on a conservative assumption that the river was only 11 meters wide throughout all reaches (SEWD unpublished data) at the time of the FFC observations. Estimated numbers of adults (>300 mm) and Age 1+ juveniles (100-199 mm and 200-299 mm) were 1,637 and 19,088 (14,044 + 5,043), respectively.

Observed densities of YOY *O. mykiss* during snorkel surveys were highly variable and could not be used as a reasonable basis for calculating population estimates. Therefore, this formula developed for the Sacramento River was used to estimate the abundance of this age class - "*O. mykiss* YOY equals [(number of females multiplied by egg potential) multiplied by 95%] multiplied by 30%" (Hallock 1989).

The number of females is equal to the number of adults divided by two, and egg potential is a standard fecundity number of 2,800. The formula assumes that there is 95% survival from the egg potential to egg life stage and 30% survival from the egg to fry (i.e., assumed to be YOY equivalent) life stage. The estimated number of YOY was 652,764 (Table 12 in the CHCP).

2.4.3. Status of the Non-Listed Species in the Action Area

The Central Valley fall-run and late fall-run Chinook salmon ESUs includes all naturally spawned populations in the Sacramento and San Joaquin River basins and their tributaries, east of Carquinez Strait. After receiving petitions to list species of West Coast Chinook salmon in 1994 and 1995, NMFS conducted coast-wide status reviews (60 FR 30263) requesting public comment. In 1998, NMFS proposed to list the Central Valley fall-run and late fall-run Chinook salmon ESUs as threatened (60 FR 30263). Listing was found not warranted and the species were designated as a candidate species in 1999 (64 FR 50394). In 2004, the Central Valley fall-

/late fall-run Chinook salmon ESU was re-classified as a Species of Concern (69 FR 19975) due to specific risk factors.

2.4.3.1. Central Valley Late Fall-Run Chinook Salmon

Historically, late fall-run Chinook salmon also occupied the San Joaquin River basin and most likely some its tributaries (Yoshiyama et al. 2001), however, current monitoring data is limited. Given the lack of detailed knowledge about them and the loss of habitat throughout the Central Valley, there is concern that late fall-run may be ESA-listed in the future.

Specifically in the Calaveras River basin, there is no conclusive evidence that populations of late fall-run Chinook salmon historically occupied the action area for a consistent period of time (Yoshiyama et al 2001). It is uncertain if late fall-run would be ESA-listed during the term of the ITP, however, late fall-run Chinook salmon may opportunistically use the Calaveras River when river flows are suitable. Thus, similar to the listed runs of Chinook salmon, late fall-run Chinook salmon are included as a Covered Species under the ITP for the CHCP because there is a potential that they could be observed in the future and be affected by CHCP activities.

2.4.3.2. Central Valley Fall-Run Chinook Salmon

In the Calaveras River basin, the presence of fall-run Chinook salmon in the reach above Bellota, seems to correlate with precipitation in the basin during the fall and winter months. Based on RST sampling conducted annually from 2002-2015 at Shelton Road (SEWD unpublished data), there have been anywhere from zero to 5,943 juvenile fall-run Chinook salmon observed migrating to at least Shelton Road between late October and mid-July (refer to Table 15 in the CHCP). Abundance estimates were calculated for fall-run Chinook salmon each year based on the proportion of flow sampled (as described in Attachment D-3 in Appendix D of the CHCP), using trap efficiency data combined with missing value calculations.

For 2005, the numbers of juvenile fall-run Chinook salmon captured and corresponding abundance estimates were relatively low compared with other years, which may be attributed to several periods of flows greater than 2,000 cfs when sampling could not occur. Catches and corresponding abundance estimates for 2006, 2007, 2012, and 2013 were fairly high (refer to Tables 15 and 17 in the CHCP) and correspond with water years with wet winters, when flows for adult fall-run Chinook salmon allowed for passage around or over the numerous fish barriers in the Calaveras River.

According to preliminary Peterson estimates prepared by FFC (FFC unpublished data), there were 1,904 adult fall-run Chinook salmon spawners in 2005; however, this may be an overestimate due to high losses of tagged carcasses to predation during initial carcass surveys. A juvenile production estimate of 140,000 (Table 13 in the CHCP) was generated for production upstream of Bellota based on a formula created for the Sacramento River (Beltman and Cacela 2002) as follows:

Fall-run Chinook salmon juveniles is equal to (the number of females multiplied by the egg potential) multiplied by 25%.

The number of females is equal to the number of adults divided by2, and egg potential is a standard fecundity number of 5,000. The formula assumes that there is 25% survival from the egg to fry life stage.

It is uncertain if fall-run Chinook salmon would be ESA-listed during the term of the ITP. Monitoring data collected by SEWD during development of the CHCP provides evidence that fall-run Chinook salmon use the spawning and rearing habitat in the Calaveras River basin dependent on water year. They are included as a Covered Species under the ITP for the CHCP because it is highly likely they would be observed in the future and be affected by CHCP activities.

2.4.4. Current Hydrology

Elevations in the Calaveras River Basin range from near sea level at the confluence with the San Joaquin River to 130 feet at Bellota, 500 feet at New Hogan Dam, and approximately 6,000 feet at the headwaters. Only about 5% of the basin is found above 4,000 feet in elevation. The Calaveras River Basin climate is characterized by cool, relatively wet winters, and hot, dry summers. Winters are characterized as short and mild with relatively frequent rains, with snow only occurring in limited amounts within the upper reaches of the watershed. Due to the low elevation of the upper watershed, snow pack does not persist into late-spring or summer. Summers are long and hot with little or no rainfall. Seasonal rainfall is variable, ranging from less than 16 inches to over 45 inches (NMFS 2014). In normal years, more than 90% of the precipitation occurs between November and April and normal annual precipitation for above New Hogan Dam is 33.3 inches, ranging from 24 inches at New Hogan reservoir to 50 inches in the upper basin.

Average annual runoff in the basin is 157,000-acre feet (years 1907 to 1980). Due to its relatively small drainage area and limited snow pack, the hydrology of the Calaveras River is characteristic of many North Coast California streams and rain-driven systems in California, whereby unimpaired flows range from low to non-existent during the dry season (summer and early fall) to moderately high with sporadic peaks during the wet season (late fall through spring).

2.4.5. Factors Affecting the Listed and Non-Listed Species and Critical Habitat

Key stressors that were identified in the NMFS Recovery Plan (2014) for CCV steelhead and critical habitat in the Calaveras River are listed below. However, these factors also affect the other listed and non-listed salmonids that may migrate, spawn, and rear in the Calaveras River basin.

- Fish passage impediments/barriers at Mormon Slough, the Old Calaveras River channel, Bellota Weir, and other locations affecting adult immigration and holding, and juvenile rearing and outmigration.
- Flow conditions (i.e., low flows) affecting passage, attraction and migratory cues for adult immigration and holding.
- Water quality conditions (i.e. urban and agricultural runoff) in the Calaveras River affecting adult immigration and holding.
- Physical habitat alteration associated with limited supplies of instream gravel affecting spawning.
- Water temperatures affecting spawning and embryo incubation, and juvenile rearing and outmigration.
- Flow dependent habitat availability affecting juvenile rearing and outmigration.

2.4.5.1. Fish Passage Barriers

New Hogan Dam

The Calaveras River has been subject to impoundment from Hogan Dam since 1930, and New Hogan Dam since 1964. Historical records provide inconclusive evidence for the historical range of salmonids in the Calaveras River upstream of the current site of New Hogan Dam. Therefore, the site of New Hogan Dam is considered the minimal approximation of the historical limit of salmonids (Yoshiyama et al. 2001). As such, there is no known evidence that New Hogan Dam blocks a significant portion of historical salmonid spawning habitat in the Calaveras River basin.

Diversion Facilities

In addition to the Bellota Weir and Headworks Facility, SEWD owns and/or operates 28 flashboard dams, two earthen dams, and one headgate dam located within the covered areas of the CHCP (refer to Table 7 in the CHCP). Twelve removable flashboard dams are located along Mormon Slough/SDC; eight removable flashboard dams in the Old Calaveras River channel; five removable flashboard dams in Mosher Slough/Creek including one combination flashboard/diversion dam; three removable flashboard dams and one earthen dam in Potter Creek; one earthen dam in the Calaveras River upstream of Bellota; and one headgate dam located at the junction of the Old Calaveras with Mosher Slough/Creek (refer to Figures 2 through 11 in the CHCP).

In addition, a total of 194 small, privately owned diversions have been identified within the District's Calaveras River service areas using SEWD data, and 53 additional diversions may exist according to CDFW (CDFG 2006) data. Of the 194 "known" diversions, 35 (one screened and 34 unscreened) exist within the Calaveras River between New Hogan Dam and Bellota, 61 in the Old Calaveras River channel, 52 in Mormon Slough, 22 in Mosher Slough/Creek, and 24 in Potter Creek. These agricultural diversions are small pumped diversions that are individually owned and operated by agricultural customers of SEWD above and below Bellota.

Baseline impacts on juvenile salmonids from diversion facilities include: entrainment into unscreened diversions and subsequent death; migration delays or blockage, and associated thermal stress, increased susceptibility to predation, or stranding and subsequent death. Impacts to adult salmonids from diversion facilities include: migration delays or blockage and subsequent thermal stress, stranding, or death.

2.4.5.2. Flow Conditions

USACE operates New Hogan Dam releases during the flood control season, which is approximately from mid-October through mid-April. During the winter and spring months, the impoundment of water in New Hogan Reservoir for flood control and conservation storage has resulted in changes to the natural hydrograph. As with other impoundments in the Central Valley, the magnitude and duration of peak flow events have been reduced, which affects the ability of adult and juvenile salmonids to migrate as often and as quickly as under historical flow conditions.

Due to the extreme flashiness of the rain-driven system, the USACE needs to maintain a relatively large flood encroachment space throughout much of the flood control season, so precipitation events during December through March often trigger the need for flood control releases. Although late-season precipitation may occur, it generally is not of sufficient magnitude to allow the reservoir to fill anywhere close to capacity. Therefore, the reservoir generally is less than 70% percent capacity by the time the irrigation season begins as a result of the USACE's flood management activities. Subsequent irrigation releases by the District throughout the summer further reduce the reservoir storage level and water supply that is available for fisheries.

NMFS's 2002 biological opinion for the *Operations of the New Hogan Dam and Lake Project by USACE* analyzed the effects of the Corps' flood control operations of New Hogan Dam on the Central Valley steelhead ESU and their designated critical habitat. Refer to NMFS (2002) for more detailed information on the consultation for that biological opinion.

As discussed in the 2002 biological opinion (NMFS 2014), the continued operations of the New Hogan Dam by the USACE for flood control purposes may result in impacts to salmonids, and particularly to CV steelhead. Lethal effects to any present salmonids could occur during ramp-down by stranding fish or dewatering redds, flood control releases could wash out redds, and dam operations impact downstream habitat through eliminating gravel recruitment from miles of upstream areas.

Critical habitat for CCV steelhead is affected by flow modifications that alter the hydrologic regime, thereby altering or eliminating functional flows (Yarnell et al. 2015). Elimination of the magnitude, duration, and frequency of flood flows may cause spawning gravel to become embedded with fine materials, reducing its effectiveness for spawning. Recruitment of gravels from areas upstream of New Hogan Dam is no longer able to occur and gravel replenishment in areas below the dam has been eliminated. Flow modification from operation of New Hogan Dam enables riparian vegetation to encroach on the channel, which decreases the amount of available riffle areas and consequently reduces spawning sites. Reduced flood flow releases decrease the amount of habitat available to salmonids, for spawning and rearing, below New Hogan Dam. Low magnitude flood flows in fall and winter severely limit upstream migration of adult fish from the San Joaquin River.

During the remainder of the year, SEWD operates releases from New Hogan Dam for municipal and irrigation purposes. During the irrigation season, SEWD releases an average of about 150 cfs, which provides relatively high, stable flows between New Hogan Dam and Bellota for diversions at the Bellota Diversion Facility, Old Calaveras River Headworks Facility, and Bellota Weir slide gates. During the non-irrigation season, reservoir releases made for municipal and irrigation purposes ensure that some flows are provided to at least Bellota; however, flows do not continue downstream of Bellota during the non-irrigation season until freshet events or flood control releases occur.

Baseline impacts to the listed and non-listed salmonids, and critical habitat, from an altered flow regime and reduced flows include: migration delays or inaccessibility to habitat, thermal stress, decreased quantity and quality of habitat for various life stages, riparian habitat alteration, and stream channel alteration.

2.4.5.3. Water Quality

The majority of land use in the Calaveras River basin is agricultural and urban, and therefore NMFS expects run-off from these land use practices to enter the stream and impact the listed species and critical habitat. The State Water Resources Control Board's (SWRCB) Clean Water Act Section 303(d) List/305(b) Report (SWRCB 2016) describes the status of known pollutants for stream reaches in the Calaveras River basin below New Hogan Dam. Based on information in the SWRCB (2016) report, water quality in the Calaveras River watershed around the confluence with the San Joaquin River, and within the city of Stockton, is degraded. Upstream of the city of Stockton, most of the water quality samples for the SWRCB report were taken in 2008 or earlier. Thus, the current status of pollutants (i.e. within the last 10 years) is unknown, and it is further unknown what level of impact the current baseline water quality in the Calaveras River basin may have on all life stages of the listed species and critical habitat.

Given the extent of land uses within the Calaveras River basin, and the evidence that water quality is degraded around the mouth of the Calaveras River (the migration route all life stages of the listed species must take), NMFS estimates that the baseline water quality conditions in the Calaveras River system, both within and outside the CHCP boundary are degraded, which could have a negative impact on both adult and juvenile salmonids.

2.4.5.4. Physical Habitat Modification

The most significant, historical modification to physical habitat, other than passage barriers, is the re-routing of the Calaveras River through Mormon Slough and the Stockton Diverting Canal. The aptly named, Old Calaveras River channel, is now primarily used for water conveyance for irrigation purposes. The channel is not considered an optimal, or even desirable, migratory route or rearing area for salmonids, especially given the lack of consistent flows and numerous instream structures and passage barriers.

The extent of physical habitat modification throughout the basin below New Hogan Dam is best described on a reach-by-reach basis. Generally, the lower Calaveras River basin consists of seven visually distinct reaches, which are described below:

Reach 1- New Hogan Dam (RM 42.0 to RM 41.3) to Canyon is characterized by a relatively low gradient with a broad floodplain. Riparian vegetation is characterized by trees and shrubs, with an obvious absence of large woody debris within the wetted channel; built structures include one small, unscreened diversion pump.

Reach 2 - Canyon to Jenny Lind (RM 41.3 to RM 34.6) is the highest gradient section of the river, dropping approximately 300 feet in elevation over the course of a few miles. The reach is characterized by high gradient riffles and plunge-pools. Built structures include one small diversion and one low-flow road crossing.

Reach 3 - Jenny Lind to Shelton Road (RM 34.6 to RM 29.3) consists of a moderate gradient that meanders through a relatively unused and inaccessible area. The floodplain throughout the reach is relatively undisturbed, with agricultural interests somewhat separated from the immediate riparian area. An abundance of large trees provides shade cover. This reach has been subject to historical gravel mining and the floodplain continues to be mined near Jenny Lind. The gravel is surprisingly free of silt, possibly due to the abundance of gravel recruitment from tailing piles. Instream woody debris, undercut banks, and overhanging vegetation are typical. Built structures include sixteen small privately-owned diversions (one screened), which may be operated during the irrigation season and two low-flow road crossings.

Reach 4 - Shelton Road to Bellota (RM 29.3 to RM 24) is characterized by low gradient, which meanders through the valley, consisting mostly of glides with only an occasional riffle. Bank vegetation is brush with agriculture frequently abutting the stream. Although sand and silt are present, there is a large supply of gravel and cobble. Built structures include ten small privately-owned diversions which are operated during the irrigation season; a relatively large (i.e., 75 cfs capacity) diversion known as Bellota that is generally operated year-round; two low-flow crossings, one culvert crossing, and one earthen dam.

Reach 5 - Old Calaveras River Channel (RM 24 to RM 5.6) is characterized by a narrow channel with ample vegetative cover and large instream woody debris. Much of the vegetative cover consists of agricultural and non-native invasive plant species, such as Himalayan Blackberry. The Old Calaveras River becomes more channelized with less cover as it reaches the valley floor. This reach has nine flashboard dam foundations where flashboards are installed during the irrigation season and 71 small privately-owned diversions, which may be operated during the irrigation season. In addition, there are two head gates and multiple bridge structures.

Reach 6 - Mormon Slough/Stockton Diverting Canal (RM 24 to RM 5.6) comprises a wide channel with steep contoured banks and little to no cover. This section of channel has 12 flashboard dam foundations where flashboards are installed during the irrigation season and 63 small privately-owned diversions, which may be operated during the irrigation season. In addition, there are two low-flow road crossings and multiple bridges and railroad trestles.

Reach 7 - Junction of Old Calaveras River/Stockton Diverting Canal to Confluence (RM 5.6 to RM 0) begins where the narrow, low capacity Old Calaveras River Channel joins with the much wider, higher capacity channel of the Stockton Diverting Canal. The channel continues to exhibit the same characteristics of steep levee banks confining a wide low gradient streambed with little natural riparian cover as the maintenance practices of the San Joaquin County Flood Control and Water Conservation District prevent the growth of shrubs and trees larger than one inch in diameter. The river shows signs of tidal influence within about four miles of the confluence with the San Joaquin River Stockton Deep Water Channel. There are multiple bridges and railroad trestles in this reach.

The four main tributaries downstream of New Hogan Dam are South Gulch, Indian, Duck, and Cosgrove Creeks. All are intermittent streams that dry up during the summer months and flow during winter and spring runoff events.

Potter Creek, a tributary channel to Mormon Slough, receives water deliveries from the Calaveras River during the irrigation season for use in adjacent farmland. During the winter, Potter Creek receives natural surface runoff from within its own watershed, and then empties into Mormon Slough and substantially increases flows below Bellota during runoff events. The channel has three flashboard dam foundations where flashboards are installed during the irrigation season and 16 small privately-owned diversions, which may be operated during the irrigation season. In addition, there are two low-flow road crossings and one small, earthen dam.

Mosher Slough/Creek and Bear Creek receive water during the irrigation season from the Old Calaveras River channel by means of a small headworks control structure with a slide gate.

There are 25 privately owned diversions, which may be operated during the irrigation season. During the winter, the control structure is closed for flood control.

Overall, the modifications to physical habitat have reduced the quantity and quality of habitat for all life stages of listed and non-listed salmonids in the Calaveras River basin.

