Stockton East Water District

Calaveras River Habitat Conservation Plan

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Executive Summary

Overview

The Calaveras River Habitat Conservation Plan (CHCP) describes operational criteria to support the biological goals of maintaining a viable population of rainbow trout and Central Valley steelhead (*Oncorhynchus mykiss*) within the CHCP boundaries, as well as maintaining adequate habitat condition upstream of Bellota for fall-, late fall-, spring- or winter-run Chinook salmon (*Oncorhynchus tshawytscha*) that may opportunistically migrate into the conservation area. While the CHCP intends to provide conditions that would support Chinook salmon should they migrate into the conservation area, these salmon are not expected to maintain a viable population based both on pre-dam and current conditions. The Calaveras River's ability to support anadromous fish populations (such as steelhead and the various runs of Chinook salmon) is limited by the impoundment and operational criteria of New Hogan Dam and Reservoir, originally constructed in 1930 to ease flooding concerns for the City of Stockton. The CHCP allows Stockton East Water District (SEWD or District) to comply with the Endangered Species Act (ESA), protecting and managing fishery resources and habitat while maintaining reliable water delivery to its constituents.

The District is seeking a 50-year Incidental Take Permit (ITP) for ESA-listed species under the authority of the National Marine Fisheries Service (NMFS). Throughout the multi-year development of the CHCP, the District has worked closely with NMFS and other interested stakeholders as part of the Calaveras River Technical Review Group (including the U.S. Fish and Wildlife Service and California Department of Fish and Wildlife) to develop operational criteria that would help maintain the health of the Calaveras River fisheries resources. Over the term of the ITP, this working relationship is expected to continue with biannual review meetings between interested parties.

Geographic Scope

The Calaveras River is a small, regulated tributary to the San Joaquin River and serves as an important source of surface water for agricultural and municipal uses in Calaveras and San Joaquin counties. SEWD's management of this precious resource on behalf of its constituents over the past forty years has created conditions which support a healthy rainbow trout fishery characterized by relatively high abundance and fish condition factors recorded during the various monitoring efforts conducted by SEWD biologists and by anecdotal accounts from local fishermen.

The plan area boundary is limited to the lower Calaveras River and its adjacent riparian zone between New Hogan Dam and the confluence with the San Joaquin River, as well as the New Hogan Reservoir. The CHCP boundaries encompass those waterways that are potentially accessible to the Covered Species within the District's service area, including:

- 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.

- 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.
- Mosher Slough/Creek from the headwaters at Mosher Creek Dam to its confluence with Pixley Slough/Bear Creek.

Covered Activities

The primary goal of the CHCP is to obtain authorization for the take of ESA-listed species that may be affected by the District's operations and maintenance activities within the boundaries of the defined area. The activities the District is seeking to be covered include:

- The impoundment and non-flood control operations of water from New Hogan Reservoir.
- The operation of the Old Calaveras River Headworks facility.
- The operation of the Bellota Diversion facility.
- The operation of small instream flashboard dams within the District's service area.
- The operation and improvement of privately-owned diversion facilities within the District's service area.
- Channel maintenance operations for instream structures within the District's service area.
- District fisheries monitoring program.

A small amount of annual take has been requested for fish that may incidentally occur and be affected by operations and/or maintenance activities on an annual basis, in addition to a supplementary fisheries monitoring program designed to assess salmonid populations throughout all phases of their life history. All activities will follow best management practices in order to minimize the effect of the activity on ESA-listed species.

Covered Species

As all activities are related to instream and/or water delivery operations, the District is seeking coverage for fish species that occur or may occur, in the case of winter- or spring-run Chinook salmon, or have critical habitat designated within the CHCP boundary.

The California Central Valley (CCV) steelhead distinct population segment (DPS)[1], which includes the Calaveras River, are currently listed as threatened (63 FR 13347; 65 FR 42422; 70 FR 37160) under the federal Endangered Species Act (ESA) by the National Marine Fisheries Service (NMFS). Multiple runs of Chinook salmon (fall-, late fall-, spring-, or winter-run) may opportunistically utilize the Calaveras River over the term of the ITP. The fall-run Chinook salmon is the evolutionarily significant unit (ESU)most frequently reported in the San Joaquin basin and, while not currently listed under the ESA, it is considered a Species of Concern (69 FR 19975) by

[1] The ESA defines a "species" to include any distinct population segment of any species of vertebrate fish or wildlife. For Pacific salmon, NOAA Fisheries Service considers an evolutionarily significant unit, or "ESU," a "species" under the ESA. For Pacific steelhead, NOAA has delineated distinct population segments (DPSs) for consideration as "species" under the ESA.

NMFS and a Species of Special Concern by the California Department of Fish and Wildlife (CDFW).

While the importance of the Calaveras River for steelhead production is currently unknown, the Calaveras River is classified as a Core 1 watershed, which means it has the potential to support a viable steelhead population. However, its utility as a salmon-supporting stream is highly limited. The District recognizes the potential problems for salmonids caused by its operations within the Mormon Slough flood control channel, Old Calaveras River channel, and its facilities. While the CHCP intends to provide conditions (improved fish passage, reduced entrainment, minimum instream flow, etc.) that would support Chinook salmon should they migrate into the project area, these salmon are not expected to maintain a viable population based both on pre-dam and current conditions.

Conservation Strategies

In general, conservation strategies have been designed to support the biological goals of the CHCP, which are to:

- maintain a viable population of *O. mykiss* within the conservation area
- 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.

These biological goals are divided into specific biological objectives that identify the various conservation measures needed to achieve the biological goals. Five biological objectives have been identified (i.e., Flow, Fish Passage, Avoid/Minimize Fish Entrainment, Water Quality, and Avoid/Minimize Direct Fish Injury/Mortality) and each includes metrics, referred to as targets, to track progress toward achieving the particular objective and goals.

The District has developed a series of best management practices regarding the described operations and maintenance activities in order to best achieve the stated biological goals and meet the specified targets identified in the biological objectives.