2.4.5.5. Water Temperatures

Based on 2001-2013 temperature data collected in the primary spawning and rearing reach between New Hogan and Shelton Road, recommended water temperature criteria identified by the Environmental Protection Agency (EPA 2003) for salmonid spawning, egg incubation, and fry emergence (i.e., <13°C; 55°F) are generally met under typical base flow releases from November through March between New Hogan and Shelton Road (Figures 12 and 13 in the CHCP). However, as ambient air temperatures begin to rise between April and June, water temperatures often exceed this objective even though flows are relatively high (i.e., >150 cfs). EPA recommended water temperatures for "core" rearing (<16°C; 61°F) are generally met between New Hogan and Shelton Road under typical fall/winter base flow (Figures 12 and 13 in the CHCP). In the spring and summer, water temperatures generally are within the "core" rearing range at New Hogan and Jenny Lind and are generally within the "non-core" rearing range at Gotelli and Shelton Road (Figure 13 in the CHCP). These water temperatures indicate that suitable conditions are available year-round in much of the spawning and rearing reach. Water temperatures that are above the recommended criteria in the Calaveras River are highly correlated with high ambient air temperatures occurring in spring and summer.

In addition, and as mentioned in section 2.2.2 of this opinion, global climate change would lead to increased summer air and water temperatures, which would negatively impact salmonids, especially juvenile *O. mykiss* that over-summer prior to out-migrating.

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).

The proposed action is issuance of the ITP for the implementation of the CHCP. This opinion assesses the effects of the proposed action on the listed CCV steelhead and on their critical habitat, Sacramento River winter-run Chinook salmon, CV spring-run Chinook salmon, and CV fall-run and late-fall run Chinook salmon. A summary of the effects analyzed in relation to the proposed activities is provided in Table 6.

Additionally, this opinion assesses the effects of the proposed action on listed CV spring-run and winter-run Chinook salmon that may opportunistically migrate into the action area. These listed runs of Chinook salmon have historically not maintained self-sustaining populations in the Calaveras River basin, and are not expected to in the future. Since the issuance of the ITP would become effective for CV fall-run and late fall-run Chinook salmon if they are listed in the future during the lifetime of the ITP, this opinion also assesses the effects of the proposed action on these species.

Table 6. Summary of effects to the Covered Species and critical habitat from activities under the proposed action.

Proposed Activities	Type of Action	Summary of Effects
New Hogan Reservoir Water Impoundment and Non-Flood Control Operations, and associated conservation program activities: 1. Minimum Instream Flow Commitment 2. Non-Dedicated Fall Storage Management Strategy 3. Flood Control Release Coordination with, and Advisory Support to, the USACE 4. Agriculture and Municipal Conservation Programs	• Long-term operations and maintenance	- Flow management of minimum instream flows and associated water temperatures - Flow management during droughts and associated water temperatures - Flow management during flood flows and associated fish passage - Fish migration delay and associated stranding, thermal stress, and mortality - Expected beneficial impacts to water supply from the agriculture and municipal conservation programs
SEWD Old Calaveras River Headworks Facility Operations, and associated conservation program activities: 1. Temporary Fish Barrier at Old Calaveras River Headworks Facility 2. Old Calaveras River Headworks Facility Improvement 3. Non-Entraining Upstream Passage Barrier Near Confluence of Old Calaveras River/ SDC	• Long-term operations and maintenance • Construction	- Fish entrainment into the Old Calaveras River channel, and associated thermal stress, stranding, migration delays, and mortality - Construction effects from the conservation program activities including noise, turbidity, contaminants, dewatering, cofferdams, and fish re-location activities
SEWD Bellota Diversion Facility Operations, and associated conservation program activities: 1. Temporary Fish Ladders at the Bellota Diversion Facility 2. Temporary Fish Screens at the Bellota Diversion Facility 3. Bellota Diversion Facility Improvement	• Long-term operations and maintenance • Construction	- Fish passage impediments in the short-term and long-term - Fish migration delay and associated stranding, thermal stress, and mortality - Juvenile salmonid entrainment in to diversion intake - Construction effects from the conservation program activities including noise, turbidity, contaminants, dewatering, cofferdams, and fish re-location activities

Proposed Activities	Type of Action	Summary of Effects
Artificial Instream Structures and SEWD Small Instream Dam Operations, and associated conservation program activities: 1. Artificial Instream Structures Improvements 2. Fall Flashboard Dam Removal Operations 3. Flashboard Dam Notches 4. Supervisory Control and Flow Data Acquisition System	• Long-term operations and maintenance • Construction	- Fish passage impediments in the short-term and long-term - Fish migration delay and associated stranding, thermal stress, and mortality - Juvenile salmonid entrainment into diversion intakes - Construction effects from the conservation program activities including noise, turbidity, contaminants, dewatering, cofferdams, and fish re-location activities
Privately Owned Diversion Facilities Operated within the District's Service Area (Technical assistance and education), and associated conservation program activities: 1. Technical assistance and education for landowners interested in Fish Screens for Privately Owned Diversions 2. Stakeholder Education Program regarding Fishery Issues	• Support and Education	- No impacts to fish or habitat were identified because there are no physical activities in or near the water.
SEWD Channel Maintenance for Instream Structures, and associated conservation program activities: 1. Timing Restrictions 2. Best management Practices Mitigation Measures	• Long-term operations and maintenance	- Effects from maintenance activities including turbidity, noise, contaminants, dewatering, cofferdams, and fish re-location activities
Fisheries Monitoring Program, and associated conservation program activities: 1. Protocols for capture and handling of fish, including communication and reporting protocols	• Fish capture and handling	- Effects from capture and handling including stress, injury, and death

2.5.1. Effects of the Proposed Action on the Covered Species

2.5.1.1. Flow Management and Water Temperature

2.5.1.1.1. *Effects of Minimum Instream Flows*

The impoundment of water in New Hogan Reservoir has resulted in changes to the flow regime of the Calaveras River. Like other major impoundments in the Central Valley, the frequency, magnitude, and duration of flood flow events has been significantly reduced, especially during the winter and spring months, which can affect the ability of adult and juvenile salmonids to migrate as often and as quickly as under pre-impoundment flow conditions.

The amount of reservoir storage available for SEWD's use is influenced by the USACE's flood control operations that can occur between mid-October and mid-April, depending on water year type. Generally, the reservoir is less than 70% capacity by the time the irrigation season begins as a result of the USACE's flood management activities.

During the irrigation season (mid-March or mid-April through mid-October, depending on water year type), SEWD releases from New Hogan Dam a daily average of about 150 cfs for diversion at the Bellota Diversion Facility, Old Calaveras River Headworks Facility, and Bellota Weir slide gates. During the non-irrigation season (mid-October to mid-April), reservoir releases made for M&I purposes ensure that some flows are provided to at least Bellota; however, flows do not reach downstream of Bellota during non-irrigation season until freshet events or USACE flood control releases occur. Currently, there are no year-round minimum instream flow requirements in the Calaveras River basin, beyond those necessary for M&I purposes between mid- April through early October (typically approximately 150 cfs). As part of the CHCP, SEWD would commit to minimum instream flow releases from New Hogan Dam to ensure a minimum of 20 cfs at Shelton Road (equivalent to about 25 cfs released from New Hogan Dam) year-round in all years, with the exception of periods during critical water storage levels, when flows would be reduced to 10 cfs at Shelton Road. Critical water storage levels occur once reservoir storage has fallen below 99,100 acre-feet (AF), which is equivalent to a conservation storage of 84,100 AF. In particular, year-round minimum instream flow releases above Bellota would ensure consistent flows during the non-irrigation season, in-between USACE flood control releases and freshet/storm events.

During development of the CHCP, it was determined that a minimum instream flow of 20 cfs at Shelton Road would be infeasible under critical water storage levels (typically associated with successive drought years) due to the potential for reducing the reservoir to the minimum pool. Furthermore, due to the potential risk of successive drought years that can quickly drain the reservoir to minimum storage levels, minimum instream flows downstream of Bellota were also determined to be infeasible because water supply deliveries would not be assured, and also because flows for fisheries in following years would be infeasible as a result of reservoir storage depletions.

Generally, salmonid migration opportunities downstream of Bellota are limited to times when USACE flood control releases are made, and/or when natural freshet events occur below New Hogan Dam, primarily between December and early April, which includes most of the salmonid migration timing (i.e., November through May). Since New Hogan Dam was built, migration opportunities occur in many years with a higher percentage of average daily fall (Sep 1-Nov 30) and spring (Mar 1-Mar 31) flows; however migration opportunities during winter flows (Dec 1-Feb 28) have been reduced due to the impoundment of the river.

During the irrigation season, although flows would occur year-round between New Hogan Dam and Bellota under the CHCP, flows would recede to very low or non-existent levels in both Mormon Slough and the Old Calaveras River channel (the two potential migratory routes for both adult and juvenile salmonids, dependent on flows). This reduction in flows could also occur in the non-irrigation season in-between USACE flood control releases and when storm events occur. The proposed action does not include minimum instream flows downstream of Bellota, therefore, continued impacts of reduced migration opportunities, migration delays, stranding and associated mortality of both adult and juvenile migrants is expected to continue.

Downstream of Bellota, adult salmon that are delayed due to low or non-existent flows, would be exposed to increased susceptibility to death by poaching (i.e. by holding in isolated pools and waiting for the next flow event), stranding, thermal stress, and pre-spawn mortality. For adult salmonids that successfully migrate upstream of Bellota, the extra cost in energy associated with delays and extended migration may reduce the ability of fish to successfully spawn (Banks 1969, Mundie 1991).

Juveniles that are delayed from moving downstream of Bellota would be exposed to an increased susceptibility to predation and/or thermal stress, and subsequent mortality. Once downstream of Bellota, juvenile salmonids may continue their migration when a subsequent flow event occurs. However, with no minimum instream flows downstream of Bellota, if a subsequent flow event does not occur shortly after migration downstream of Bellota, or if the flow event is not of sufficient magnitude to allow for successful downstream migration, then juvenile salmonids could be further delayed. This would expose those juvenile salmonids again to increased susceptibility of predation and/or thermal stress, and subsequent mortality.

The year-round flow releases of 20 cfs under the CHCP would provide consistent flows, especially throughout the non-irrigation season, that would support adult salmonid spawning and holding, and juvenile salmonid rearing upstream of Bellota. These year-round flows are particularly beneficial to juvenile *O. mykiss* utilizing the area since they may stay in the river for up to three years before migrating to the marine environment. The minimum instream flow commitment under the CHCP would ensure that during the non-irrigation season, in-between USACE flood control releases and freshet/storm events, the reach above Bellota would continue to be wetted and that *O. mykiss* would successfully rear in the reach. Any juvenile Chinook salmon that remain in the river throughout the summer and migrate as yearlings would also benefit. In addition, if adult winter-run, spring-run, fall-run or late fall-run Chinook salmon were to opportunistically access the reach upstream of Bellota, then both the adults and juveniles would benefit from these minimum instream flows above Bellota under the CHCP.

Although the proposed action would provide beneficial impacts to the Covered Species that may be present upstream of Bellota, the proposed action does not include any minimum instream flows below Bellota Diversion Dam. Therefore, under the proposed action, the continued operation of SEWD's diversion facilities, specifically the flow management under the proposed action would result in continued degraded conditions for Covered Species that may be present downstream of Bellota.

2.5.1.1.2. *Effects of Associated Water Temperatures from Minimum Instream Flows*

CCV Steelhead

In the Calaveras River basin, water temperatures are highly correlated with ambient air temperatures occurring in spring and summer, which is the primary rearing time for salmonids and especially for *O mykiss*. The optimal maximum water temperature for juvenile steelhead rearing is 64°F, and lethal effects can start to occur around 73°F (NMFS 2014). Water temperature data that was collected between 2000 and 2013 indicate that the 7-day moving average of the daily maximum water temperatures between New Hogan Dam and Jenny Lind (~7 river miles) from April through October, generally remained below 64°F (Figure 2). Irrigation flows during this timeframe were approximately 150 cfs, which would be similar flows during the same months under the proposed action. Downstream of Jenny Lind through to Shelton Road (~6 river miles), for the same years, monthly timeframe, and irrigation flows, the 7-day moving average of the daily maximum water temperatures hovered around 64°F, but never reached 70°F (Figure 3).

The non-irrigation season, from October through March, includes the adult migration, holding, and spawning life stages, as well as egg incubation and emergence. The peak holding and spawning time for CCV steelhead is approximately January and February. For adult holding and spawning, the optimal maximum water temperature is 52°F (NMFS 2014). Figures 2 and 3 CHCP (SEWD and FishBio 2019) show that water temperature generally remained around 50-52°F during these months from New Hogan Dam to Shelton Road. Egg incubation and emergence occurs from February through March, and water temperatures up to 59°F are tolerable during this life stage (NMFS 2014). Figures 2 and 3 show that water temperature generally remained below 60°F during these months from New Hogan Dam to Shelton Road. However, water temperatures tended to exceed 60° in mid- to late March during warmer and drier water years, especially moving downstream from New Hogan Dam.

SEWD was implementing the minimum instream flow of 20 cfs at Shelton Road during data collection for water temperatures. Water temperature data indicates that under the proposed project, the minimum instream flows would provide adequate to optimal water temperatures from New Hogan Dam to Shelton Road for all life stages of CCV steelhead. Fisheries monitoring data supports this conclusion (refer to Table 14 in the CHCP), and is further discussed in section 2.5.2.1 of this opinion as it relates to habitat.

Under the proposed action, water temperatures that would occur upstream of Bellota would be beneficial for CCV steelhead. However, the continued operation of SEWD's diversion facilities, specifically flow management under the proposed action would result in continued degraded conditions for CCV steelhead present downstream of Bellota.

Winter-Run Chinook Salmon

The life history strategy of winter-run Chinook salmon is generally not conducive to low elevation, rain-dominated river systems such as the Calaveras River basin. If any adult winter-run Chinook salmon were able to migrate upstream of Bellota during the winter months of wetter water years, it is uncertain if they would successfully spawn and the eggs survive to emergence. The maximum suitable water temperature for holding and spawning for winter-run Chinook salmon is 60°F. In the Sacramento River basin, where winter-run Chinook salmon are present, peak spawning and egg incubation is from May through August, and the maximum suitable water temperature for egg incubation is 55°F (Myrick and Cech 2004). Water temperatures from New Hogan Dam to Jenny Lind generally remain around 60-61°F during this timeframe, but increases to 64°F moving downstream to Shelton Road. Water temperatures immediately below New Hogan Dam generally remain around 55°F in the summer and early fall months (Figures 2 and 3).

Prior to the development of the CHCP, during non-irrigation months SEWD has been voluntarily implementing a base instream flow of at least 20 cfs for fish above Bellota, with the exception of years with critical water storage levels. Water temperature data indicates that under the proposed project, the minimum instream flows would result in the water temperatures at the maximum end that winter-run Chinook salmon adults prefer. If any winter-run Chinook salmon opportunistically migrated upstream as far as New Hogan Dam and successfully spawned immediately downstream of the dam, the proposed action would provide suitable water temperatures for those individual fish and their eggs.

Spring-Run Chinook salmon

The life history of spring-run Chinook salmon is similar to that of winter-run Chinook salmon, and evolved in snow-melt dominated river systems. If any adult spring-run Chinook salmon were able to migrate upstream of Bellota during the spring months of wetter water years, it is uncertain if they would successfully spawn and the eggs to survive to emergence. Similar to winter-run Chinook salmon, the maximum suitable water temperature for holding and spawning for spring-run Chinook salmon is 60°F, and the maximum suitable water temperature for egg incubation is 55°F.

Prior to the development of the CHCP, during non-irrigation months SEWD has been voluntarily implementing a base instream flow of at least 20 cfs for fish above Bellota, with the exception of years with critical water storage levels. Water temperature data indicates that under the proposed project, the minimum instream flows would result in the water temperatures at the maximum end that spring-run Chinook salmon adults prefer. If any spring-run Chinook salmon opportunistically migrated upstream as far as New Hogan Dam and successfully spawned immediately downstream of the dam, the proposed action would provide suitable water temperatures for those individual fish and their eggs.

Fall-run and Late Fall-Run Chinook salmon

The life history of late fall-run Chinook salmon is similar to winter-run Chinook salmon, and they have similar water temperature requirements during similar timeframes. Therefore, it is anticipated that the water temperature impacts from the proposed action would be the same as those described for winter-run Chinook salmon above.

The life history of fall-run Chinook salmon is the best adapted for rain-dominated river systems, such as the Calaveras River. The holding and spawning period for fall-run Chinook salmon is during the months of the year with the coolest air temperatures (November through February), which corresponds with the coolest water temperatures from New Hogan Dam to Shelton Road (Figures 2 and 3). Egg incubation and emergence would also occur while water temperatures were generally below 55°F from February through early March from New Hogan Dam to Shelton Road (Figures 2 and 3).

Similar to CCV steelhead, the spring months are the primary rearing time for juvenile fall-run Chinook salmon. Water temperature requirements for all runs of rearing juvenile Chinook are similar as those for juvenile *O. mykiss* (Myrick and Cech 2004). Prior to the development of the CHCP, during non-irrigation months SEWD has been voluntarily implementing a base instream flow of at least 20 cfs for fish above Bellota, with the exception of years with critical water storage levels. Water temperature data indicates that under the proposed project, the minimum instream flows would provide adequate to optimal water temperatures from New Hogan Dam to Shelton Road for all life stages of fall-run Chinook salmon. Fisheries monitoring data supports this conclusion (refer to Table 15 in the CHCP), and is further discussed in section 2.5.2.1 of this opinion as it relates to habitat.

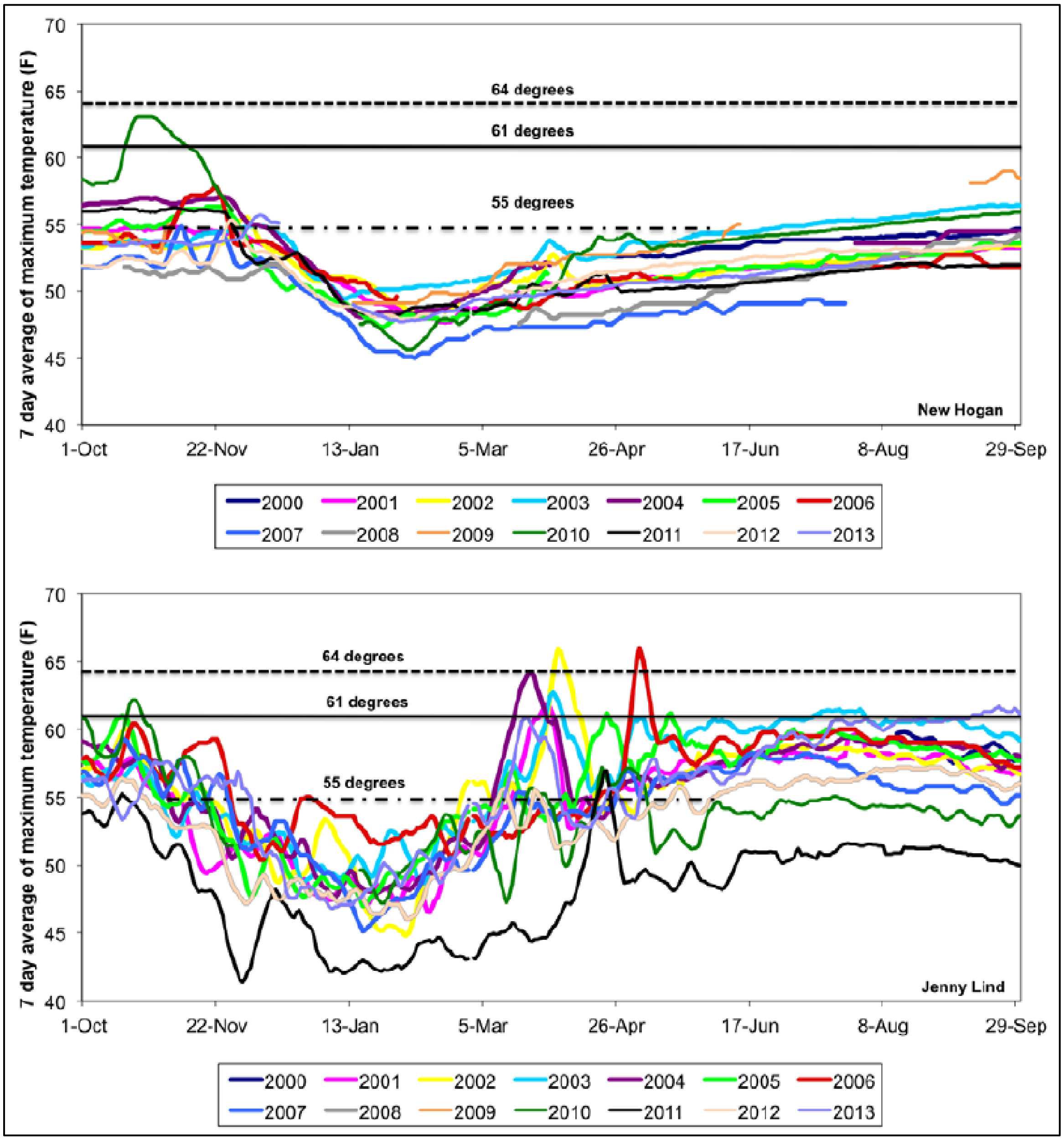

Figure 2. Seven-day moving average of the daily maximum at New Hogan Dam (river mile 42) and Jenny Lind (river mile 34.6), for Water Years 2000-2013.

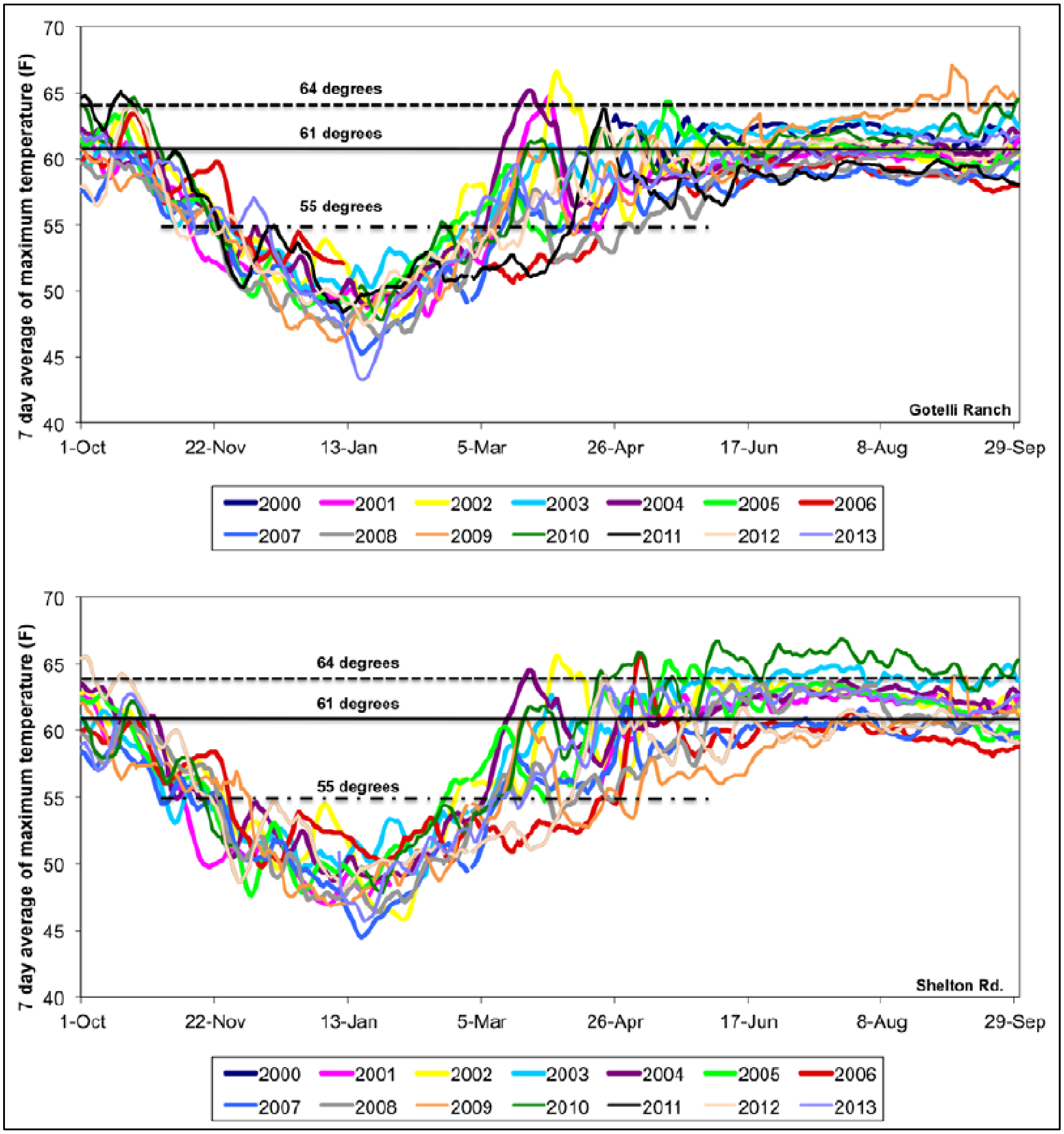

Figure 3. Seven-day moving average of the daily maximum at Gotelli Ranch (river mile 32) and Shelton Road (river mile 29.3), for Water Years 2000-2013.

2.5.1.1.3. Effects of Flow Management during a Drought and Associated Water Temperatures

When critical water storage occurs, releases from New Hogan Dam may be reduced to a minimum of 10 cfs, until critical water storage conditions are no longer in effect. Actual releases would be determined by SEWD, in consultation with NMFS, based on a consideration of potential storage impacts (and commensurate effects on future supplies for M&I deliveries, irrigation diversions, and fishery needs) as well as short-term impacts on M&I deliveries and fishery needs. Under the CHCP, a flow reduction to the 10 cfs minimum at Shelton Road would be expected to occur in approximately 4.0% of all months (23 months of 573).

Under historical drought conditions (e.g., 1987-1992), flow releases from New Hogan were reduced below 10 cfs during extended periods when conservation storage was near the minimum pool. Under these low storage conditions, monthly maximum reservoir release temperatures exceeded EPA's recommended spawning/incubation temperature of 55°F during October, November, March, and April, and exceeded 65°F during most years in October and at least one year in April (no data for 1989; USACE 2001). Due to these suboptimal instream temperatures combined with very low to non-existent flows, it was questionable whether salmonids were able to persist below the dam. No salmonid observations were recorded from 1989 through 1994. Despite this drought period where flows were less than 10 cfs, salmonid populations re-colonized the Calaveras River within a short period of time once flows were increased, as evidenced by renewed observations of salmon and steelhead beginning in 1995 and continuing until present.

Similar to historical drought conditions, at the height of the recent drought (i.e. water years 2014 and 2015), flow releases from New Hogan Dam were decreased, and water temperatures upstream of Jenny Lind increased to approximately 70°F during the late summer and early fall months (Figure 4). Further downstream from Jenny Lind through Shelton Road, the seven-day moving average of the daily average water temperatures exceeded 70°F or 75°F through the summer and early fall months (Figure 5), which indicate that several days per week had a daily maximum water temperature of over 75°F. Sustained water temperatures over 70°F would have lethal impacts to any Covered Species present in the area, and in particular to *O. mykiss* since they are expected to rear in the reaches above Bellota through one or more summer and fall seasons. However, the daily minimum water temperatures for water years 2014 and 2015 (SEWD unpublished data), consistently decreased to, or below, 70°F, presumably during the evenings. These fluctuations in water temperature, which are highly correlated with air temperatures, likely provided some temporal refuge for *O. mykiss,* which allowed them to persist in the area through the drought.

During the fall months, a reduction in the minimum instream flows during critical water years would have the same negative impacts on adults salmonids as those described above for no guaranteed minimum instream flows downstream of Bellota. For adult salmonids that successfully migrate upstream of Bellota, negative impacts would also include thermal stress, an increased probability of redd de-watering and redd superimposition due to decreased quantity of spawning habitat, and death from high water temperatures.

Similarly, during the spring and fall months, a reduction in the minimum instream flows during critical water years would have negative impacts on juvenile salmonids, particularly those that over-summer in the reaches above Bellota. Impacts to fish would include: increased susceptibility to predation, reduced growth, and increased susceptibility to disease, thermal stress, and death from high water temperatures. However, it is expected that the 10 cfs releases would at least provide a wetted channel in a portion of the spawning and rearing habitat above Bellota, and reduce the potential for stranding, especially in the non-irrigation season in-between USACE flood releases and freshet/storm events. However, it is expected that the 10 cfs releases would at least provide a wetted channel in the spawning and rearing habitat from New Hogan Dam to Bellota, and reduce the potential for stranding, especially in the non-irrigation season in-between USACE flood releases and freshet/storm events. Despite the negative impacts, the reduced flows during critical water storage conditions are expected to provide some benefit for the Covered Species, because maintenance of a consistently wetted channel would promote fish survival, as evidenced by data collected during the recent drought years.

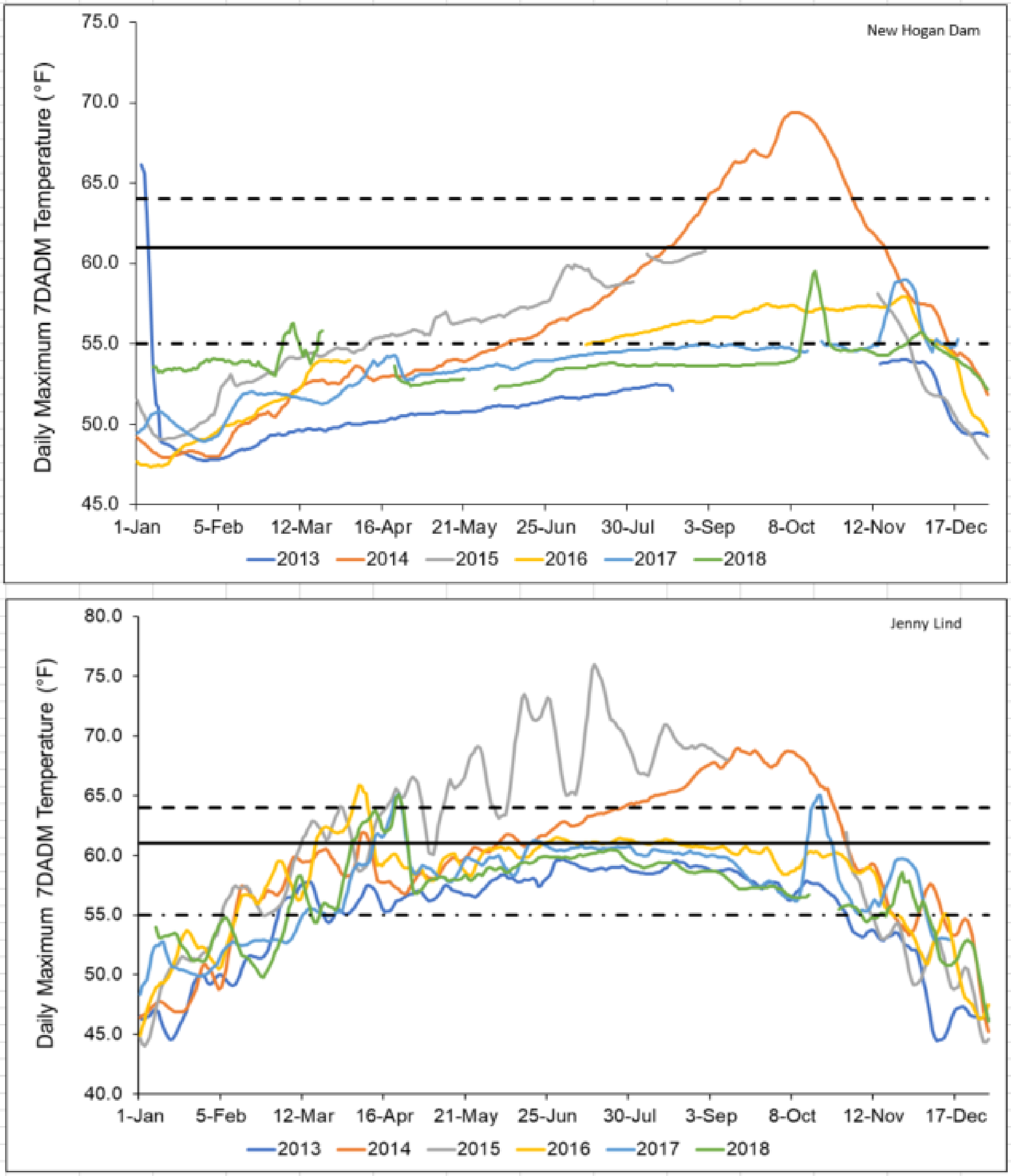

Figure 4. Seven-day moving average of the daily maximum at New Hogan Dam (river mile 42) and Jenny Lind (river mile 34.6), for Water Years 2013-2018. Note: there are some missing data values for both locations for several water years due to equipment malfunctions.

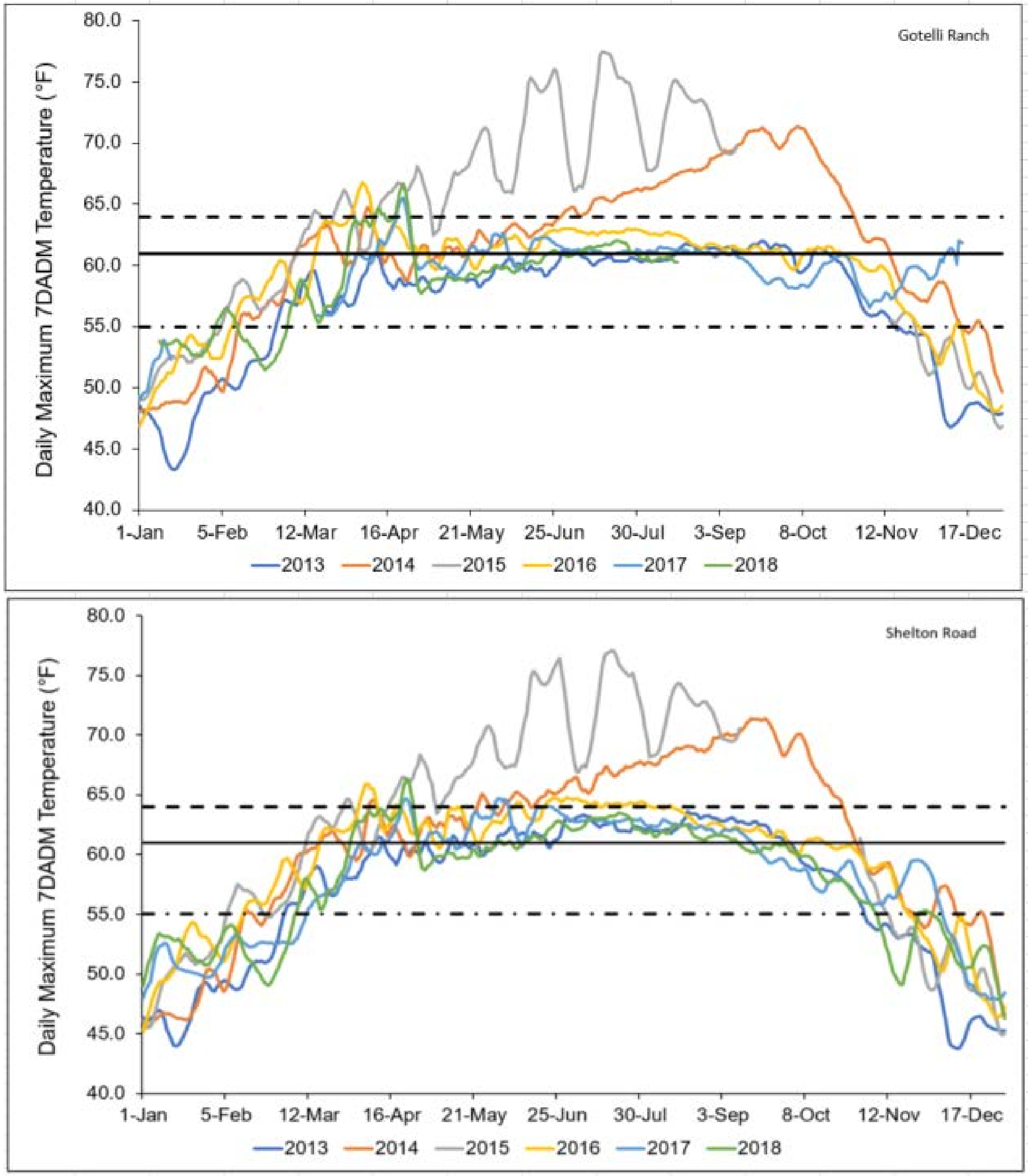

Figure 5. Seven-day moving average of the daily maximum at Gotelli Ranch (river mile 32) and Shelton Road (river mile 29.3), for Water Years 2013-2018. Note: there are some missing data values for both locations for several water years due to equipment malfunctions.