Adaptive Management and Monitoring

The CHCP's Adaptive Management Plan (AMP) provides guidance regarding the manner in which the monitoring information collected by the District, as well as information collected by others (e.g., USFWS and CDFW), will be used to continually evaluate and, if necessary, modify the CHCP implementation and long-term management of environmental resources. Collecting and analyzing data through monitoring and research are essential components of the AMP. Conservation strategies are expected to effectively achieve the plan's biological goals, objectives, and associated targets since they were designed based on the best scientific information currently available. If effectiveness monitoring indicates that the desired results of the conservation strategies are not being achieved, or if other information needs to be incorporated into the CHCP, then adjustments in the conservation and mitigation strategies can be made to account for changing conditions and new scientific information. The District has committed to participating in biannual meetings in order to review data obtained and implement adaptive management activities, if needed.

Since 2001, SEWD has voluntarily implemented several temporary and permanent fish passage improvements while developing the CHCP. In order to determine which structures caused the greatest impairment to salmonid migrations, SEWD worked collaboratively with the California Department of Water Resources (DWR) (2007) to assess which barriers pose the greatest impairment to fish passage, and work completed to date has been prioritized as a result of this assessment. These actions include: placing sandbags at road crossings to provide better depths and velocities for fish passage at these structures; installing a temporary Denil fish ladder to improve upstream fish access at the Bellota Weir; installing a temporary barrier (i.e., net) at the head of the Old Calaveras River channel to prevent juvenile entrainment and stranding issues; replacing a two-foot high temporary dam on the downstream side of the Bellota Weir apron with a permanent two-foot high rock dam to create a deeper pool on the weir apron to allow fish to more effectively pass upstream; installing and operating temporary fish screens at the Bellota Diversion Facility to reduce juvenile entrainment; and implementing permanent structural improvements at Budiselich Flashboard Dam and Caprini Low Flow Crossing to increase passage opportunities over a wider range of flows, with additional structural improvements currently in development.

During this time, SEWD has also funded salmonid monitoring programs to collect data regarding juvenile and adult migrations and abundance. Juvenile migration data has been documented since 2002 using a rotary screw trap (RST) located at Shelton Road. Data collected from RST sampling provides information regarding temporal migration patterns; annual abundance estimation of migrants by life stage; fish condition factor; the effects of environmental factors on migration timing, migration rate, and survival; and the effects of water management operations on those factors. Using these data, Peterson et al. (publication pending) found that discharge from Cosgrove Creek, a tributary to the Calaveras, appeared to cue juvenile outmigration more so than releases directly from New Hogan Reservoir. Data from the monitoring programs were used to develop the CHCP conservation strategies for *O. mykiss* and will be used to adaptively manage the population in the future.

Adult salmonid migration monitoring is accomplished using two methods: a video recording system installed at the upstream end of the fish ladder at the Bellota Weir, and through redd surveys. Adult monitoring efforts may yield data regarding relative abundance, migration timing, percentage of hatchery strays (i.e., adipose fin clipped fish), size, sex, and influence of environmental conditions on migration timing. While the video recording system will be used to enumerate adults as they pass upstream to their spawning grounds, redd surveys can be used to provide an estimate of relative abundance. Furthermore, redd counts provide data to support escapement estimates, spawn timing and distribution, relative productivity of specific reaches, and the relationships between spawn timing and environmental or operational factors.

Table of Contents

List of Tables

List of Figures

List of Appendices

A. – Calaveras River Biological Resources
B. – Calaveras River Environment
C. – SEWD Project Operations
D. – Compliance and Effectiveness Monitoring for the Calaveras River Habitat Conservation Plan
E. – PHABSIM Analysis

Acronyms

AF – Acre-feet
AFRP – Anadromous Fish Restoration Program
AMP – Adaptive Management Plan
AWS – Attraction Water System
BCFS – British Columbia Forest Service
BLM – Bureau of Land Management
BMP – Best Management Practices
CCWD – Calaveras County Water District
CDFG – California Department of Fish and Game
CDFW – California Department of Fish and Wildlife
CDHS – California Department of Health Services
CEQ – Council on Environmental Quality
CEQA – California Environmental Quality Act
CESA – California Endangered Species Act
CFS – Cubic feet per second
CHCP – Calaveras River Habitat Conservation Plan
CRFG – Calaveras River Fish Group
CVFPB – Central Valley Flood Protection Board
DOC – Department of Conservation
DWR – California Department of Water Resources
EFH – Essential fish habitat
EPA – Environmental Protection Agency
ESA – Endangered Species Act
ESU – Evolutionarily significant unit
DPS – Distinct Population Segment
FFC – Fishery Foundation of California
HadCM2 – United Kingdom Hadley Centre's Climate Model
HCP – Habitat Conservation Plan
HSI – Habitat suitability index
ITP – Incidental take permit
LAFCO – Local Agency Formation Commission
M&I – Municipal & Industrial
MSA – Magnuson-Stevens Fishery Conservation and Management Act
NEPA – National Environmental Policy Act
NHG – New Hogan Dam
NMFS – National Marine Fisheries Service

NSJWCD – North San Joaquin Water Conservation District
RM – River mile
RMA – Routine Maintenance Agreement
RST – Rotary screw trap
RWQCB – Regional Water Quality Control Board, Central Valley Region
SJCWMP – San Joaquin County Water Management Plan
SDC – Stockton Diverting Canal
SEWD – Stockton East Water District
SWRCB – State Water Resources Control Board
USACE – United States Army Corps of Engineers
USFWS – U.S. Fish and Wildlife Service
USGS – U.S. Geological Survey
WTP – Water Treatment Plant
YOY – Young-of-year

Chapter 1. Introduction

The purpose of the CHCP is to provide information to NMFS regarding the District's Calaveras River operations and how they may affect salmonid species listed under the ESA (Chapters 6 and 7), and to define an operating conservation program (Chapter 7)[2] to achieve certain biological goals and objectives, as required for a Section 10 incidental take permit (ITP). The biological goals provide the broad overarching principles of the conservation program, and biological objectives consist of measurable targets for achieving the goals (65 Federal Register 35242, June 1, 2000). Additionally, an adaptive management plan (AMP) process has been defined through which the implementation of the conservation strategies can be improved to ensure that the biological goals, objectives, and associated targets are being met (Chapter 9). This introduction section provides an overview of the District's history and purpose, the legal framework influencing the District's operations, the regulatory framework for the CHCP, and the proposed duration of the Section 10 ITP.