2.5.1.1.4. *Effects of Flood Flow Management*

Prior to implementation of coordinating flood flows with USACE, storage above 152,000 AF was typically released in the latter half of November with flows ranging from about 400 cfs to >3,000 cfs. Under a typical historical scenario, releases in 2005 (a year when storage was at 203,000 AF on October 15) would have ranged from 800 cfs to 1,200 cfs per day during the latter part of November in order to reduce the reservoir to 152,000 AF by December 1. Under the proposed action, SEWD would coordinate with members of the Calaveras River Fish Group (CRFG; see Chapter 9 in the CHCP for description of group) to provide recommendations to the

USACE to retain a slightly higher reservoir storage level than the criterion for December as described above, resulting in about 28,000 AF to be released between October 15 and November 30. SEWD, taking into consideration recommendations from members of the CRFG, then recommends a release schedule for this period to optimize fish passage opportunities. Under the current recommended flow schedule and current configuration of instream structures, several hundred fall-run Chinook salmon have been able to migrate through Mormon Slough, and some were able to successfully ascend the Bellota Weir.

Currently, salmonid migration opportunities are generally limited to periods when flood control releases are made, and/or natural freshet events occur below the dam primarily between December and early April, which encompasses much of the potential historical migration timing (i.e., November through May, Tables 3 and 4). In recent years, salmonids have occasionally been observed entering the river as early as November (SEWD and FishBio 2019). Early arrival times have typically coincided with localized runoff originating from storm drains downstream of Bellota that creates a temporary connection to tidewater in the lower reach. Due to lack of any runoff in the remainder of the river, salmonids attracted into the lower reach are unable to continue their migration to areas upstream of Bellota until flood control releases and/or tributary (e.g., Cosgrove, Indian, and Duck creeks) freshets occur.

2.5.1.2. Fish Passage Barriers

2.5.1.2.1. *Bellota Diversion Facility*

As part of the CHCP, the Bellota Diversion Facility Improvement project includes three components: (1) a new diversion intake with fish screen; (2) replacement of existing flashboards with a pneumatically operated crest gate at the bottom of the weir sill; and (3) a fish ladder that would provide volitional passage under a higher proportion of flow scenarios. Current passage opportunities into the reach above Bellota, only occur under a narrow range of flows and are limited to periods when the temporary fish ladders at Bellota are functional (design capacity is between 10 cfs and 24 cfs), and when there are sufficient hydraulic conditions during weir overtopping events. Based on adult migration surveys between November 23 and December 26, 2005 (FFC 2007), about 32% of 685 salmon (i.e., 221) attempting to migrate upstream were able to pass over the weir. During the survey, New Hogan releases ranged from 33 cfs to 140 cfs and flows at Bellota ranged from 56 cfs to 251 cfs (FFC 2007).

The extra cost in energy associated with temporary migration delays may reduce the ability of fish to successfully spawn. Fish that are unable to continue their migration upstream of Bellota could eventually spawn in Mormon Slough, which contains lower quality spawning habitat. In addition, fish could experience thermal stress, stranding, and associated mortality if they are unable to migrate upstream of Bellota. For fish that spawn within Mormon Slough, their eggs may not survive to emergence due to flow fluctuations. Any resulting fry or juveniles may experience thermal stress, increased susceptibility to predation, or stranding and associated mortality. If there are still juveniles rearing in Mormon Slough when the irrigation season begins, they may become entrained into small, unscreened irrigation diversions, the result of which would be death. Additionally, during flashboard dam removal and installation at the Bellota Weir, flow fluctuations may lead to salmonids that are downstream of Bellota, to experience increased thermal stress, increased susceptibility to predation, temporary migration delays, and stranding and associated mortality.

Implementation of the CHCP would provide fish passage opportunities at Bellota that would be available under a majority of flow conditions (i.e., between the 5 and 95 percent streamflow exceedances). It is anticipated that fish passage improvements at the weir would result in approximately a three-fold increase in fish passage, based on assumptions that the fishway works as intended and that the proportion of salmonids able to pass the weir is equivalent to the proportion of flow scenarios during which the weir is passable (i.e., 90% of streamflow exceedances; FFC 2007). Increased passage opportunities at the weir are expected to increase the number of adult salmonids that are able to successfully access the spawning reach upstream of Bellota and reduce the potential for stranding and migration delays that can occur under current conditions. Actions that would be implemented under the CHCP to improve passage around Bellota Diversion Facility would benefit the Covered Species. However, fish passage would still be impaired, and fish that are unable to migrate upstream of Bellota would continue experience the negative impacts described above.

Once CHCP passage improvements are implemented in the river, particularly at the Bellota Weir, coordination with USACE on flood flow releases is expected to result in an increased number of salmonids (consistent with the number of salmonids that have previously been impeded by passage structures) successfully migrating into the river upstream of the Bellota Weir. It is expected that this migration increase would occur during the fall in at least 20% of years (i.e., those years when there is between 10,000-70,000 AF of storage that must be released between October 15 and November 30).

The coordination of flood flows that would be implemented as part of the CHCP is expected to have beneficial impacts on the Covered Species, and would increase fish passage opportunities through the lower section of the Calaveras River below Bellota. Migration opportunities for anadromous fish would still be limited to when natural rain events, and flood and pre-flood releases provide sufficient flow for successful passage.

2.5.1.2.2. *Flashboard Dam Operations*

Under the proposed action, flashboard dam operations would occur in the same manner as they are currently, to facilitate irrigation diversions into numerous small, unscreened irrigation diversions for approximately 168 landowners. Flashboards are generally installed on or about April 15, but may be installed as early as mid-February under critical storage and dry year conditions (<15% frequency expected occurrence) and as late as mid-May (<15% frequency expected occurrence) during wet years.

Since 2006, with the exception of critical water storage conditions (i.e., 2014), SEWD has installed flow conveyance openings (one square foot notched openings) located about 3 to 4 feet above the base of each dam, and 6 to10 feet from the south abutment of each dam. Under the proposed action, these notches would continue to be installed to provide a pass-through area for downstream migrating juvenile salmonids, particularly under those conditions when flashboard dams are not spilling, and juvenile salmonids would not have any other way to travel downstream.

Juvenile salmonids that migrate downstream of Bellota in winter and early spring, could become trapped behind flashboard dams as they are installed in the downstream reaches. The consequences of juvenile salmonids becoming trapped behind flashboard dams could include: entrainment into small unscreened diversions, resulting in death; thermal stress; increased susceptibility to predation; temporary migration delays or blockage; stranding and associated mortality. The addition of notches to the flashboard dams in April and May under the CHCP would increase outmigration success for juvenile salmonids, and decrease the potential for the associated consequences of entrapment behind flashboard dams.

During critical water years, notches are not installed and impacts to juvenile salmonids would include delays in migration and associated thermal stress, increased susceptibility to predation, entrainment into unscreened diversion intakes in the watershed from being stuck behind a flashboard dam, and subsequent death. In critical water years, it is expected that much of the stream channels below Bellota would eventually dry out, thus any juvenile salmonids that are not able to complete their migration downstream prior to the channel drying out, would die. However, the frequency of occurrence for when the notches would not be installed is low. Based on historic storage levels from 2006 to current, there were only 56 days out of 434 total days (12.9%) where storage exceeded the critical storage threshold of 99,100 AF. The 56 days occurred during the height of the drought in water years 2014 and 2015.

SEWD generally removes the flashboard dams in Mormon Slough by October 15 to accommodate flood control concerns. Flashboard dams in the Old Calaveras, Potter Creek, Mosher Slough/Creek, and Bear Creek diverting canal are generally removed at the same time. However, in some years (<15% frequency expected occurrence), flashboards are left in place in these latter waterways through November for groundwater percolation benefits.

Prior to 2004, flashboard dams were removed in random order, which typically resulted in several isolated pools forming within the Old Calaveras River, resulting in stranding and associated mortality of adult salmonids. Since 2004, the potential for stranding and associated mortality has been reduced by a new flashboard dam removal procedure (i.e., consecutive removal of flashboards from an upstream to downstream direction) that minimizes the formation of multiple isolated pools. This new procedure, known as the "Fall Flashboard Dam Removal Operations," was identified during the CHCP development process as a conservation strategy that has been initiated (voluntarily) prior to the issuance of the final CHCP, and would be continued under the proposed action.

Actions that would be implemented under the CHCP to improve fish passage past flashboard diversion dams would benefit the Covered Species. Fish passage would still be impaired through the continued use of flashboard diversion dams, and the adverse impacts described would still occur, particularly in critically dry water years.

2.5.1.2.3. *Artificial Instream Structures*

As part of the CHCP, SEWD would implement replacement or retrofitting of instream structures based on impairment score developed in coordination with the Department of Water Resources (DWR). Three priority tiers were developed, and those structures with the highest potential to impair fish passage were assigned Tier 1. Under the CHCP, SEWD would implement the replacement or retrofitting of all Tier 1 structures in Mormon Slough/SDC that are owned and operated by SEWD (i.e. five structures). The implementation timeline and the improvement of additional structures in Mormon Slough/SDC would be identified through the adaptive management process that is outlined in the CHCP (refer to Chapter 9 of the CHCP).

The adverse impacts on the Covered Species from instream structures within Mormon Slough/SDC (the primary migratory route for adult and juvenile salmonids), would be the same as those for passage barriers described above. Under the proposed action, fish passage at several of these instream structures would be improved, which would benefit the Covered Species. However, not all of the passage barriers owned and operated by SEWD would be improved or retrofitted, and therefore fish passage, while improved at some locations, would still be impaired and cause adverse impacts at other locations under the proposed action.

2.5.1.3. Fish Entrainment

2.5.1.3.1. *Headworks Facility*

Whenever the Headworks Facility slide gates are open and flows enter the Old Calaveras River channel, there is a potential for juvenile or adult salmonids to be entrained into the Old Calaveras River channel. Dependent on a variety of factors (e.g., time of year, species, and life stage), salmonids entrained into the channel may experience thermal stress; increased susceptibility to predation; entrainment into small, unscreened irrigation diversions; temporary migration delays or blockage; reduced spawning success; or stranding and associated mortality.

Juvenile or adult salmonids that become entrained through the Headworks Facility during the winter months may be temporarily delayed or experience stranding and associated mortality as flows recede between flow events. In particular, salmonids located in the area between the Headworks Facility and Podesta Reservoir may be affected by flow reductions whenever the slide gates are closed for flooding concerns.

Juvenile salmonids that remain in the channel, or are entrained into the channel, during the summer months may experience thermal stress, increased susceptibility to predation, entrainment into small unscreened irrigation diversions and subsequent death, or stranding and subsequent death. Healthy juvenile and adult *O. mykiss* have been observed and captured/relocated from the channel in early fall (SEWD and FishBio 2019), which indicates that under some conditions, rearing conditions within the channel can be adequate for a limited time, until fish relocation can occur.

No volitional fish passage exists in the Old Calaveras River channel. If flows allow for it, adult salmonids that attempt to migrate upstream through the Old Calaveras River channel must navigate past numerous passage impediments (i.e., 15 instream structures plus the Headworks Facility, if the slides gates are closed). Salmonids that are unable to continue their upstream migration due to flow fluctuations and passage barriers, could eventually spawn in the Old Calaveras River channel, or return downstream and subsequently migrate upstream into nearby waterways including Mormon Slough, or they could experience stranding and associated mortality in the channel. For those fish that spawn within the Old Calaveras River channel, their eggs may not survive to emergence due to potential flow fluctuations, and any emergent fry may experience the same effects identified above for entrained juveniles. For those adults that return downstream and seek an alternative migration route, the extra cost in energy associated with the temporary migration delay and extended duration may reduce the ability of fish to successfully spawn (Banks 1969; Mundie 1991).

The potential for entrainment into the Old Calaveras River channel and subsequent stranding has been reduced since 2005 by the installation and operation of a temporary barrier at the Headworks Facility. The temporary barrier would continue to be operated until the Headworks Facility improvement is implemented as part of the CHCP.

In the long-term, to prevent entrainment, either a permanent non-entraining barrier (e.g., rock weir) would be installed at the Headworks Facility or the facility would be decommissioned within the first 10 years of the ITP. In addition, a non-entraining upstream passage barrier would be installed at the downstream end of the Old Calaveras River channel near the confluence with the Stockton Diverting Canal (SDC) to prevent adult salmonids from entering the channel during occasions when there is flow connectivity with the SDC.

The Old Calaveras River channel has numerous fish passage barriers and experiences rapid fluctuations in flows that are not solely controlled by SEWD, and maintaining open access to the waterway for salmonids would result in continued impacts to Covered Species. Consequently, the actions implemented as part of the CHCP to eliminate salmonid entrainment and access into the Old Calaveras River channel would benefit the Covered Species.

2.5.1.3.2. *Bellota Diversion Facilities*

Prior to 2005, there was increased potential for juveniles to be entrained into the Bellota Diversion Facilities. Juvenile salmonids that are entrained into the Bellota Diversion Facilities definitively die. However, the potential for entrainment has been reduced since 2005/2006 through installation and operation of temporary screens at the Bellota Diversion Facility. This conservation strategy was identified during the CHCP development process as an activity that was initiated prior to the issuance of the final CHCP.

The temporary screens have a mesh size of 3/16-inch, which meets the current federal and state screening criteria of 1/4” mesh for fingerlings (≥60 mm) but not the 3/32” mesh for fry (<60 mm). Although these temporary screens do not meet fry screening criteria, staff for the fishery agencies (i.e., NMFS, USFWS, and CDFW) collaborating on development of the CHCP, agreed that the screens would provide at least some level of protection for fish during the interim period prior to implementation of the permanent combined crest gate/fishway/fish screen. The temporary screens would continue to be operated until a permanent solution for the Bellota Diversion Facility is implemented. As part of the proposed action, a permanent, NMFS-approved fish screen would be included as part of the Bellota Diversion Facility Improvement Project. Once the permanent fish screen is completed, all juvenile salmonid size classes would be protected from entrainment and associated mortality. Actions that would be implemented as part of the CHCP to reduce entrainment into the Bellota Diversion Facilities would benefit the Covered Species.

2.5.1.3.3. *Technical Assistance for Landowners with Private Diversion Facilities*

The operations and associated impacts of privately owned diversion facilities were not analyzed in this opinion because they are not actions by SEWD under the proposed action. Under the proposed action, SEWD would provide technical assistance and education for landowners in SEWD’s service area who have privately owned diversion facilities. However since technical assistance and education do not impact the salmonids or critical habitat, they were not analyzed in this opinion. Nevertheless, NMFS anticipates that these conservation strategies would raise awareness in the landowner community surrounding the Calaveras River about the salmonids and critical habitat. This could ultimately lead to future incremental changes in the operations of privately owned diversions, which would benefit the Covered Species.

2.5.1.4. Maintenance Effects

Pursuant to a Routine Maintenance Agreement (RMA) with CDFW (refer to Attachment C-2 of the CHCP), SEWD performs routine channel maintenance as needed on numerous structures, including diversion structures (i.e., flashboard or earthen dams); road and low-water crossings; and intake structures with slide gates and trash racks. Per the RMA, routine maintenance is limited to the time period of July 1 through October 15, unless a variance from CDFW is requested.

When a variance request is granted, which would occur infrequently, and routine maintenance occurs outside of this time frame, adverse impacts to juvenile salmonids would include: temporary increases in stress associated with short-term increases in turbidity; injury or death if individuals come into contact with equipment in the water; and avoidance of rearing habitat associated with temporary increases in turbidity and physical habitat disturbances.

Non-routine, infrequent maintenance (historically occurs every two to four years) typically includes removing sediment at the entrance of Bellota, and reconstruction of the McGurk Earth Dam, which is privately owned but due to a previous agreement, SEWD constructs, maintains, and if needed, rebuilds the structure. These non-routine maintenance events occur in flowing water, and impacts could include: juveniles experiencing temporary increases in stress associated with short-term increases in turbidity, or may experience injury or death of individuals that come into contact with equipment. Juveniles or adults within the immediate area downstream of these activities may experience temporarily reduced feeding success, avoidance of rearing habitats, and impeded upstream and downstream migration. However, adverse impacts associated with non-routine maintenance in flowing water are expected to be minimal due to the limited frequency, duration, and location of activities (i.e., do not occur every year, take less than a few days to implement, and located in less sensitive migratory corridor areas below spawning and rearing habitat).

Routine and non-routine maintenance would have adverse impacts on the Covered Species, but would be limited in frequency given the typical work window.

2.5.1.5. Construction Effects

2.5.1.5.1. *Noise*

Construction projects that would be implemented as part of the CHCP would include activities that produce underwater noise, including as pile driving. Piles that are driven into riverbed propagate sound waves through the water which can damage a fish's swim bladder and other internal organs by causing sudden rapid oscillations in water pressure. This results in rupturing or hemorrhaging tissue in the bladder when the air in swim bladders expand and contract in response to the pressure oscillations (Gisiner 1998; Popper et al. 2006). A perforated or hemorrhaged swim bladder has the potential to compromise the ability of a fish to orient itself both horizontally and vertically in the water column. This can result in the diminished ability to maintain position in the water column and affects the efficiency of feeding, migration, and avoidance of predators, can reduce general fitness, and even result in death. Sensory cells and other internal organ tissue may also be damaged by noise generated during pile driving activities as sound reverberates through a fish's viscera (Gaspin 1975). In addition, morphological changes to the form and structure of auditory organs (saccular and lagenar maculae) have been observed after intense noise exposure (Hastings 1995). Smaller fish with lower mass are more susceptible to the impacts of elevated sound fields than larger fish. Juveniles and fry have less inertial resistance to a passing sound wave and are therefore more at risk for non-auditory tissue damage (Popper & Hastings 2009) than larger fish of the same species.

Multiple studies have shown responses in the form of behavioral changes in fish due to human-produced noise (Popper & Hastings 2009; Slotte et al. 2004; Wardle et al. 2001). Instantaneous behavioral responses may range from mild awareness to a startle response. Fish may also exhibit movements that displace them from a position normally occupied in their habitat for short or long durations. Depending on the innate behavior that is being disrupted, the short-term and long-term adverse effects could be varied. This is of particular concern for juvenile fish as there are innate behaviors that are essential to their maturation and survival such as feeding, sheltering, and migratory patterns. An example of a significant, direct adverse effect would be cessation or alteration of migratory behavior. In the context of the action area, the migratory behavior of juvenile salmonids may be affected by various pile driving and acoustic impacts. Though pile driving may affect migratory behavior, it is not expected to completely prevent salmonids from passing upstream or downstream because pile driving would not be continuous through the day, and would not occur at night, when the majority of fish migrate.

Based on recommendations from the Fisheries Hydroacoustic Working Group, NMFS uses dual metric criteria to assess onset of injury for fish exposed to pile driving sounds (Caltrans 2015, Caltrans 2017). For a single strike, the peak exposure level (peak) above which injury is expected to occur is 206 dB (reference to 1 micro-pascal [1µpa] squared per second). However, cumulative acoustic effects are expected for any situation in which multiple strikes are being made to an object with a single strike peak dB level above the effective quiet threshold of 150 dB. Therefore, the accumulated sound exposure level (SEL) level above which injury of fish is expected to occur is 187 dB for listed fish greater than 2 grams in weight, and 183 dB for fish less than 2 grams. If either the peak SEL or the accumulated SEL threshold is exceeded, then physical injury is expected to occur. Behavioral effects may still occur below these thresholds for injury. NMFS uses a 150 dB root mean square (RMS) threshold for behavioral responses in salmonids. Though the dB value is the same, the 150 dB RMS threshold for behavioral effects is unrelated to the 150 dB effective quiet threshold.

SEWD's proposal includes performing pile driving activities within the threshold to avoid mortality of the Covered Species. Furthermore, pile driving activities would not occur during the peak migration of juvenile or adult salmonids, and any fish in the immediate area would be re-located prior to pile driving activities. However, further away from the construction area, a few individual fish would still experience behavioral effects and increased physiological stress from the noise.

2.5.1.5.2. *Turbidity*

Localized increases in sedimentation and turbidity may result from a number of actions associated with the construction activities under the CHCP. Various construction activities could result in temporary increases in turbidity and suspended sediment concentrations through disturbance of sediments and soils within and adjacent to waterways. Any construction-related erosion or disturbance of sediments and soils would increase downstream turbidity and sedimentation if soils were transported in river flows.

High levels of turbidity can generally result in gill fouling, reduced temperature tolerance, reduced tolerance to fish diseases and toxicants, reduced swimming capacity and reduced forage capacity in lotic fishes (Waters 1995, Wood and Armitage 1997). In addition, reduced predator avoidance behavior by juvenile salmonids has been documented at increased levels of turbidity (Gregory 1993). Increased turbidity can also reduce prey detection by fish, and the availability of prey items, thereby affecting growth and survival of fish (Kemp et al. 2011; Sigler et al. 1984; Suttle et al. 2004).

Avoidance of adverse habitat conditions by fish is the most common result of increases in turbidity and sedimentation (Waters 1995). Therefore, increased turbidity attributed to construction activities could preclude fish from occupying habitat required for specific life stages. A review by Lloyd (1987) indicated that several behavioral characteristics of salmonids can be altered by even relatively small changes in turbidity (10 to 50 nephelometric turbidity units [NTUs]). Salmonids exposed to slight to moderate increases in turbidity exhibited avoidance, loss of station in the stream, reduced feeding rates and reduced use of overhead cover. Reaction distances of rainbow trout on prey items were reduced with increases of turbidity of only 15 NTUs over an ambient level of 4 to 6 NTUs in experimental stream channels (Barret et al. 1992).

In-water construction and maintenance activities that increase turbidity would primarily occur in the summer months, and are expected to have minimal effects on the Covered Species due to implementation of minimization measures and best management practices, and the expected low presence in the action area.

2.5.1.5.3. *Contaminants*

Introduction of chemicals during construction activities can cause direct mortality, interfere with fish passage, induce physiological stress, and/or reduce the biodiversity of prey in the immediate and downstream areas. Pollution-related effects are indirect, and may persist in the action area after construction concludes, which could affect multiple life stages of the Covered Species. Accidental waste spills, compromised on-site storage containers, or leaks in construction equipment could also introduce oil, gasoline, hydraulic fluid, or other associated substances into the waterway. The implementation of BMPs are expected to minimize the probability of pollutant incursion into aquatic habitats.

Operations of construction equipment/heavy machinery also has the potential to deposit heavy metals throughout the action area at low levels (Paul and Meyer 2001). These materials have been shown to alter juvenile salmonid behavior through disruptions to various physiological mechanisms, including sensory disruption, endocrine disruption, neurological dysfunction, and metabolic disruption (Scott and Sloman 2004). Oil-based products used in combustion engines are known to contain PAHs which have been known to bioaccumulate in other fish taxa such as flatfishes (order Pleuronectiformes) and have carcinogenic, mutagenic and cytotoxic effects (Johnson et al. 2002). Studies have shown that increased exposure of salmonids to PAHs results in reduced immunosuppression and therefore increases their susceptibility to pathogens (Arkoosh and Collier 2002; Arkoosh et al. 1998).

Hazardous materials could also be transported further downstream within the action area, and impact areas beyond the active construction zone. The potential magnitude of biological effects resultant from accidental, unintentional, or unavoidable chemical discharges depends on: (1) the type, amount, concentration, and solubility of the contaminant; (2) the timing of the discharge and duration the contaminant persists in the environment; and (3) the affected species sensitivity and susceptibility to that particular contaminant, the duration and frequency of their exposure, and their initial health before exposure.

Construction activities under the CHCP would primarily occur in the summer months, when the Covered Species are expected to occur in low abundance or not present. Furthermore, the implementation of BMPs would significantly reduce the potential for contaminants to enter the waterways and stream channel. Therefore, the risk of exposure to contaminants is low.

2.5.1.5.4. *Dewatering, Cofferdams, and Fish Re-Location Activities*

Fish have the potential to become entrapped behind the cofferdam during the dewatering activities, resulting in injury or death, and/or require handling for relocation, which may result in injury or death. Fish capture and relocation would be necessary during dewatering activities if individuals of the Covered Species are present and found in the enclosed area of the cofferdam. Each step during the capture/relocation process could also induce physiological stress, even when a skilled fish biologist performs the relocation. The capture and relocation of salmonids associated with the dewatering of the cofferdam is expected to adversely affect a small number of salmonids present in the action area at the time of the activity. As dewatering activities would only occur during the summer months, then primarily juvenile CCV steelhead are expected to be affected. Therefore, primarily juvenile CCV steelhead are expected to be adversely affected during dewatering. Any juvenile Chinook salmon, from any CV run, that opportunistically over-summer could be affected as well, however Chinook salmon that exhibit a yearling life history strategy are not expected to occur in high abundances in the Calaveras River basin. Therefore, an extremely low number of juvenile Chinook salmon would be adversely affected during dewatering as well.

2.5.1.6. Monitoring Activities

Fisheries monitoring has been conducted since 2002 and under the proposed action would continue throughout the term of the ITP in order to improve understanding of salmonids, particularly CCV steelhead, within the Calaveras River. Detailed information about the fisheries monitoring is provided in Appendix D of the CHCP.

Juvenile and adult salmonids may experience temporary increases in stress associated with harassment from capture and handling. There is also a low likelihood (i.e., less than 5%) that salmonids may be injured or killed during capture or handling. Potential impacts would be minimized through the use of minimization and good practice measures as outlined in section 1.3.1.1 of this opinion.

Monitoring activities would have adverse impacts to individual fish, however, the information gained would benefit the Covered Species. The information collected through the monitoring program would help identify the temporal and spatial distributions of migrating and holding CCV steelhead and Chinook salmon that migrate into the Calaveras River basin. This data would help ensure that suitable flows, water temperatures, and passage conditions are being provided above Bellota when and where the fish are in the Calaveras River.

2.5.2. Effects of the Proposed Action on Critical Habitat for Central Valley Steelhead

2.5.2.1. Flows and Water Temperature

2.5.2.1.1. *Effects of Minimum Instream Flows and Associated Water Temperature*

The year-round flows upstream of Bellota would provide adequate habitat conditions for salmonids in priority spawning and rearing areas, as evidenced by the relatively high annual abundance of *O. mykiss* and good condition factors of both juvenile *O. mykiss* and Chinook salmon observed during rotary screw trap monitoring during 2002-2015 (SEWD and FishBio 2019). The average annual number of *O. mykiss* juveniles captured in the Calaveras River has been 1,125 (range: 319-2,769), while the average estimated juvenile Chinook migrant population has been 5,206 (range: 884-13,670).

Condition factors provide a general indicator of the overall health of an individual fish and have been used to assess overall health of a salmonid population. Condition factors can also be used to indicate the quality of habitat conditions (e.g., prey availability; Hanson and Bajjaliya 2005) of rearing PBFs within critical habitat. In addition, a review of Central Valley salmonids by Williams (2006) indicates that habitat use *"…may be more reliably inferred from measures of the organisms' condition [including Fulton's K factor]" rather than the presence or abundance of organisms in a habitat, which are "…not necessarily a good index of the quality of the habitat (Van Horne 1983; Manly et al. 2002)."* Based on a comparison of K values with general appearance, fat content, and other factors, a K factor of 1.25 and above was found to indicate good condition for salmonid fishes (Barnham and Baxter 1998; Baxter et al. 1991, as cited in Povslen 1993).

Average *O. mykiss* K factors measured in the Calaveras River during 2002-2008, even during lower flow periods, ranged from 1.28 to 1.55 each year (total sample size n=1,765 fish). For the two years during the same period that Chinook salmon juveniles were also captured, average K factors for Chinook salmon ranged from 1.49 to 1.62 (total sample size n=1,040 fish). *O. mykiss* K values, coupled with high abundance, indicate that habitat conditions upstream of Shelton Road are able to support a viable population of *O. mykiss* even under lower fall/winter flow conditions. A potential exception may occur during an extended drought where a prolonged period of very low flows might result in decreased habitat quality temporarily.

Further evidence to support good habitat conditions in the spawning and rearing PBFs upstream of Bellota, are provided by additional data for water temperatures, water depths, Habitat Suitability Indices (HSI), Weighted Usable Area/Physical Habitat Index (WUA/PHI), and fish assemblage. Water temperature is one of the most important environmental factors affecting fish (Willey 2004; Fry 1967; Lantz 1969; Fry 1971). Based on 2001-2012 temperature data collected in the primary spawning and rearing reach between New Hogan and Shelton Road, the recommended water temperature criteria identified by the Environmental Protection Agency (EPA; EPA 2003) for salmonid spawning, egg incubation, and fry emergence (i.e., <13°C; 55°F) are generally met under typical base flow releases from November through March between New Hogan and Shelton Road (Figures 2 and 3 in this opinion).

Additionally, water depths are an important component of redd selection for spawning adult salmonids and rearing habitat for fry and juveniles. Barnhardt (1986) identified typical water depths that steelhead select during various life stages, including 0.12-0.70 meters (m) for adult spawning, 0.08-0.36 m for fry rearing, and 0.25-0.5 m for juvenile rearing. Average water depths upstream of Bellota under low flow conditions (i.e., 25 cfs) were within or were slightly greater than these typical depths during a fall 2005 snorkel survey (SEWD unpublished data). Average depths were 0.86 m for Reach 1 (range: 0.5-1.5 m), 0.90 m for Reach 3 (range: 0.1-2.1 m), and 0.49 m for Reach 4 (range: 0.2-0.9 m); no survey was conducted in Reach 2. These preliminary measurements indicate that water depths are suitable under typical flow conditions for all life stages of *O. mykiss*.

HSI values were calculated from data collected in 2003 during a California Fish and Game Rapid Biomonitoring and Physical Habitat Assessment (Tetra Tech 2005). Data used to generate HSIs included Epifaunal Substrate/Available Cover, Embeddedness, Velocity/Depth Regime, Sediment Deposition, Channel Flow Status, Channel Alteration, Frequency of Riffles, Bank Stability, Vegetative Protection, and Riparian Vegetative. HSI values were recorded under moderate flow conditions (i.e., about 100 cfs) at multiple locations including three monitoring sites between Bellota and New Hogan. HSIs at all three locations in this reach were greater than 139 (i.e., values were 151.3, 160.3, 166.7), indicating that optimal habitat conditions existed for fisheries upstream of Bellota (Tetra Tech 2005).

Furthermore, in 2008, an instream flow study was conducted in the lower Calaveras River (New Hogan to Bellota) using a Physical Habitat Simulation (PHABSIM) model to calculate an index relationship between streamflow and potential habitat for steelhead (refer to Appendix E in the CHCP). Four reaches were evaluated including:

Reach 1 - New Hogan Dam to Canyon (RM 42.0 to RM 41.3);
Reach 2 - Canyon to Jenny Lind (RM 41.3 to RM 34.6);
Reach 3 - Jenny Lind to Shelton Road (RM 34.6 to RM 29.3); and
Reach 4 - Shelton Road to Bellota (RM 29.3 to RM 24).

Results of the PHABSIM study indicate that low flows ranging from 12 cfs for fry and 30-40 cfs for spawning adults optimize the amount of weighted usable area/physical habitat index (WUA/PHI) in the upper two reaches where the majority of spawning and early rearing occurs (Stillwater Sciences 2004). Based on WUA/PHI curves, a minimum flow commitment of 20 cfs at Shelton Road (equivalent to about 25 cfs released from New Hogan) ensures that suitable habitat is available in the important spawning and rearing area during the non-irrigation season from late fall through early spring, which encompasses the steelhead spawning season (December through March) as well as year-round rearing. During the non-irrigation season, natural freshet events and/or flood control releases provide migration opportunities during normal to above-normal precipitation years, particularly for steelhead. These flow events create conditions that allow adult fish to migrate into the spawning reach where habitat is suitable for spawning and that allow juvenile fish to migrate out of the river on their way to the ocean.

During the irrigation season (late spring through early fall), flows are higher than those that would optimize WUA/PHI for fry and juvenile rearing in Reaches 1 and 2, but provide water temperatures that are typically within EPA recommended water temperatures for “core” steelhead rearing (<16°C; 61°F). Flows released for irrigation (~150 cfs) provide a relatively high amount of suitable physical habitat in Reach 3 and maintain over-summering water temperatures that are generally within those recommended for “non-core” rearing areas (<18°C; 64°F). Reach 4 is considered to be mostly a migration corridor due to limited habitat structure, presence of non-native predators, and unsuitable over-summering temperatures.

Under the proposed action, the minimum instream flows that would be implemented above Bellota would benefit CCV steelhead critical habitat by maintaining year-round adequate conditions in the primary spawning and rearing PBFs.

The proposed action does not include minimum instream flows below Bellota. During most of the irrigation season, and in-between USACE flood releases and freshet/storm events during the non-irrigation season, flows downstream of Bellota would be very low to non-existent. Adverse impacts to critical habitat would include reduced or non-existent migratory corridor PBFs, and reduced or non-existent spawning and rearing PBFs. However, the spawning and rearing PBFs downstream of Bellota contain low quality habitats, so CCV steelhead would only be expected to opportunistically spawn or rear below Bellota due to fish passage barriers that prevent or delay their migration.

2.5.2.1.2. *Effects of Flow Management during a Drought*

Under the proposed action, during critical water storage conditions, flows above Bellota would be reduced to 10 cfs and the margins of the stream channel in CCV steelhead critical habitat would be partially de-watered, until a storm event or USACE flood release occurs. Lower flows would maintain critical habitat rearing PBFs for CCV steelhead during subsequent drought years from New Hogan Dam to Bellota. In the margins of the stream channel that are de-watered, negative impacts to critical habitat could include: reduced hyporheic habitat for invertebrates (i.e., prey availability), and encroachment of non-native riparian vegetation into the channel and subsequent changes in channel morphology. The frequency of occurrence of drought flows is described in section 2.5.1.1.3 of this opinion. Overall, drought flows under the proposed action would maintain a wetted channel bed and riparian vegetation in critical habitat, and thus would have beneficial impacts to critical habitat alongside the adverse impacts.

2.5.2.1.3. *Effects of Flood Flow Management*

Coordination of flood flows that would be implemented under the CHCP would increase the quantity and quality of fish migratory corridor PBFs within critical habitat during the fall. Fall is an important time for adult salmon migrating upstream, and for yearling salmon migrating downstream that reared above Bellota through the summer. Thus, coordination flood flows would have beneficial impacts to critical habitat.

2.5.2.1.4. *Effects of Agriculture and Municipal Conservation Programs*

The Agriculture and Municipal Conservation Programs are actions by SEWD under the proposed action, however since they do not physically impact salmonids or critical habitat, they were not analyzed in this opinion. Nevertheless, NMFS expects these conservation programs to potentially lead to a more stable water supply in the future for critical habitat, which would be beneficial.

2.5.2.2. Maintenance Effects

The effects of routine maintenance on critical habitat include: temporary increases in turbidity, stream bank erosion, and loss of riparian vegetation and habitat. The effects of non-routine maintenance on critical habitat include: habitat alteration from the re-building of McGurk Earth Dam, temporary increases in turbidity, temporary channel dewatering, and loss of riparian vegetation and habitat. Overall, the effects of facility maintenance that would occur under the proposed action would have adverse impacts on critical habitat.

2.5.2.3. Construction Effects

2.5.2.3.1. *Turbidity*

Increased turbidity from construction activities would temporarily adversely impact the migratory, spawning, and rearing PBFs of CCV steelhead critical habitat. Increased turbidity and suspended sediments would temporarily impair migratory corridors, and the deposition of suspended fine sediments within spawning and rearing areas would degrade the quality of those PBFs. Furthermore, higher turbidity and suspended sediments could reduce the macro-invertebrate prey base of juvenile salmonids. However, the adverse effects on critical habitat are anticipated to be temporary and limited to the areas downstream of the primary spawning and rearing areas.

2.5.2.3.2. *Habitat Quality and Accessibility*

Activities under the CHCP would result in the inaccessibility to a portion of CCV steelhead critical habitat. The proposed installation of a permanent barrier at both the mouth and head of the Old Calaveras River channel would permanently exclude CCV steelhead from critical habitat within the channel. Improvements at the Headworks Facilities would also result in the inaccessibility to a portion of CCV steelhead critical habitat, and would result in adverse impacts such as vegetation removal, the addition of riprap, and the replacement of existing instream structures, and the addition of one new instream structure. Under the proposed action, critical habitat for CCV steelhead would be adversely impacted.

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).

The private and state activities described below are likely to adversely affect the Covered Species and designated critical habitat for CCV steelhead. These factors are ongoing and expected to continue into the future. However, the extent of the adverse effects from these activities is uncertain, and it is not possible to accurately predict the extent of the effects from these future non-Federal activities.