1.1 Overview of the Stockton East Water District

The Calaveras River, a tributary to the San Joaquin River (Figure 1), serves as an important source of water for agricultural and municipal uses in Calaveras and San Joaquin counties. The District manages the water resources of the Calaveras River during non-flood control periods for its respective constituents.

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 Valley Springs, California, about 28 miles east of Stockton, California. Prior to 1949, there were no outlet controls on the dam and flows were not regulated in the lower river. In 1949, outlet controls were installed at the dam and the Stockton and East San Joaquin Water Conservation District (previous name of SEWD), together with the City of Stockton, began operating the dam in a manner to conserve runoff for later release for irrigation purposes. Immediately below the original dam, the United States Army Corps of Engineers (USACE) completed the construction of New Hogan Dam in 1964. The new dam increased the 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 pool (inactive pool) of 15,000 AF for sediment storage, fish and incidental uses. The New Hogan Project is operated for flood control, municipal and industrial water supply, irrigation, and recreation purposes.

[2] An "operating conservation program means those conservation management activities which are expressly agreed upon and described in a conservation plan or its Implementing Agreement, if any, and which are to be undertaken for the affected species when implementing an approved conservation plan, including measures to respond to changed circumstances" (§ 222.3, 50 CFR Ch. II [10–1–98 Edition]).

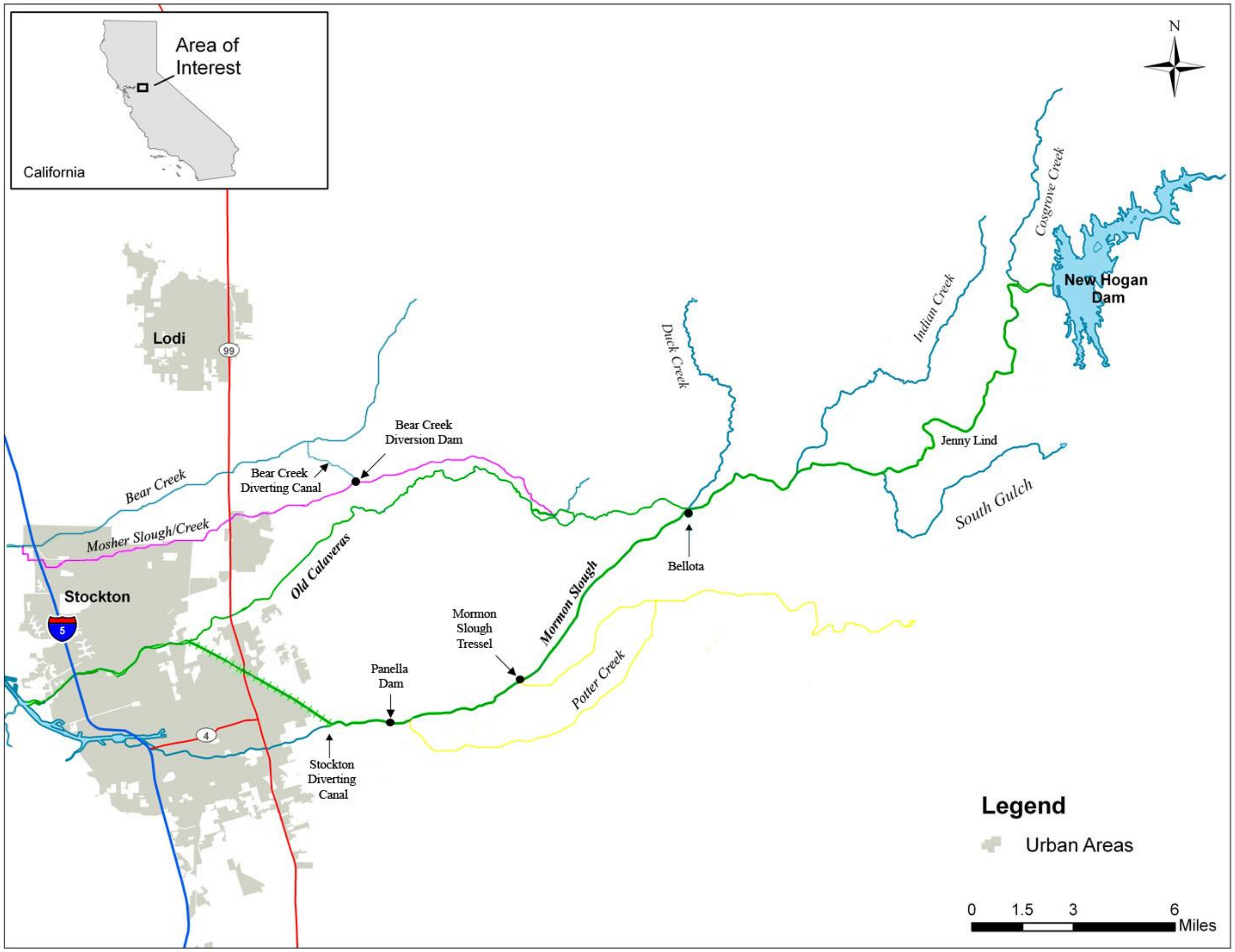

Figure 1. Overview of the lower Calaveras River basin. Habitat Conservation Plan boundaries highlighted in green (Lower Calaveras River via both Old Calaveras channel and Mormon Slough/Stockton Diverting Canal), pink (Mosher Slough/Creek), and yellow (Potter Creek).

SEWD, formerly known as the Stockton and East San Joaquin Water Conservation District, was created in 1948 as the successor agency to the Linden Irrigation District. SEWD provided water delivery to productive agricultural lands in eastern San Joaquin County from supplies conserved in Hogan Reservoir. Those supplies were increased with construction of New Hogan Reservoir in 1964 and SEWD provides approximately 50,000 AF of surface water annually to its agricultural service area (Table 1). Agricultural production in San Joaquin County generates in excess of $1.5 billion dollars in revenues annually. In 1971, the California State Legislature enacted Chapter 819 of the Statutes of 1971 to expand the powers of SEWD due to the declining supply of water in the region's groundwater basin. The Special Act provides that SEWD is governed by the Water Conservation District law commencing at Water Code Section 74000, if not otherwise inconsistent with the Special Act. Under this new legislation, SEWD was charged with developing additional water resources for the area in order to reduce and control the critical overdraft of the groundwater basin. Based on estimates from the San Joaquin County Water Management Plan (SJCWMP), the basin is currently overdrafted by an average of 150,000 AF/yr. As a result, the groundwater level in the basin has decreased by up to 2 feet per year, to a depth of -70 feet mean sea level (MSL) in some areas (GBA 2011).

In addition to supplying agricultural water, SEWD provides approximately 50-57,000 AF of treated surface water annually to its urban contractors including the City of Stockton, the County of San Joaquin, and the California Water Service Company (Table 1). The urban contractors serve over 300,000 residents and thousands of businesses in San Joaquin County.

Table 1. SEWD service area statistics as of 2004 San Joaquin County Water Management Plan, and LAFCO (Annexation).

	Agriculture	Urban
Land Area (acres):	95,400	47,900
Water Use (AF):		
Groundwater	120,000	25,000
Surface water	50,000	50-57,000

1.2 Legal Framework Influencing Stockton East Water District Operations

Several legal factors influence the District's operations, including the District's water supply contracts for New Hogan Reservoir; USACE's New Hogan Dam Water Control Plan; and SEWD's water supply imperatives including its water supply contract for New Melones Reservoir.

1.2.1 New Hogan Reservoir Water Supply Contract

The Bureau of Reclamation (Reclamation) and SEWD and the Calaveras County Water District [(CCWD) collectively referred to in this section as Districts] entered into a water supply contract for the entire yield of New Hogan Reservoir, entitled "Contract Between the United States of America and Stockton and East San Joaquin Water Conservation District and Calaveras County Water District Providing for Repayment and Conservation Use of New Hogan Project," on

August 25, 1970 (New Hogan Contract; Contract No. 14-06-200-5057A). The New Hogan Contract is a repayment contract requiring the Districts to pay for the entire cost of the conservation storage. In return, the Districts are allocated the entire yield of the project for the authorized purposes of use. Reclamation holds the water rights from the State Water Resources Control Board, but otherwise exercises no discretion in the operations of New Hogan Reservoir. During non-flood control periods, operational releases from New Hogan Reservoir are called for by the Watermaster as authorized by the New Hogan Contract. The New Hogan Contract gives the Districts the exclusive right as against the United States to determine the rate of release of water from the water supply pool, and the Districts in turn give SEWD the right to determine the rate of release in coordination with CCWD as set forth in the contract between CCWD-SEWD (see below). The USACE determines releases when the water level rises above the top of the water supply pool and into the flood control pool. The New Hogan Contract specifies the priority of water uses in the following section of the contract:

> ***Reservoir Operation-Use of Water by Districts***
> 4.(a) Acting through the [USACE] District Engineer, at the request of the Watermaster [i.e., SEWD], the United States shall store, regulate and/or release all flows of the Calaveras River at New Hogan for the purpose of making available agricultural, municipal, and industrial, and domestic water for use by the Districts. Such storage, regulation, and release of water shall be subordinate only to the storage and release of water for flood control, as conclusively determined by the [USACE] District Engineer; maintenance of a storage basin of fifteen thousand (15,000) acre-foot capacity for silting and storage of water for recreational and incidental uses, including recreational use on United States lands adjacent to the Reservoir; and to release of the portion of the unregulated runoff in the Calaveras River which is passed through New Hogan as it occurs in recognition of prior downstream water rights entitlements.

1.2.2 CCWD-SEWD New Hogan Reservoir Water Allocation Contract

Simultaneous with the execution of the New Hogan Contract, CCWD and SEWD entered into a contract that governs payment and allocation of water between them, and guides Watermaster decision-making, "Contract Between the Stockton & East San Joaquin Water Conservation District and the Calaveras County Water District Providing for the Use, Repayment, and Administration of Water from the New Hogan Project of the United States (Aug. 25, 1970)," (CCWD-SEWD Contract). Among other things, the CCWD-SEWD Contract allocates 43.5% of Project yield to CCWD and the remaining 56.5% to SEWD. The CCWD-SEWD Contract recognizes that at such times that CCWD does not request the full 43.5% entitlement, SEWD may use CCWD water until CCWD requests increased supplies. If SEWD uses CCWD water, SEWD must terminate this use upon CCWD's request for increased supplies. Consequently, the total amount of water used by the two Districts together will not change with increased CCWD diversions. The allocation between SEWD and CCWD will change as CCWD builds up to full use of its 43.5% entitlement.

1.2.3 New Hogan Dam Water Control Plan

The USACE determines flood control releases when the New Hogan Project is in flood control mode while SEWD, as the designated Watermaster for the Districts, determines the municipal and irrigation releases in non-flood control periods. Since 1964, the USACE, Sacramento District, has operated New Hogan Project for flood control in accordance with the Water Control Plan consisting of the Flood Control Diagram and portions of the Water Control Manual (see Appendix C for additional details). Flood control operations by the USACE occur when the storage in New Hogan exceeds the flood control space required at any particular time as determined under the authorized Flood Control Diagram.

1.2.4 Stockton East Water District Water Supply Imperatives

In 1971, the California State Legislature enacted Chapter 819 of the Statutes of 1971, which expanded the powers of SEWD because of the unique and special circumstances in the District, namely that the water supplies in the underground basin of the area are insufficient to meet the water demands in the area, and because of the geological conditions peculiar to the area, the ancient saline deposits that underlie the Delta to the east. When the groundwater basin is overdrafted, and the water level lowered, those saline deposits intrude into the basin causing serious water quality deterioration and the destruction of the groundwater basin. Under this new legislation, SEWD specifically was charged with developing additional water resources for the area in order to reduce and control the critical overdraft of the basin. A 1985 report undertaken by a number of local agencies in San Joaquin County determined that serious overdrafting of the groundwater basin continued and that the saline front advanced inland approximately one mile between 1963 and 1983. Water levels declined at an average rate of 1.7 feet per year during the period from 1947 to 1984, and in the areas of the greatest groundwater depression, average water levels were more than 60 feet below sea level in 1980. The report concluded that if no additional surface water is imported to serve the area and all demands are met from groundwater, the groundwater model indicates that water levels will decline to as much as 160 feet below sea level (up to 200 feet below the ground surface) and the saline front will advance approximately an additional two miles by 2020 (Brown and Caldwell 1985).