2.6.1. Agricultural Practices

Agricultural practices in the action area may adversely affect riparian habitats through upland modifications of the watershed that lead to increased siltation, reductions in water flow, or agricultural runoff. Grazing activities from cattle operations can degrade or reduce suitable critical habitat for listed salmonids by increasing erosion and sedimentation as well as introducing nitrogen, ammonia, and other nutrients into the watershed, which can flow into the receiving waters of the associated watersheds. Stormwater and irrigation discharges related to both agricultural and urban activities contain numerous pesticides and herbicides that may adversely affect listed salmonids reproductive success and survival rates (Dubrovsky et al. 1998, Daughton 2003).

2.6.2. Increased Urbanization

Increases in urbanization and housing developments can impact habitat by altering watershed characteristics, and changing both water use and storm-water runoff patterns. Increased growth would place additional burdens on resource allocations, including natural gas, electricity, and water, as well as on infrastructure such as wastewater sanitation plants, roads and highways, and public utilities. Some of these actions, particularly those that are situated away from waterbodies, would not require Federal permits, and thus would not undergo review through the ESA section 7 consultation process with NMFS.

2.6.3. Levee Maintenance and Repair

Minor levee maintenance activities are ongoing in parts of the Action Area involving bank stability measures and vegetation control. No major levee repairs are occurring now. These activities, although ongoing, are minor and infrequent. Minor levee maintenance would be conducted outside of the water; however, BMPs would be implemented to minimize erosion and sediment and minimize impacts to water quality. Vegetation control would be minor as short grasses would be maintained on the levees and not result in adverse impacts to CCV steelhead critical habitat.

2.6.4. South Stockton Master Water Plan Update and Reservoir

Infrastructure improvements are planned to serve demands for future build-out of the South Stockton service area and to minimize additional groundwater pumping by providing surface water through a pipeline from the Stockton East Water District Drinking Water Treatment Plant, via the South Stockton Aqueduct project. This project would not contribute to cumulative impacts.

2.6.5. Farmington Groundwater Recharge Program

This program would ultimately recharge up to 35,000 AF per year of water by implementing conjunctive management strategies for the utilization of available water resources. When surface water supplies are abundant, the program's objective is to recharge the groundwater basin through in-lieu irrigation and partnerships with growers who rotate direct recharge activities with other land uses. Construction in the recharge cell areas would result in the cumulative loss of upland habitat outside of CCV steelhead critical habitat. The recharge program would not affect instream flow conditions in the Calaveras River and so would not contribute to cumulative impacts to fisheries.

SEWD conducts ongoing assessments to identify any potential projects planned within waterways in its service boundaries since new project activities may influence SEWD's ability to fulfill its legal responsibilities to reduce and control the critical overdraft of the basin. No other operations-related projects are foreseeable within the study area with the exception of a possible

SEWD's Water Supply Enhancement Project (WSEP) that is being processed to address the critical groundwater overdraft in the basin. The WSEP involves the diversion of surplus/flood flows on the Calaveras River and Littlejohn and Rock Creeks. Movement and delivery of water within the Calaveras River watershed under a potential future WSEP could have negative impacts on Covered Species and CCV steelhead critical habitat. Depending on how the program is implemented, new diversions that may occur at, or downstream of, Bellota could affect flows and water temperatures in migration routes downstream of Bellota resulting in impacts to anadromous fish migration.

2.7. Integration and Synthesis

The Integration and Synthesis section is the final step in our assessment of the risk posed to species and critical habitat as a result of implementing the proposed action. In this section, we add the effects of the action (Section 2.5) to the environmental baseline (Section 2.4) and the cumulative effects (Section 2.6), taking into account the status of the species and critical habitat (Section 2.2), to formulate the agency's biological opinion as to whether the proposed action is likely to: (1) Reduce appreciably the likelihood of both the survival and recovery of a listed species in the wild by reducing its numbers, reproduction, or distribution; or (2) appreciably diminishes the value of designated or proposed critical habitat for the conservation of the species.

2.7.1. Status of the Covered Species and Designated Critical Habitat for CCV Steelhead

According to the NMFS 5-year species status review (NMFS 2016a), the status of CCV steelhead appears to have remained unchanged since the 2011 status review that concluded that the DPS was in danger of extinction. Most CCV steelhead populations are very small, are not monitored, and may lack the resiliency to persist for protracted periods if subjected to additional stressors, particularly widespread stressors such as climate change. The genetic diversity of CCV steelhead has likely been impacted by low population sizes and high numbers of hatchery fish relative to natural-origin fish. The life-history diversity of the DPS is mostly unknown, as very few studies have been published on traits such as age structure, size at age, or growth rates in CCV steelhead.

Critical habitat for CCV steelhead includes the stream reaches in the Sacramento River and its tributaries, as well as reaches of the San Joaquin River and its tributaries. Although the current conditions of PBFs for CCV steelhead critical habitat in the Central Valley are significantly limited and degraded, the habitat remaining is considered highly valuable.

The NMFS 2016 5-Year Status Review re-evaluated the status of CV spring-run Chinook salmon and concluded that the species should remain listed as threatened (NMFS 2016b). The Central Valley spring-run Chinook salmon ESU includes all naturally spawned populations of spring-run Chinook salmon in the Sacramento River and its tributaries in California, including the Feather River, as well as the Feather River Hatchery spring-run Chinook program. The ESU excludes the San Joaquin River and its tributaries, including the Calaveras River. Through implementation of the NMFS Recovery Plan and the SJRRP reintroduction efforts (SJRRP 2018), an increased number of CV spring-run Chinook salmon are expected to use the San Joaquin River as a migration pathway.

The Sacramento River winter-run Chinook salmon ESU consists of only one population that is confined to the upper Sacramento River in California's Central Valley and excludes the San Joaquin River and its tributaries, including the Calaveras River. According to the NMFS 5-year species status review (NMFS 2016c), the status of the winter-run Chinook salmon ESU, the extinction risk has increased from moderate risk to high risk of extinction since the 2007 and 2010 assessments. Based on the Lindley et al. (2007) criteria, the population is at high extinction risk. Critical habitat area for Sacramento River winter-run Chinook salmon extends from the Sacramento River at Keswick Dam to Chipps Island at the westward margin of the Sacramento-San Joaquin Delta.

There is very limited data on the status of CV late fall-run Chinook salmon, and recent surveys indicate that the species currently only occurs in the Sacramento River basin. There is not an established population of late fall-run Chinook salmon in the Calaveras River basin. CDFW's Grand Tab (CDFW Grand Tab dated 5/7/2019) compilation of escapement estimates for late fall-run Chinook salmon in the Sacramento River watershed generally indicates a declining trend. There are no escapement or population estimates for late fall-fun Chinook salmon in the San Joaquin watershed. It is uncertain if CV late fall-run Chinook salmon would be ESA listed in the next 50 years.

CV fall-run Chinook salmon are the most ubiquitous in the Central Valley rivers, and have been documented in the Calaveras River several times. Based on CDFW's Grand Tab (CDFW Grand Tab dated 5/7/2019) compilation of escapement for estimates for CV fall-run Chinook salmon, the status of the species in the Sacramento and San Joaquin watersheds seems to decline and rebound based on water year types, and is heavily influenced by hatchery productions throughout the Central Valley. Recent trends for the Sacramento River populations show a decline in recent years as result of drought years (i.e. 2014-2015). The past five years have seen a declining trend for escapement in the Sacramento River watershed (excluding hatchery escapement abundances). In the San Joaquin River watershed, CV fall-run Chinook salmon escapement estimates have remained relatively stable, and general trends show an increase in escapement estimates into the San Joaquin tributaries (excluding hatchery escapement). It is uncertain if CV fall-run Chinook salmon would be ESA listed in the next 50 years.

2.7.2. Summary of the Environmental Baseline and Cumulative Effects

The environmental baseline indicates that past and present activities within the Calaveras River basin have caused significant habitat loss, degradation, and inaccessibility for all the Covered Species. Alterations in flow regimes, water diversions, instream structures, and continual contaminants from agricultural and urban discharges have also substantially reduced the functionality of the waterways.

The lower Calaveras River is designated critical habitat for CCV steelhead and extends from New Hogan Dam downstream to Bellota, Mormon Slough from Bellota to the mouth, the SDC, the Old Calaveras River channel downstream of Bellota to the SDC, and the Calaveras River from the SDC to the mouth. Past and present activities have caused a significant reduction in the quality and quantity of the remaining PBFs within the action area for the population of CCV steelhead that utilize the critical habitat in the area. Nevertheless, there is a robust population of *O. mykiss*, and a small but self-sustaining population of CCV steelhead. It is currently unknown what proportion of the *O. mykiss* population in the Calaveras River exhibits the resident life history strategy versus the proportion that exhibit the CCV steelhead life history strategy.

The current population of CV fall-run Chinook salmon that utilizes the Calaveras River do not seem to be self-sustaining, and are primarily only documented in the basin during wetter water year types. However, based on available historical records and knowledge of the hydrology of the Calaveras River basin, NMFS estimates there is potential for fall-run Chinook salmon to establish a self-sustaining population in the future.

The cumulative effects described in this opinion include continual or future effects, such as the discharge of point and non-point source pollution and increased urbanization that affect the Covered Species in the action area. These activities typically result in habitat fragmentation, and conversion of complex nearshore aquatic habitat to simplified habitats that incrementally reduces the carrying capacity of migratory corridors. In addition, the impoundment of water, water diversions, fish passage barriers, water quality issues, and agricultural and urban land uses are reasonably certain to continue in the future in the action area. The effects of these cumulative actions result in the continued degradation, inaccessibility, and reduction of riparian and freshwater habitat for the Covered Species in the action area.

2.7.3. Summary of Project Effects on the Covered Species and Critical Habitat

During construction, some behavioral effects, as well as injury or death to individual fish is likely to result. Construction activities would occur during the summer and early fall months, which is outside of the migrating adult and juvenile time frame, and when the abundance of individual fish is low. This would result in correspondingly low levels of injury or death. In addition, during construction activities, some water quality impacts would occur, such as increased turbidity. However, implementation of BMPs and mitigation measures would minimize the impacts to fish present in the immediate construction area.

The long-term operations of SEWD facilities would result in injury, death, and behavioral effects to individual fish through various pathways. Additionally, the associated routine and non-routine maintenance of project facilities could also result in injury, death, behavioral effects, and water quality impacts. Implementation of the conservation strategies and mitigation measures in the CHCP would help to reduce those impacts, and consequently were designed to mitigate for impacts caused by the long-term operation and maintenance of SEWD facilities.

The conservation strategies in the CHCP will reduce the impacts associated with SEWD operations and facility maintenance. However, the construction and monitoring activities associated with implementation of the conservation strategies could also result in injury, death, and behavioral effects to individual fish. Implementation of BMPs, particularly for fish monitoring activities would minimize those anticipated impacts.

In addition, implementation of the CHCP would include temporary CCV steelhead critical habitat degradation, and inaccessibility to a portion of CCV steelhead critical habitat that is already severely degraded, as described in the environmental baseline section above. Short-term and long-term impacts to critical habitat that would occur due to the proposed action include: temporary water quality impacts, addition of riprap, removal of riparian vegetation, bank erosion, increased potential for hazardous material to come into contact with the stream bed channel, temporary dewatering, the permanent replacement of a large instream structure, and the inaccessibility to critical habitat within the Old Calaveras River channel.

The long-term beneficial effects from the proposed action would outweigh both the short-term and long-term negative impacts. Overall, the proposed action would: (1) manage flows to benefit the Covered Species present in the action area, and benefit critical habitat for CCV steelhead, especially above Bellota; (2) maintain high quality PBFs in CCV steelhead critical habitat above Bellota; (3) reduce juvenile entrainment, and adult and juvenile stranding throughout the migration corridor of Mormon Slough; (4) substantially increase fish passage accessibility into prime spawning and rearing habitat above Bellota; (5) eliminate the potential for juvenile and adult salmonid mortality within the Old Calaveras River channel; (6) eliminate entrainment of juvenile salmonids through the Bellota Diversion Facilities; and (7) produce long-term data sets on the use of the Calaveras River by the Covered Species, particularly by CCV steelhead.

2.7.4. Risk to the CCV Steelhead Designated Critical Habitat, CCV Steelhead DPS and Chinook Salmon ESUs

The proposed project would have minimal adverse impacts to the overall DPS for CCV steelhead, and the ESUs for CV spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, and late fall-run and fall-run Chinook salmon. Short-term impacts to the action area would occur during construction activities, but would occur when the Covered Species are least likely to be present in the immediate construction area. The adaptive management process under the CHCP would help to ensure that individual actions and projects would be modified as necessary in order to maximize their success and beneficial impacts towards the Covered Species. Furthermore, conservation and minimization measures would be implemented to minimize adverse impacts to CCV steelhead critical habitat.

The significant beneficial effects from the proposed action would promote the recovery and conservation of the DPS for CCV steelhead in particular. The Recovery Plan identifies the population of CCV steelhead in the Calaveras River as a Core 1 population for the recovery of the Southern Sierra Diversity Group and Mainstem San Joaquin River. As described in this opinion, the proposed action would result in the implementation of several priority one actions outlined in the Recovery Plan, as well as additional actions that would be beneficial towards recovery of CCV steelhead in the Calaveras River basin. The population of CV fall-run Chinook salmon that occurs in the Calaveras River would experience the same benefits from the proposed action as described for CCV steelhead.

There are no established populations of CV spring-run Chinook salmon, Sacramento River winter-run Chinook salmon, or CV late fall-run Chinook salmon in the Calaveras River. Therefore, the proposed action would not put those Chinook salmon ESUs at further risk. If any small numbers or small population of any of these Chinook salmon runs were to establish themselves in the action area during the term of the ITP, then the ESUs would benefit from increased spatial diversity because of the proposed action.

Taking into consideration the minimal adverse impacts and the significant beneficial effects associated with the proposed action, plus the environmental baseline, cumulative effects, and status of the Covered Species and CCV steelhead critical habitat, the proposed project is not expected to: (1) Reduce appreciably the likelihood of both the survival and recovery of the listed or non listed species in the wild by reducing its numbers, reproduction, or distribution; nor (2) appreciably diminish the value of designated CCV steelhead critical habitat for the conservation of the species.

2.8. Conclusion

California Central Valley Steelhead and Critical Habitat

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 Central Valley steelhead or destroy or adversely modify its designated critical habitat.

Sacramento River Winter-Run Chinook Salmon and Central Valley Spring-Run Chinook Salmon

After reviewing and analyzing the current status of the listed species, 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 Sacramento River winter-run Chinook salmon and Central Valley spring-run Chinook salmon. No critical habitat has been designated or proposed for these species, however, if critical habitat is designated in the action area in the future, the proposed action is not likely to destroy or adversely modify designated critical habitat.

Central Valley Fall-Run and Late Fall-Run Chinook Salmon ESUs

After reviewing and analyzing the current status of the currently non-listed species, the environmental baseline, the effects of the proposed action, the effects of other activities caused by the proposed action, and cumulative effects, if the ESUs were to be listed during the ITP period, it is NMFS' biological opinion that the proposed action is not likely to jeopardize the continued existence of Central Valley fall-run Chinook salmon and late fall-run Chinook salmon. No critical habitat has been designated or proposed for these species, however, if critical habitat is designated in the action area in the future, the proposed action is not likely to destroy or adversely modify 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). "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.

Fall-run and late fall-run Chinook salmon are included as a Covered Species in the CHCP and in this opinion, but neither are currently proposed for listing nor are currently listed. As such, there are no take prohibitions under the ESA for these salmon runs at the time of writing this biological opinion. The Incidental Take Statement and ITP shall become effective for fall-run and late fall-run Chinook salmon if and when they become listed under the ESA during the terms of this opinion and the ITP.

For any U.S. Army Corps of Engineers (USACE) permits required for construction components under the proposed action, and to the extent this opinion satisfies the level of detail needed to analyze the associated effects, this biological opinion could satisfy the requirements for the USACE to consult with NMFS under section 7 of the ESA.

2.9.1. Amount or Extent of Take

Under the proposed action, the only activity that would result in direct take of the Covered Species is the Fisheries Monitoring Program. All other activities would result in incidental take of the Covered Species. The CHCP also includes an adaptive management process that would be utilized to reduce the amount of take over the permit duration.

2.9.1.1. Incidental Take Associated with Flow Management, Passage Barriers, and Entrainment

In the biological opinion, NMFS determined that incidental take is reasonably certain to occur as follows: take, in the form of harm or death as a result of flow management, passage barriers, and entrainment. Uncertainties associated with the amount or extent of incidental take include:

(1) annual variations in abundance and migration timing of adult and juvenile salmon and steelhead; and individual habitat use in areas where impacts may occur;

(2) proportion of migration delay or blockage that can be attributed to factors outside the SEWD’s control, including passage problems associated with privately owned diversion facilities, or due to flood control operations; and

(3) amount of natural migration delay or blockage that would occur under a natural hydrologic regime (i.e., from precipitation events).

Flows and Passage Barriers

Surveys conducted from 2001 to 2012 indicate the potential number of adult and juvenile salmonids delayed or stranded downstream of Bellota due to flow fluctuations in the fall, winter, and spring. Between 2001 and 2012, the FFC conducted periodic passage surveys and observed some juvenile and adult salmonids within Mormon Slough and the Old Calaveras River. In addition, the FFC operated fyke nets in the Old Calaveras and Mormon Slough during the first three weeks of May 2003 and in Mormon Slough during February 2007, and conducted one electrofishing survey with CDFW downstream of Bellota in early July during 2003. For passage surveys, the location and timing of adult observations indicates that adults may be falsely attracted into the river by localized runoff from storm drains in the lower Mormon Slough/SDC area. Storm runoff can occur in this lower area even when there are no corresponding freshets and/or flood control releases in the river upstream of the point of discharge. This localized runoff likely occurs due to short rain events near Stockton where impervious surfaces concentrate precipitation into storm drains emptying into the lower channel. With no natural flow connection from the upper river, migration is blocked.

Using these survey results, incidental take was estimated assuming that *O. mykiss* juveniles observed in fall/winter were Age 1+ and in spring were fry. The extent of incidental take was identified as the maximum number of individuals observed in a given year during the course of these surveys. Therefore, up to approximately 81 Age 1+, 137 YOY, and 21 adult *O. mykiss*; and 210 juvenile and 464 adult fall-run Chinook could be incidentally taken through non-flood control operations by SEWD (refer to Table 7 in this opinion for incidental take summary).