San Joaquin County is in a period of rapid growth, and the rate of growth is projected to continue to increase. The imperative to engage in regional planning and water use projects is accordingly increasing in importance. Potential conjunctive use operations have been identified as a viable opportunity to increase water supply reliability within SEWD boundaries, which is identified as part of the eastern San Joaquin groundwater basin. SEWD has implemented several pilot recharge projects, which confirm the viability of a conjunctive use program. SEWD is implementing a conjunctive use program that will optimize the efficiency and reliability of SEWD's surface water resources, including New Hogan supplies, and of local groundwater resources, and would help to mitigate the lowering of the groundwater table as a result of continuing overdraft in San Joaquin County. Presently, and in the future, SEWD’s entitlement and use of Calaveras River water under the CCWD-SEWD Contract is a critical and fundamental resource in meeting the water supply and health and safety needs of the citizens of San Joaquin County.

1.2.5 Stockton East Water District - New Melones Reservoir Water Supply Contract

In 1983, in furtherance of the legislative direction to acquire additional surface water supplies to replenish the critically overdrafted groundwater basin, SEWD contracted with Reclamation for 75,000 AF of water from New Melones Reservoir on the Stanislaus River to be used for agricultural and M&I purposes in SEWD's service area. Conveyance facilities were constructed between New Melones Reservoir and the Dr. Joe Waidhofer Water Treatment Plant (WTP). Since completion of SEWD's conveyance facilities in 1993, Reclamation has not fulfilled its obligations under the contract for delivery of water requested by SEWD. The most water delivered to SEWD pursuant to its contract is 34,400 AF (46%) in 1998.[3] Historically, SEWD has only received an average of 11.5 % of its contractual entitlement. Unfortunately, the water supply from the Stanislaus River is very unreliable, which has made the Calaveras River SEWD's sole reliable source of surface water for its agricultural and M&I customers.

1.3 Regulatory Framework for the CHCP

SEWD developed this CHCP to consult with NMFS and obtain an ITP for listed salmonids and species of special concern potentially affected by the District's operations, hereinafter referred to as "Project Operations," as provided for in Section 10 of the ESA. As of 2008, listed salmonid species and critical habitat under NMFS's jurisdiction that have the potential to be affected by Project Operations include the:

- Central Valley steelhead (*Oncorhynchus mykiss*) listed as threatened in 1998 and re-listed in 2006 (63 FR 13347; 71 FR 834);
- Sacramento River winter-run Chinook salmon (*O. tshawytscha*) listed as endangered in 1994 and reaffirmed in 2005 (59 FR 440; 70 FR 37160)[4];
- Central Valley spring-run Chinook salmon (*O. tshawytscha*) listed as threatened in 1999 and reaffirmed in 2005 (64 FR 50394; 70 FR 37160)[3];
- Central Valley fall/late fall-run Chinook salmon (*O. tshawytscha*) designated as a species of special concern in 2004 (69 FR 19975)[5]**;** and
- Calaveras River below New Hogan Dam designated as critical habitat for Central Valley steelhead in 2005 (70 FR 52488).

An ITP will allow the District to legally proceed with certain water management activities that may otherwise result in "take" of the Covered Species, as described in the ITP. Under the ESA, "take" is defined as to "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect any

[3] Reclamation allocated SEWD its full contractual supply in water years 2006, 2010 – 2013 and 2016.

[4] Although the Calaveras River is not included in either the winter-run or spring-run ESUs and it is unlikely that winter-run or spring-run Chinook would establish a viable population in the Calaveras River, there remains a slight potential that individual winter-run or spring-run salmon could occasionally stray into the basin and be affected by water management activities in the river. Therefore, these races are included in this CHCP.

[5] Although the Calaveras River falls within the fall/late fall-run Chinook ESU, it is unlikely that late fall-run Chinook would establish a viable population in the Calaveras River. Nonetheless, there remains a slight potential that individual late fall-run salmon could occasionally stray into the basin and be affected by water management activities in the river. Therefore, this race is included in this CHCP.

threatened or endangered species."[6] The purpose of the CHCP is to ensure that there are adequate measures to minimize and mitigate potential effects of Project Operations for the authorized incidental take. Implementation of, and compliance with, the conservation strategies identified in this CHCP are intended to satisfy the incidental take permitting provisions of the ESA.

1.3.1 Endangered Species Act

The federal ESA for anadromous salmonids is administered by NMFS and contains provisions that prohibit any person from "taking" listed species unless specifically authorized through a Section 7 (Federal agencies) or Section 10 (non-Federal entities) consultation, or through compliance with provisions of a 4(d) rule for threatened species. Section 10 of the ESA states:

> The Secretary [of Commerce] may permit...any act otherwise prohibited by Section 9 for scientific purposes or to enhance the propagation or survival of affected species...; or any taking [of fish and wildlife] otherwise prohibited by Section 9(a)(1)(B) if such taking is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity.

Under Section 10(a)(2)(A) of the ESA, an incidental take permit application must be supported by a habitat conservation plan (HCP) that specifies the following:

(1) the impacts likely to result from the taking of the species for which permit coverage is requested;
(2) measures to monitor, minimize, and mitigate such impacts;
(3) funding available to implement such measures;
(4) alternative actions that would not result in taking;
(5) reasons for not utilizing such alternatives;
(6) responses to changed circumstances; and
(7) any additional measures NMFS may require as necessary or appropriate for purposes of the plan.