Entrainment into the Old Calaveras River Channel

No direct entrainment studies have been conducted at the Old Calaveras Headworks Facilities; therefore, information regarding the potential number of fry-sized salmonids that may encounter the facility and their migration timing has been derived from Shelton Road RST data. Since 2002, *O. mykiss* YOY have annually been observed moving past Shelton Road primarily in April and May (SEWD and FishBio 2019, Table 14). Fall-run Chinook juveniles have only been observed in eight of 14 years since 2002 with very few in four years (i.e., one in 2008, six in 2002, 11 in 2014, and 21 in 2015) and between 449 and 5,943 in the remaining four years; in these latter four years, most juveniles were observed migrating between February and June (SEWD and FishBio 2019, Table 15). It is unknown whether some or all the fry-sized fish observed at Shelton Road actively migrate downstream towards the ocean or estuary and would be exposed to the Headworks Facility, or whether they just redistribute to additional rearing areas upstream of Bellota.

Based on these assumptions, it is estimated that up to 25% of juveniles reaching the vicinity of Bellota will migrate within the zone of potential influence of the Headworks Facility since it is located off-channel. Juveniles estimated to migrate within the zone of potential influence are estimated to be entrained at a rate directly proportional to the percent of flow diverted through the Headworks Facility. Therefore, up to approximately 218 YOY *O. mykiss* and 1,217 fall-run Chinook fry could encounter the Headworks Facility annually and potentially be entrained into the Old Calaveras River (SEWD and FishBio 2019, Table 18).

At the mouth of the Old Calaveras River channel, although all salmonids greater than 60 mm (i.e., juvenile fall-run Chinook migrating April-July and Age 1+ *O. mykiss*) should be prevented from entering the Old Calaveras River by the barrier net, some may pass through if the net is damaged or pushed out of position by debris or other factors. For this reason, incidental take estimates for salmonids greater than 60 mm were calculated by the method described above for YOY as though the net barrier was not in place. Therefore, up to 169 Age 1+ *O. mykiss* and up to 1,220 fall-run Chinook parr/smolt could encounter the Headworks Facility annually and likely entrained into the Old Calaveras River (SEWD and FishBio 2019, Table 18).

The total estimated number of *O. mykiss* juveniles is 387 (218 YOY + 169 Age 1+) and fall-run Chinook juveniles is 2,437 (1,217 fry + 1,220 parr/smolt; refer to Table 7 in this opinion for incidental take summary, and SEWD and FishBio 2019, Table 18).

Entrainment and Passage at Bellota Diversion Facilities

Since early 2006, temporary fish screens at the Bellota Diversion Facility have prevented parr/smolts (≥60 mm according to NMFS screening criteria) from being entrained. However, until a permanent screen is installed, entrainment of fry-sized *O. mykiss* or salmon may occur at the Bellota Diversion Facility whenever the facility is operating and these fish are near the diversion. No entrainment studies have been conducted at the facility; therefore, information regarding the potential number of fish that may encounter the facility and their migration timing has been derived from Shelton Road RST data as described for the Headworks Facility.

It is estimated that up to 25% of fry reaching the vicinity of Bellota will migrate within the zone of potential influence of the Bellota Diversion. Juveniles estimated to migrate within the zone of potential influence are estimated to be entrained at a rate directly proportional to the percent of flow diverted through the screens of the Bellota Diversion. Therefore, up to approximately 251 YOY *O. mykiss* and 3,650 Chinook juveniles <60 mm could encounter the Bellota Diversion Facility and potentially be entrained into the Bellota Intake in most years (SEWD and FishBio 2019, Table 18). The majority of incidental take for the juvenile lifestages of the Covered Species is estimated to be from entrainment through the Headworks Facility and/or the Bellota Diversion Facilities. After implementation of the proposed conservation strategies to eliminate entrainment through these facilities, the estimated take is anticipated to be reduced to zero.

In critical water years, flashboard dams without passage notches may be installed as early as February and concurrently downstream passage past Bellota would be prevented to reduce potential impacts to juveniles greater than 60 mm (i.e., juvenile Chinook migrating April-July and Age 1+ *O. mykiss* February-July), resulting in increased exposure of YOY *O. mykiss* and Chinook juvenile migrants to the Bellota Diversion Facility. Under this critical water year scenario, up to approximately 500 YOY *O. mykiss* and 7,300 Chinook juveniles <60 mm could encounter the Bellota Diversion Facility and likely entrained (refer Table 7 in this opinion for incidental take summary, and SEWD and FishBio 2019, Table 18).

Spring-run, Winter-run, and Late Fall-run Chinook salmon

The presence of adult and juvenile spring-run, winter-run, and late fall-run Chinook salmon within the action area is estimated to be low to none. Therefore, up to one adult and four juvenile winter-run Chinook salmon, and four adult and 16 juveniles could be incidentally taken for spring- run and late-fall run per water year from flows, passage barriers, and entrainment effects under the proposed action.

Table 7. Summary of incidental take for the Covered Species from flow management, passage barriers, and entrainment under the proposed action per year, except as noted by an asterisk where take for entrainment will be reduced after implementation of conservation strategies.

Covered Species	Lifestage	Total Incidental Take in All Other Water Year Types	Total Incidental Take in Critical Water Year Types
CCV Steelhead	Adult	21	21
CCV Steelhead	Age 1+	250*	250*
CCV Steelhead	Juvenile (YOY)	606*	1,212*
Spring-run Chinook	Adult	4	4
Spring-run Chinook	Juvenile	16*	16*
Winter-run Chinook	Adult	1	1
Winter-run Chinook	Juvenile	4*	4*
Fall-run Chinook	Adult	464	464
Fall-run Chinook	Juvenile	6,297*	12,594*
Late Fall-run Chinook	Adult	4	4
Late Fall-run Chinook	Juvenile	16*	16*

*The majority of incidental take for these lifestages is estimated to be from entrainment through the Headworks Facility and/or the Bellota Diversion Facilities. After implementation of the proposed conservation strategies to eliminate entrainment through these facilities, which will be by year 10 of the ITP, the estimated take is anticipated to be reduced to zero.

2.9.1.2. Incidental Take Associated with Maintenance and Construction Activities

NMFS cannot, using the best available information, quantify and track the amount or number of individuals that are expected to be incidentally taken per species because of the variability and uncertainty associated with the population sizes of the species, annual variation in the timing of migration, and variability regarding individual habitat use of the action area. However, it is possible to express the extent of incidental take in terms of ecological surrogates for those elements of the proposed action that are expected to result in incidental take.

These ecological surrogates are measureable, and can be used to monitor the ecological surrogates to determine whether the level of anticipated incidental take described in this incidental take statement is exceeded.

In summary, the best available ecological surrogates for the amount and extent of incidental take for the proposed action is as follows:

Pile Driving **–** The ecological surrogate to describe the extent of incidental take in the form of harm associated with piling driving, is 150dB RMS behavioral threshold exceeded no more than 2,154 meters from the pile, 187 dB cumulative SEL threshold exceeded no more than 1597 meters from the pile, and peak 206 dB threshold exceeded no more than 18 meters from the pile.

All fish passing through or otherwise present during construction activities will be exposed to construction noise. Only the level of acoustic noise generated during the construction phases can be accurately and consistently measured, thus providing a quantifiable metric for determining incidental take of Covered Species. Therefore, the measurement of acoustic noise generated during the construction phase will serve as physically measurable surrogates for the incidental take of the Covered Species.

Incidental take in the form of harm is expected to result in fish displacement, behavior modification, stress, injury, and death. Elevated noise disturbance is also expected to elevate fish stress levels even when no observable behavior changes are made, and are expected to decrease individual's overall fitness and survival through compounding sub-lethal effects.

Vibratory pile driving is expected to produce underwater pressure levels over 150 dBRMS out to 2,154 meters from the location of the pile driving sites. Though underwater sound levels are not expected to injure or kill fish directly, since the sounds will be above the effective quiet threshold, they are expected to cause disruption of normal habitat utilization, stress, and elicit temporary behavioral effects in any Covered Species that are present. Any behavioral alterations in juvenile fish are expected to decrease their fitness and ultimate survival by decreasing feeding opportunities, which will decrease their growth and by causing area avoidance that will delay their downstream migration and increase their predation risk. Beyond 2,154 meters, underwater sound is expected to attenuate down to effective quiet underwater sound levels, or 150 dB RMS or less, and therefore 2,154 meters from the pile being driven is considered the limit of this ecological surrogate. The behavioral surrogate will be limited in general to 2,154 meters from the boundary of the construction footprint and any cofferdam placement, and exceeding 150 dB RMS beyond 2,154 meters from the construction site boundary will be considered exceeding expected incidental take levels for this surrogate.

Impact pile driving is also expected to produce underwater pressure waves that are expected to injure or kill any Covered Species within 18 meters of the pile being driven. The largest size of pile that is estimated to produce a maximum of 210 dB peak sound. Risk to fishes will be present as long as impact pile driving is occurring. Beyond 18 meters, cumulative SELs are expected to injure fish that remain in the area during in-water pile driving activities. Injuries to fish are expected to occur out to 1,597 meters from the driven pile. Beyond these distance thresholds, underwater pressure waves are expected to decrease below lethal and sub-lethal levels.

Construction-related turbidity – The ecological surrogate for incidental take in the form of harm is measurements of turbidity increases (in NTU) less than 50 NTUs higher than NTU background levels measured upstream of the project, within 1000-feet.

Incidental take in the form of harm is expected to result in fish disturbance and sub-lethal effects associated with elevated in-river turbidity plumes is an increase in downstream in-river turbidity generated by construction and maintenance activities. Additionally, harm will result through elevated stress levels and disruption of normal habitat use. These temporary responses are linked to decreased growth, survivorship, and overall reduced fitness as described for underwater noise avoidance.

The ecological take surrogate for turbidity is based on salmonids sensitivity to raised turbidity levels. Fifty NTUs is above the range at which salmonids experience reduced growth rates, but below the range salmonids would only be expected to actively avoid the area. Therefore, the ecological surrogate for turbidity increase no more than 50 NTUs higher than NTU background levels measured upstream of the construction or maintenance site. Turbidity would be measured immediately downstream of the boundary established for the construction or maintenance site. Within the already established 1000-foot disturbance surrogate, turbidity should be no more than 50 NTUs above the turbidity measurements in upstream measurements. Since in-river values can change daily, the upstream and downstream turbidity measurements must be taken daily in order to compare them. Exceeding 50 NTUs within 1000 feet will be considered as exceeding the expected incidental take levels.

Capture of juvenile fish during in-water work area isolation -

NMFS expects that during dewatering activities of a cofferdam, there is a possibility that fish can become entrained behind the cofferdam and fish handling and relocation would be required. Dewatering of this enclosed area is expected to result in take in the form of harm, injury or death to stranded fish, as well as to handling of captured and relocated fish. Because of the variability and uncertainty associated with the population sizes of the species, annual variation in the timing of migration, and variability regarding individual habitat use of the action area, the actual number of individuals that are expected to be incidentally taken per species is not known, though expected to be low during construction of the cofferdam. However, it is possible to estimate the extent of incidental take in terms of an ecological surrogate, based on the size of the cofferdam area and fixed wall. During fish capture/handling/relocation process, total immediate mortality is expected to be equal to or less than 3% of the total number of all relocated fishes. If this overall mortality level or size of the cofferdam is exceeded, the proposed action will be considered to have exceeded anticipated take levels.

2.9.1.3. Take Associated with Monitoring Activities

CCV Steelhead, Spring-run, and Fall-run Chinook salmon

Take will occur during trapping and handling, and incidental mortality is expected to be less than 5% of fish captured and released. Take estimates, which are summarized in Tables 8 - 11, are based on the most recent 4(d) permit (i.e., 2020) for anadromous fish monitoring in the Calaveras River, that were issued to SEWD's fishery biologist consultants, FishBio (refer to 4(d) permit file number 23212; Tables 8 - 11). Total estimated take for fall-run Chinook salmon is based on past RST studies and past spawning and redd surveys upstream of Bellota.

No intentional lethal take will occur, but incidental mortality may result from capture, handling, or marking fish. Based on previous experience capturing and photonically marking juvenile fall-run Chinook salmon in the Stanislaus River and capturing juvenile *O. mykiss* in the Calaveras River (SEWD and FishBio 2019), low incidental mortality is expected as a result of capturing and marking fish (i.e., < 5%). PIT tagging is not expected to result in any additional incidental mortality since mortality rates reported by researchers that conduct PIT tag procedures (Bunnell and Isely 1999; Dare 2003; Gries and Letcher 2002; Zydlewski et al. 2003) are similar to experiences by SEWD fishery biologists with photonic marking and PIT tagging (i.e., less than 5%).

If incidental mortality does occur, SEWD's fishery biologist will contact NMFS and CDFW immediately and will coordinate with CDFW for turning carcass(es) over. Since sampling will not be conducted continuously (i.e., generally 3-5 days per week) and not all fish passing the trap during sampling will be captured, the number of fish potentially captured and tagged likely represents a small proportion of the actual population and may vary annually.

Winter-run, and Late Fall-run Chinook salmon

The presence of adult and juvenile winter-run, and late fall-run Chinook salmon within the action area is estimated to be low to none. Estimates of take are based on information provided in the CHCP (SEWD and FishBio 2019) and in the 2020 4(d) permit (refer to Tables 8 – 11).

Table 8. Take for rotary screw trapping in the Calaveras River basin (trap located near Shelton Road at approximately river mile 28) under the Fisheries Monitoring Program for each year during the 50-year ITP.

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
1	California Central Valley steelhead	Natural	Adult	Male and Female	1	0	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tag, PIT; Tissue Sample Scale	
2	California Central Valley steelhead	Listed Hatchery Adipose Clip	Adult	Male and Female	1	0	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tag, PIT; Tissue Sample Scale	
3	California Central Valley steelhead	Natural	Juvenile	Male and Female	425	9	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Dye Injection (tattoo, photonic)	Marked for Efficiency Trials
4	California Central Valley steelhead	Natural	Juvenile	Male and Female	1,520	30	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tag, PIT; Tissue Sample Scale	
5	California Central Valley steelhead	Natural	Juvenile	Male and Female	400	8	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tissue Sample Scale	
6	Central Valley spring-run Chinook salmon	Natural	Juvenile	Male and Female	40	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tissue Sample Scale	

[2] Authorized Indirect Mortality is a part of the Authorized Take.

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
7	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Juvenile	Male and Female	40	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tissue Sample Scale	
8	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	6,000	600	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tag, PIT; Tissue Sample Scale	
9	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	1,000	100	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Dye Injection (tattoo, photonic)	Marked for Efficiency Trials
10	Central Valley late fall-run Chinook salmon	Natural	Juvenile	Male and Female	40	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tissue Sample Scale	
11	Sacramento River winter-run Chinook salmon	Natural	Juvenile	Male and Female	16	0	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Trap, Screw	Anesthetize; Tissue Sample Scale	

Table 9. Take for carcass surveys in the Calaveras River basin (in reaches between the Stockton Diverting Canal and New Hogan Dam within Mormon Slough only) under the Fisheries Monitoring Program for each year during the 50-year ITP.

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Take Action	Observe/Collect Method	Procedures
1	Central Valley spring-run Chinook salmon	Natural	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
2	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
3	California Central Valley steelhead	Natural	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
4	California Central Valley steelhead	Listed Hatchery Adipose Clip	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
5	Central Valley fall-run Chinook salmon	Natural	Spawned Adult/ Carcass	Male and Female	200	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
6	Central Valley fall-run Chinook salmon	Listed Hatchery Adipose Clip	Spawned Adult/ Carcass	Male and Female	200	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
7	Central Valley late fall-run Chinook salmon	Natural	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Take Action	Observe/Collect Method	Procedures
8	Central Valley late fall-run Chinook salmon	Listed Hatchery Adipose Clip	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
9	Sacramento River winter-run Chinook salmon	Natural	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale
10	Sacramento River winter-run Chinook salmon	Listed Hatchery Adipose Clip	Spawned Adult/ Carcass	Male and Female	20	Observe/ Sample Tissue Dead Animal	Fish or a stream survey (where fish information is collected)	Tissue Sample Fin or Opercle; Tissue Sample Otolith; Tissue Sample Scale

Table 10. Take for observational methods in the Calaveras River Basin under the Fisheries Monitoring Program for each year during the 50-year ITP. The proposed monitoring would occur in the Calaveras River (HUC 18040004) at multiple locations between RM 42 (New Hogan Dam) and the confluence with the San Joaquin River.

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method
1	Central Valley spring-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Fish or a stream survey (where fish information is collected)
2	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Fish or a stream survey (where fish information is collected)
3	California Central Valley steelhead	Natural	Adult	Male and Female	5	0	Observe/ Harass	Fish or a stream survey (where fish information is collected)
4	California Central Valley steelhead	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Fish or a stream survey (where fish information is collected)
5	Central Valley spring-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
6	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
7	Central Valley spring-run Chinook salmon	Natural	Juvenile	Male and Female	20	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
8	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Juvenile	Male and Female	20	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method
9	California Central Valley steelhead	Natural	Adult	Male and Female	10	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
10	California Central Valley steelhead	Listed Hatchery Adipose Clip	Adult	Male and Female	10	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
11	California Central Valley steelhead	Natural	Juvenile	Male and Female	50	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
12	Central Valley spring-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Snorkel/ Dive surveys
13	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Snorkel/ Dive surveys
14	Central Valley spring-run Chinook salmon	Natural	Juvenile	Male and Female	40	0	Observe/ Harass	Snorkel/ Dive surveys
15	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Juvenile	Male and Female	40	0	Observe/ Harass	Snorkel/ Dive surveys
16	California Central Valley steelhead	Natural	Adult	Male and Female	300	0	Observe/ Harass	Snorkel/ Dive surveys
17	California Central Valley steelhead	Listed Hatchery Adipose Clip	Adult	Male and Female	100	0	Observe/ Harass	Snorkel/ Dive surveys

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method
18	California Central Valley steelhead	Natural	Juvenile	Male and Female	2,500	0	Observe/ Harass	Snorkel/ Dive surveys
19	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	6,000	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
20	Central Valley fall-run Chinook salmon	Natural	Adult	Male and Female	200	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
21	Central Valley fall-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	200	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
22	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	6,000	0	Observe/ Harass	Snorkel/ Dive surveys
23	Central Valley fall-run Chinook salmon	Natural	Adult	Male and Female	200	0	Observe/ Harass	Snorkel/ Dive surveys
24	Central Valley fall-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	200	0	Observe/ Harass	Snorkel/ Dive surveys
25	Central Valley late fall-run Chinook salmon	Natural	Juvenile	Male and Female	50	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
26	Central Valley late fall-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
27	Central Valley late fall-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
28	Central Valley late fall-run Chinook salmon	Natural	Juvenile	Male and Female	50	0	Observe/ Harass	Snorkel/ Dive surveys
29	Central Valley late fall-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Snorkel/ Dive surveys

Row Number	Species	Production/ Origin	Lifestage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method
30	Central Valley late fall-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Snorkel/ Dive surveys
31	Sacramento River winter-run Chinook salmon	Natural	Juvenile	Male and Female	16	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
32	Sacramento River winter-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
33	Sacramento River winter-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Observations at weirs, fish ladders, dams where no trapping occurs
34	Sacramento River winter-run Chinook salmon	Natural	Juvenile	Male and Female	16	0	Observe/ Harass	Snorkel/ Dive surveys
35	Sacramento River winter-run Chinook salmon	Natural	Adult	Male and Female	5	0	Observe/ Harass	Snorkel/ Dive surveys
36	Sacramento River winter-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	5	0	Observe/ Harass	Snorkel/ Dive surveys

Table 11. Take for other methods that may be utilized depending on data needs under the Fisheries Monitoring Program for each year during the 50-year ITP. The proposed monitoring methods would occur in the Calaveras River (HUC 18040004) at multiple locations between RM 42 (New Hogan Dam) and the confluence with the San Joaquin River. PIT tag antennas may be deployed at RM 25. Note: Electrofishing will not be conducted in spawning areas.