Section 10(a)(2)(B) of the ESA specifies the issuance criteria which must be satisfied before NMFS can issue an incidental take permit. These criteria include a requirement that the taking authorized by the permit "…will not appreciably reduce the likelihood of the survival and recovery of the species in the wild." Although not specifically required by the ESA, it is appropriate for the conservation actions taken under a Section 10(a)(1)(B) permit to assist in carrying out species recovery plans and to improve the status of listed species affected by the permit. As such, the CHCP includes conservation strategies that are consistent with NMFS's (2014) Central Valley salmonid recovery plan.

1.3.2 Additional Regulations

In addition to the ESA, the District shall also comply with all other applicable local, state, and federal regulations, laws or ordinances. These include, but are not limited to, the following: National Environmental Policy Act (NEPA); California Environmental Quality Act (CEQA);

[6] [ESA §3(19)] ***Harm*** is further defined at 50 CFR section 222.102.

USACE Clean Water Act 404 permits; State Water Resources Control Board (SWRCB) discharge notification requirements; California Department of Fish and Wildlife (CDFW) 1600 Streambed Alteration Agreements and California Endangered Species Act (CESA); and United States Environmental Protection Agency (EPA) and Department of Pesticide Regulation laws and regulations.

1.4 Permit Duration

The CHCP is proposed to be a 50-year plan and the CHCP permits and authorizations shall have a term of 50 years. Due to the uncertainty with respect to the actual date of implementation, the CHCP will run 50 years beyond the effective date of the Section 10 ITP. For example, if the ITP becomes effective on August 15, 2019, the duration of the CHCP will be through August 15, 2069.

Chapter 2. CHCP Boundaries

The CHCP boundary generally encompasses the lower Calaveras River and its adjacent riparian zone between New Hogan Dam and the confluence with the San Joaquin River, as well as New Hogan Reservoir. Figure 1 depicts the area of the lower Calaveras River watershed within the HCP boundaries. According to the HCP Handbook (USFWS and NMFS 2016), "HCP boundaries should encompass all areas within the applicant's project, land use area, or jurisdiction within which any permit or planned activities likely to result in incidental take are expected to occur." Therefore, the CHCP boundaries encompass those waterways that are potentially accessible to one or more Covered Species within the District's service areas, as follows:

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[7].

Chapter 3. Environmental Setting

This section provides a brief overview of the Calaveras River Basin and is limited to the information needed to understand the factors that affect the distribution and abundance of

[7] 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 any potential impacts to adults entering during this period are not considered within the scope of this 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 a low 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.

anadromous salmonids within the river. Additional details regarding the basin are presented in Appendix B.

The Calaveras River Basin originates in the Sierra Nevada mountains and extends southwesterly for roughly 60 miles to the Stockton metropolitan area. The entire basin encompasses an area of approximately 590 square miles. The mountainous portion upstream from New Hogan Reservoir comprises roughly 360 square miles. The lower basin consists of approximately 230 square miles, including 100 square miles of foothill drainage between New Hogan Dam (RM 42) and Bellota (RM 23.8) and 120 square miles of valley floor downstream of Bellota (USAED 1981). 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 (Tetra Tech 2001; USACE 2001).

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, snowpack does not persist into late-spring or summer. Summers are long and hot with little or no rainfall. Seasonal rainfall is variable from year to year, ranging from less than 16 inches to over 45 inches (USAED 1981). 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 snowpack, 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). Prior to SEWD's operations, the lower river frequently dried up during the late summer. Now, water stored in New Hogan Reservoir during wet seasons is released year-round for diversion, which results in sustained year-round flows between at least New Hogan Dam and Bellota Weir in all but drought years.

Although the historic use of the Calaveras River by salmonids is uncertain, there are two primary environmental factors that have limited salmonid populations within the basin: the area's geography/topography and hydrology. The geography/topography of the Calaveras River, with respect to salmonid abundance and distribution, can be partitioned into two zones, an upper and a lower zone, that are characterized by their flow regimes and ability to opportunistically support salmonid populations. Currently, the upper and lower zones are delineated by the presence of New Hogan Dam (RM 42, elevation 500 feet), but it is unknown how much farther upstream the lower zone may have extended prior to impoundment.

In the upper zone, "…all streams in the Calaveras River are dry in late summer where they cross Highway 49" (Linn 1963). However, low perennial flows exist in some portions of several major tributaries during at least normal to wet years (Linn 1963; BLM 1980a and 1980b). These perennial flows likely arise from springs that occur in the upper watershed, which provide conditions able to "…maintain natural trout populations at elevations from around 1,200 to 2,000 feet" (Linn 1963). However, habitat for winter-run and spring-run was lacking in the upper basin (Yoshiyama 2001). Based on the presence of rainbow trout in the upper watershed (Linn 1963; BLM 1980a and 1980b), steelhead may have opportunistically used the upper basin prior to impoundment whenever flows were sufficient for migration.

In the lower zone, the intermittent nature of flows in the Calaveras River would have historically limited the year-round use of this reach by salmonids and provided marginal habitat for various salmonid life stages. Due to the low elevation and associated low summer flows, the lower river would not have supported spring-run and winter-run spawning and incubation, or late fall-run Chinook rearing. Nevertheless, high flows during the winter and spring months of normal to wet years (i.e., December-April), as well as during the late fall of years when significant rainfall and associated freshets occurred early (i.e., November), could have provided some opportunities for spawning, rearing, and emigration consistent with requirements of fall-run Chinook and steelhead.

Today, although the duration and magnitude of peak winter/spring flows have been reduced due to reservoir operations, salmonids are able to opportunistically access the lower zone for spawning whenever adequate migration flows are available. Upstream and downstream migration opportunities are currently limited to occasions between November and March/early April when substantial precipitation occurs, which often does not begin until December because rainfall from initial storm events is generally absorbed into the ground through infiltration, and runoff does not occur until the ground becomes saturated. Once the Bellota Weir and other flashboard dams are installed near the beginning of April, their operation limits the ability of adult salmonids to migrate upstream, and juvenile salmonids to migrate downstream of Bellota. However, sustained summer flows that are now provided during most years between New Hogan Dam and Bellota for water management purposes result in over-summer rearing opportunities for salmonids within the reach between New Hogan Dam and Bellota and in the Old Calaveras River channel.

The lower Calaveras River between New Hogan Dam (RM 42) and the San Joaquin River confluence consists of seven visually distinct reaches as 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; artificial 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 a low gradient, and 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 62 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 52 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 entering the Calaveras River between New Hogan Dam and Bellota are South Gulch, Indian, Duck, and Cosgrove creeks. All are intermittent streams that dry up during the summer months and only 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 downstream of 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 22 privately owned diversions, which may be operated during the irrigation season. During the winter, the control structure is closed for flood control.

Flashboard dams and irrigation diversions operated in Mormon Slough/SDC and the Old Calaveras River channel from early to mid-April through mid-October prevent adult salmonids from migrating upstream of Bellota and limit the ability of juvenile salmonids to migrate downstream of Bellota. If winter-run or spring-run Chinook salmon were to attempt to utilize the river in the future, flashboard dams may affect any winter-run or spring-run adults trying to migrate upstream and any resulting juvenile spring-run Chinook migrating downstream in April and May (winter-run juveniles would be expected to migrate downstream during the non-irrigation season when flashboard dams are not installed). However, sustained, summer flow releases for water management purposes during most years result in over-summer rearing opportunities within the New Hogan Dam to Bellota reach. Due to steelhead life-history patterns, described in detail in section 4.3, these year-round flow conditions provide substantial benefits for this species.

Although there have been no direct observations of adult salmonids entering Potter Creek, a reconnaissance survey of both entrances to the creek (i.e., north and south) indicates that adult salmonids could migrate into either channel during runoff events in winter and early spring when flashboard dams are not in place. Any resulting juvenile salmonids would be limited from migrating downstream into Mormon Slough during the irrigation season by flashboard dams and could be subject to potential entrainment into irrigation diversions.

Mosher Slough/Creek does not typically provide upstream access from the San Joaquin River for salmonids. However, in October 2003, several adult fall-run Chinook salmon were observed in Mosher Slough/Creek near its intersection with the Southern Pacific Railroad. It is believed that these fish were able to gain access to this location due to a one-time combination of events, including (1) SEWD's operation of a recharge test in an existing storm retention basin adjacent to State Highway 99 & Mosher Slough/Creek using flows diverted from the Old Calaveras River channel, and (2) the City of Stockton's operation of a recharge test in an existing retention basin just upstream of the Southern Pacific Railroad using flows diverted from the Mokelumne River into Mosher Slough/Creek via the Woodbridge Irrigation District distribution system. Although SEWD may use the retention basin in the future, recharge will only be conducted with available water supply and is not expected to result in connection of Mosher Slough/Creek with the Sacramento-San Joaquin Delta. Although adult migration and subsequent spawning are not anticipated to occur within Mosher Slough/Creek, there is a slight chance that juvenile salmonids (limited to the fall-run and spring-run Chinook salmon and steelhead juvenile outmigration period) may enter the upstream end of the channel through the Mosher Slough Dam during the irrigation season. These juveniles would then be limited from migrating downstream into the San Joaquin Basin by flashboard dams within the channel and would be subject to potential entrainment into irrigation diversions.

During the non-irrigation season (generally mid-October through mid-April), flashboard dams are not installed, and no irrigation diversions are operated. However, flashboard dam foundations and low flow crossings within the Calaveras River migration corridor may impede passage whenever adults attempt to migrate upstream or juveniles migrate downstream, particularly under low flow conditions. There is no evidence that similar impedance occurs in Potter Creek and Mosher Slough/Creek. Also, during the non-irrigation season, diversions at Bellota for M&I purposes may entrain Chinook or steelhead fry (<60 mm) migrating downstream during December through early April. Fish larger than ≥60 mm are no longer susceptible to entrainment due to the addition of interim fish screens in December 2005, but there is potential for impingement on the screens to occur.

Chapter 4. Covered Species

The number of species to be covered in this HCP results from a balance between: 1) the District's need for regulatory certainty, and 2) NMFS's need to confine the HCP to a manageable and enforceable level. NMFS's HCP Handbook states that the greater the number of species addressed in the HCP, the more complicated the HCP may become. This section lists species proposed to be covered and gives the rationale for their selection.

The following salmonids and designated critical habitats were chosen due to their known opportunistic or potential occurrence within the Calaveras River:

Central Valley steelhead (*O. mykiss*)
Central Valley steelhead designated critical habitat
Sacramento River winter-run Chinook salmon (*O. tshawytscha*)
Central Valley spring-run Chinook salmon (*O. tshawytscha*)
Central Valley fall/late fall-run Chinook salmon (*O. tshawytscha*)

Steelhead and fall-run Chinook are known to opportunistically utilize the river when upstream migration conditions are available. Winter-run Chinook were not likely native to the Calaveras River; however, they may have "…somehow colonized the Calaveras after the dam was put in (Yoshiyama 2001)." Winter-run were observed in the Calaveras River in the 1970s and early 1980s; but, none have been seen since 1984 and they are considered extirpated from the area. Although these fish have always been referred to as "winter-run," they may have actually been "…late-fall run, given that the spawning period was relatively early compared to the Sacramento winter run," (Yoshiyama et al. 2001). Regardless, neither winter-run nor late fall-run have been observed in the basin for at least two decades. Spring-run have never been observed in the Calaveras River but were historically present in nearby tributaries until they were extirpated from the San Joaquin Basin several decades ago. In recent years, a few phenotypic spring-run have been observed in the nearby Stanislaus River, but it is unclear whether these fish are truly spring-run.

Although the Calaveras River is not included in either the winter-run or spring-run evolutionarily significant units (ESU), and it is unlikely that winter-run, spring-run, or late fall-run Chinook would establish viable populations in the Calaveras River, there remains a slight potential that individual fish could occasionally stray into the basin and be affected by water management activities in the river. Therefore, these three races are included under this CHCP. Tables 2 and 3 provide the typical timing of various life stages of Covered Species.