Row Number	Species	Production/ Origin	Life-stage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
1	Central Valley spring-run Chinook salmon	Natural	Juvenile	Male and Female	40	1	Capture/ Handle/ Release Fish	Electrofishing, Backpack	Anesthetize	Backpack Electrofishing: January-May; up to bi-weekly; June-October; up to monthly
2	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Juvenile	Male and Female	40	1	Capture/ Handle/ Release Fish	Electrofishing, Backpack	Anesthetize	Backpack Electrofishing: January-May; up to bi-weekly; June-October; up to monthly
3	California Central Valley steelhead	Natural	Juvenile	Male and Female	500	10	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Electrofishing, Backpack	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Backpack Electrofishing: January-May; up to bi-weekly; June-October; up to monthly
4	Central Valley spring-run Chinook salmon	Natural	Adult	Male and Female	5	1	Capture/ Handle/ Release Fish	Seine, Beach		Seining: December-May; up to bi-weekly; June-November
5	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	3	1	Capture/ Handle/ Release Fish	Seine, Beach		Seining: December-May; up to bi-weekly; June-November

Row Number	Species	Production/ Origin	Life-stage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
6	Central Valley spring-run Chinook salmon	Natural	Juvenile	Male and Female	40	1	Capture/ Handle/ Release Fish	Seine, Beach	Anesthetize	Seining: December-May; up to bi-weekly; June-November
7	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Juvenile	Male and Female	40	1	Capture/ Handle/ Release Fish	Seine, Beach	Anesthetize	Seining: December-May; up to bi-weekly; June-November
8	California Central Valley steelhead	Natural	Adult	Male and Female	50	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Seining: December-May; up to bi-weekly; June-November
9	California Central Valley steelhead	Listed Hatchery Adipose Clip	Adult	Male and Female	10	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Seining: December-May; up to bi-weekly; June-November
10	California Central Valley steelhead	Natural	Juvenile	Male and Female	500	10	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Seine, Beach	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Seining: December-May; up to bi-weekly; June-November

Row Number	Species	Production/ Origin	Life-stage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
11	Central Valley spring-run Chinook salmon	Natural	Adult	Male and Female	5	1	Capture/ Handle/ Release Fish	Hook and line/ angler/ rod and reel		
12	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	3	1	Capture/ Handle/ Release Fish	Hook and line/ angler/ rod and reel		
13	California Central Valley steelhead	Natural	Adult	Male and Female	50	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Hook and line/ angler/ rod and reel	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	
14	California Central Valley steelhead	Listed Hatchery Adipose Clip	Adult	Male and Female	10	1	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Hook and line/ angler/ rod and reel	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	
15	California Central Valley steelhead	Natural	Juvenile	Male and Female	500	10	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Hook and line/ angler/ rod and reel	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	

Row Number	Species	Production/ Origin	Life-stage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
16	Central Valley spring-run Chinook salmon	Natural	Juvenile	Male and Female	40	1	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize	
17	Central Valley spring-run Chinook salmon	Listed Hatchery Adipose Clip	Juvenile	Male and Female	40	1	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize	
18	California Central Valley steelhead	Natural	Adult	Male and Female	25	1	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	
19	California Central Valley steelhead	Natural	Juvenile	Male and Female	250	5	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	
20	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	500	10	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Electrofishing, Backpack	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Backpack Electrofishing: January-May; up to bi-weekly; June-October; up to monthly
21	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	500	10	Capture/ Handle/ Release Fish	Seine, Beach	Anesthetize	Seining: December-May; up to bi-weekly; June-November

Row Number	Species	Production/ Origin	Life-stage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
22	Central Valley fall-run Chinook salmon	Natural	Juvenile	Male and Female	500	10	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	
23	Central Valley fall-run Chinook salmon	Natural	Adult	Male and Female	50	1	Capture/ Handle/ Release Fish	Hook and line/ angler/ rod and reel		
24	Central Valley fall-run Chinook salmon	Listed Hatchery Adipose Clip	Adult	Male and Female	50	1	Capture/ Handle/ Release Fish	Hook and line/ angler/ rod and reel		
25	Central Valley late fall-run Chinook salmon	Natural	Juvenile	Male and Female	50	10	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Electrofishing, Backpack	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Backpack Electrofishing: January-May; up to bi-weekly; June-October; up to monthly
26	Central Valley late fall-run Chinook salmon	Natural	Juvenile	Male and Female	50	10	Capture/ Handle/ Release Fish	Seine, Beach	Anesthetize	Seining: December-May; up to bi-weekly; June-November
27	Central Valley late fall-run Chinook salmon	Natural	Juvenile	Male and Female	50	10	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	

Row Number	Species	Production/ Origin	Life-stage	Sex	Authorized Take	Authorized Indirect Mortality[2]	Take Action	Observe/ Collect Method	Procedures	Details
28	Sacramento River winter-run Chinook salmon	Natural	Juvenile	Male and Female	16	0	Capture/ Mark, Tag, Sample Tissue/ Release Live Animal	Electrofishing, Backpack	Anesthetize; Tag, PIT; Tissue Sample Fin or Opercle; Tissue Sample Scale	Backpack Electrofishing: January-May; up to bi-weekly; June-October; up to monthly
29	Sacramento River winter-run Chinook salmon	Natural	Juvenile	Male and Female	16	0	Capture/ Handle/ Release Fish	Seine, Beach	Anesthetize	Seining: December-May; up to bi-weekly; June-November
30	Sacramento River winter-run Chinook salmon	Natural	Juvenile	Male and Female	16	0	Capture/ Handle/ Release Fish	Net, Fyke	Anesthetize; Tissue Sample Fin or Opercle; Tissue Sample Scale	

2.9.2. Effect of the Take

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

2.9.3. Reasonable and Prudent Measures

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

1) Measures shall be taken by Stockton East Water District to implement the conservation strategies and biological objectives, including the adaptive management process, described in the Calaveras Habitat Conservation Plan, in coordination with NMFS.

2) Measures shall be taken by Stockton East Water District to minimize sediment events and turbidity plumes in the action area and related short-term and long-term effects, as discussed in this biological opinion.

3) Measures shall be taken by Stockton East Water District to reduce underwater sound impacts and other disturbances related to pile driving, as discussed in this biological opinion.

4) Measures shall be taken by Stockton East Water District to reduce mortality of the Covered Species requiring capture/relocation in association with the Fisheries Monitoring Program described in the Calaveras Habitat Conservation plan and in this opinion, for any dewatering or fish rescue activities.

5) Measures shall be taken by Stockton East Water District to reduce the extent of degradation and alteration to the habitats in the action area as a result of construction and maintenance activities, as discussed in this biological opinion.

6) Measures shall be taken by Stockton East Water District to minimize impacts to existing vegetation.

7) Measures shall be taken by Stockton East Water District to prepare and provide NMFS with a plan and a report describing how the Covered Species in the action area would be protected and/or monitored and to document the observed effects of the action on the Covered Species and critical habitat of CCV steelhead.

2.9.4. Terms and Conditions

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

1) The following terms and conditions implement reasonable and prudent measure 1:

a) Stockton East Water District shall implement all the conservation strategies, and associated compliance and effectiveness monitoring for each conservation strategy, as described in the Calaveras Habitat Conservation Plan, in coordination with NMFS.

b) Stockton East Water District shall implement the Adaptive Management Strategy as described in the HCP to inform success of the conservation strategies at meeting the biological goals and objectives, in coordination with NMFS.

c) Stockton East Water District shall coordinate with NMFS during all phases of fish passage and screen design development associated with the conservation strategies in the HCP, to ensure that conservation measures are incorporated and ecological benefits are maximized, to the extent practicable or feasible.

2) The following terms and conditions implement reasonable and prudent measure 2:

a) A qualified biologist shall use a held-hand turbidity monitor to conduct water quality monitoring during all in-water activities to ensure the turbidity control measures are functioning as intended. If an in-river turbidity plume is created and conditions within the plume exceed take limits (50 NTUs above ambient) for Covered Species, Stockton East Water District, or its consultant, shall coordinate with NMFS within 24 hours after an event that exceeds the given water turbidity surrogate, to discuss ways to reduce turbidity back down to acceptable levels.

b) Stockton East Water District shall notify and coordinate with NMFS if a work-window variance from CDFW is requested pursuant to the Routine Maintenance Agreement.

3) The following terms and conditions implement reasonable and prudent measure 3:

a) During the in-water work window of July 15 – October 15, when water temperatures are below 75°F, the daily work schedule shall be limited to between one hour after sunrise to one hour before sunset, to avoid peak fish migration times and to allow for cumulative Sound Exposure Level (SEL) impacts to reset daily.

b) When local water temperatures are below 75°F, the number of impact strikes per day shall be limited to 1,000 to reduce potential injuries to the Covered Species through cumulative SEL.

c) Piles shall be driven into place using a vibratory hammer first, and effort shall be made to gradually build up to the maximum impact force, to give fish in the area opportunity to vacate under normal swimming effort and avoid injury or death. Impact pile driving shall only be utilized after vibratory hammering was initially applied, and greater force or load testing is required for the particular pile.

d) When local water temperatures are below 75°F, attenuation measures shall be used during impact pile driving to control and dampen underwater pressure wave propagation. Effective attenuation measures include:

(i) Pile driving within a dewatered cofferdam or caisson.

(ii) Use of a bubble curtain.

(iii)Use of a cushion block.

e) Underwater sound monitoring shall be conducted during impact pile driving when water temperatures are below 75°F, to ensure incidental take limits are not exceeded according to the ecological surrogates assigned.

(i) No more than 150 dB RMS beyond 2,154 meters from the boundary of the construction footprint/cofferdam placement.

(ii) No more than 187 dB SEL cumulative beyond 1,597 meters from the construction site boundary per day.

(iii) No more than 206 dB peak beyond an 18-meter radius from each pile driven with an impact hammer.

f) NMFS shall be notified within 24 hours if the ecological surrogate for take threshold is exceeded.

4) The following terms and conditions implement reasonable and prudent measure 4:

a) During dewatering or fish rescue activities, a qualified fish biologist shall be present onsite to make observations, and capture/relocate fish if they become entrapped in the dewatered area.

b) Only fish biologists trained in salmonid capture and relocation shall remove and relocate fish during dewatering activities.

c) A fish relocation plan will be submitted to NMFS for approval prior to commencing activities.

d) NMFS shall be notified within 24 hours if the ecological surrogate for take threshold is exceeded.

5) The following terms and conditions implement reasonable and prudent measure 5:

a) Stockton East Water District shall continue to coordinate with NMFS during all phases of construction, implementation, and monitoring by hosting annual meetings and issuing annual reports throughout the construction period.

b) BMPs shall be implemented to reduce or eliminate the potential for hazardous contaminants to enter the water or stream channel.

c) NMFS shall be notified within 24 hours if the ecological surrogate for take threshold is exceeded.

6) The following terms and conditions implement reasonable and prudent measure 6:

a) Stockton East Water District shall ensure that the planting of native vegetation will occur at a 3:1 ratio as described in any construction implementation plans. All plantings must be provided with the appropriate amount of water to ensure successful establishment.

7) The following terms and conditions implement reasonable and prudent measure 7:

a) Stockton East Water District shall provide a report of project activities to NMFS by December 31 of each year construction takes place.

b) The report shall include a summary description of in-water construction activities, incidental take avoidance and minimization measures taken, and any observed take incidents, including number and species captured and relocated during dewatering.

c) Stockton East Water District shall notify and coordinate with NMFS on all fish passage and screen designs development related activities associated with the HCP.

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).

1) Stockton East Water District should continue supporting and promoting aquatic and riparian habitat restoration within the Calaveras River basin, especially those with listed aquatic species. Practices that avoid or minimize adverse effects to listed species should be encouraged.

2) Stockton East Water District should continue to work cooperatively with other State and Federal agencies, private landowners, governments, and local watershed groups to identify opportunities for cooperative analysis and funding to support salmonid habitat restoration projects.

3) Stockton East Water District should, to the best of their ability, implement high priority actions in the NMFS Central Valley Salmon and Steelhead Recovery Plan.

To be kept informed of actions minimizing or avoiding adverse effects or benefiting Covered Species or their habitats, NMFS requests notification from SEWD of the implementation of any conservation recommendations.

2.11. Reinitiation of Consultation

This concludes formal consultation for the Issuance of an Incidental Take Permit for the Calaveras Habitat Conservation Plan.

As 50 CFR 402.16 states, reinitiation of consultation is required and shall be requested by the Federal agency or by the Service 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. The MSA (section 3) defines EFH as "those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity." Adverse effect means any impact that reduces quality or quantity of EFH, and may include direct or indirect physical, chemical, or biological alteration of the waters or substrate and loss of (or injury to) benthic organisms, prey species and their habitat, and other ecosystem components, if such modifications reduce the quality or quantity of EFH. Adverse effects on EFH may result from actions occurring within EFH or outside of it and may include site-specific or EFH-wide impacts, including individual, cumulative, or synergistic consequences of actions (50 CFR 600.810). Section 305(b) also requires NMFS to recommend measures that can be taken by the action agency to conserve EFH.

This analysis is based on the EFH assessment determined by NMFS and descriptions of EFH for Pacific Coast salmon (Pacific Fishery Management Council [PFMC] 2014) contained in the fishery management plans developed by the PFMC and approved by the Secretary of Commerce. NMFS' proposed action in this intra-service EFH consultation is the issuance of an ITP by NMFS under Section 10(a)(1)(B) of the Endangered Species Act (ESA) of 1973, as amended, for SEWD's implementation of the CHCP.

3.1. Essential Fish Habitat Affected by the Project

The geographic extent of salmon freshwater EFH is described as all water bodies currently or historically occupied by PFMC managed salmon within the USGS 4th field hydrologic units identified by the fishery management plan (PFMC 2014). This designation includes the Calaveras River below New Hogan Dam (HUCs 18040004 and 18040011) for all runs of Chinook salmon that are managed by the PFMC (fall-run, and late fall-run). The Pacific Coast salmon fishery management plan also identifies Habitat Areas of Particular Concern (HAPCs): complex channel and floodplain habitat, spawning habitat, thermal refugia, estuaries, and submerged aquatic vegetation. The HAPCs for complex channel and floodplain habitat, spawning habitat, and thermal refugia are expected to be either directly or indirectly adversely affected by the proposed action. These HAPCs are currently degraded habitat within the action area due to numerous instream structures for water diversion and flood control, as well as from extensive agricultural land use in the upper portion of the action area, and urbanization in the lower portion of the action area.

3.2. Adverse Effects on Essential Fish Habitat

Effects to the HAPCs for complex channel and floodplain habitat, spawning habitat, and thermal refugia are discussed in the context of effects to CCV steelhead critical habitat PBFs as designated under the ESA and described in section 2.5.2. A list of adverse effects to this EFH HAPC is included in this EFH consultation, which are expected to be similar to the impacts affecting critical habitat, including: habitat degradation and inaccessibility, sediment and turbidity, and in-channel disturbances.

Habitat degradation and inaccessibility:

- Reduced water quality and quantity (flow and temperature) due to the long-term operations and maintenance of SEWD Project facilities
- Permanent lack of access to habitat due to some activities that would be implemented under the CHCP (i.e., permanent barrier at the mouth of the Old Calaveras River channel)
- Habitat degradation from routine and non-routine maintenance activities, such as placement of riprap and loss of riparian vegetation, and stream bank erosion
- Reduced shelter from predators
- Reduction/change in aquatic macroinvertebrate production
- Reduced habitat complexity

Sediment and turbidity:

- Degraded water quality
- Reduction/change in aquatic macroinvertebrate production

In-channel disturbance:

- Channel disturbance and noise pollution from pile driving activity
- Channel disturbance from in-water construction and non-routine maintenance activities
- Temporary de-watering or re-routing of water for construction and non-routine maintenance activities

3.3. Essential Fish Habitat Conservation Recommendations

The following are EFH conservation recommendations for the proposed action:

To address the adverse effects of habitat degradation and inaccessibility:
Implement BO Section 2.9.4 Terms and Condition #1, 5, and 6.

To address the adverse effects of sediment and turbidity:
Implement BO Section 2.9.4 Terms and Condition #2.

To address the adverse effects of in-channel disturbances:
Implement BO Section 2.9.4 Terms and Condition #1, 5 and 6.

Fully implementing these EFH conservation recommendations would protect, by avoiding or minimizing the adverse effects described in section 3.2, above, approximately 20 acres of designated EFH for Pacific Coast salmon.

3.4. Statutory Response Requirement

The EFH recommendations are the same as terms and conditions described in this opinion. Therefore, the statutory response requirement will be met through the reporting requirements as outlined in the terms and conditions of this opinion.

3.5. Supplemental Consultation

NMFS must reinitiate EFH consultation with itself 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 is NMFS. Other interested users could include Stockton East Water District, and U.S. Army Corps of Engineer. Individual copies of this opinion can provided to interested parties. The document will be available within two 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, and reviewed in accordance with West Coast Region ESA quality control and assurance processes.

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