NMFS staff concurred with the selection of steelhead and four Chinook salmon races as the species addressed in this HCP. However, the ITP will initially only apply to steelhead, winter-run Chinook salmon, and spring-run Chinook salmon, since only these species are listed and under NMFS jurisdiction at this time (fall/late fall-run Chinook are not currently listed but are considered Species of Concern and may be listed as threatened or endangered in the future; upon any future listing, fall/late fall-run Chinook will become covered under the ITP as described in Chapter 11).

The HCP Handbook also suggests that the District collect and review existing information on the HCP species, focusing on the species' distribution, artificial propagation, abundance, and ecology. The Handbook recommends that research efforts should be confined to distribution or other studies that directly bear on the needs of the HCP. Currently, there is little information regarding any salmonids within the Calaveras River. Table 4 presents a brief summary of the data that exist for salmonids in the Calaveras River and the following sections describe the regulatory status of each species/race. Appendix A provides additional detail and data regarding Chinook salmon and steelhead in the Calaveras River.

Table 2. Life stage timing for covered CHCP species currently utilizing the Calaveras River.

		Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Adult Migration[1]	**Fall-run Chinook**	New Hogan Dam to confluence											**Fall Chinook**	
	Steelhead		***O. mykiss***										***O. mykiss***	
Spawning	**Fall-run Chinook**	New Hogan Dam to Bellota											**Fall Chinook**	
	Steelhead		***O. mykiss***											
Egg Incubation	**Fall-run Chinook**	New Hogan Dam to Bellota	**Fall Chinook**										**Fall Chinook**	
	Steelhead		***O. mykiss***											
Juvenile Rearing	**Fall-run Chinook**	New Hogan Dam to Bellota	**Fall Chinook**											
	Steelhead		***O. mykiss***											
Juvenile Outmigration[1]	**Fall-run Chinook**	New Hogan Dam to confluence	**Fall Chinook**											
	Steelhead		***O. mykiss***											

[1]Passage opportunities under a natural hydrograph would have generally been available during portions of December through May, and occasionally as early as November. Today, upstream passage is limited to naturally occurring flows in the river and downstream passage opportunities are limited when flashboard dams are installed (typically from early/mid-April to mid/late October). Deviation from the potential historical condition is indicated by broken hash marks.

Table 3. Life stage timing for covered CHCP species not likely to utilize the Calaveras River.

		Location	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
Adult Migration[1]	Winter-run Chinook	New Hogan Dam to confluence	Winter-run											
	Spring-run Chinook					Spring-run								
	Late fall-run Chinook		Late fall-run										Late-fall run	
Adult Holding	Spring-run Chinook	New Hogan Dam to Bellota			Spring-run									
Spawning	Winter-run Chinook	New Hogan Dam to Bellota				Winter-run								
	Spring-run Chinook									Spring-run				
	Late fall-run Chinook		Late fall-run											
Egg Incubation	Winter-run Chinook	New Hogan Dam to Bellota				Winter-run								
	Spring-run Chinook									Spring-run				
	Late fall-run Chinook					Late fall-run								
Juvenile Rearing	Winter-run Chinook	New Hogan Dam to Bellota	Winter-run						Winter-run					
	Spring-run Chinook		Spring-run											
	Late fall-run Chinook		Late fall-run											
Juvenile Outmigration[1]	Winter-run Chinook	New Hogan Dam to confluence	Winter-run										Winter-run	
	Spring-run Chinook		Spring-run										Spring-run	
	Late fall-run Chinook		Late fall-run											

[1]Passage opportunities under a natural hydrograph would have generally been available during portions of December through May, and occasionally as early as November. Today, migration opportunities are available whenever flood control and/or natural freshet events occur below New Hogan Dam, which encompasses much of the historic timeframe, but adult migration is prevented and juvenile migration is limited whenever flashboard dams are in place (typically from early/mid-April to mid/late October). Deviation from the potential historical condition is indicated by broken hash marks.

4.1 Sacramento River Winter-run Chinook Salmon

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. Sacramento River winter-run Chinook salmon were originally listed as threatened in August 1989, under emergency provisions of the ESA, and formally listed as threatened in November 1990 (55 FR 46515). They were reclassified as endangered on January 4, 1994 (59 FR 440) due to increased variability of run sizes, expected weak returns as a result of two small year classes in 1991 and 1993, and a 99 percent decline between 1966 and 1991.

On June 14, 2004, NMFS proposed to downgrade Sacramento River winter-run Chinook salmon from endangered to threatened status (69 FR 33102). However, on June 28, 2005, after reviewing the best available scientific and commercial information, NMFS issued its final decision to retain the status of Sacramento River winter-run Chinook salmon as endangered (70 FR 37160).

Critical habitat area for Sacramento River winter-run Chinook salmon was designated on June 16, 1993 (58 FR 33212) as the Sacramento River from Keswick Dam to Chipps Island at the westward margin of the Sacramento-San Joaquin Delta, including Kimball Island, Winter Island, and Brown's Island; all waters from Chipps Island westward to the Carquinez Bridge, including Honker Bay, Grizzly Bay, Suisun Bay, and the Carquinez Strait; all waters of San Pablo Bay westward of the Carquinez Bridge, and all waters of San Francisco Bay north of the San Francisco-Oakland Bay Bridge. The winter-run critical habitat designation excludes the San Joaquin River and its tributaries, including the Calaveras River.

Sacramento River winter-run Chinook salmon and their designated critical habitat do not currently occur within the Calaveras River watershed and 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 in the CHCP as there is a slight potential that they could be observed in the future and be affected by CHCP in-water activities.

Table 4. Available salmonid data for the lower Calaveras River from New Hogan Dam to the mouth, 1972-2015. Shading indicates observations that occurred during the drought periods of 1976-1977, 1987-1992, and 2012-2015. Codes are provided at end of table.

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1972	Mar/Apr	CHN	Adult	248 (233A;15D)	SDC	1,000	Estimate identified in Meyer 1984; no description of how estimate derived	CDFG (California Department of Fish and Game). (1979). Calaveras River anadromous fish runs from 1972, a simple chronology of events. Memo to Calaveras River File, Calaveras County. August 28, 1979. CDFG, Region 2. 5pp.
1972-1973	Late winter/ Early spring	CHN	Juvenile	1	Below NHG	-		
1973-1974		CHN	Juvenile	7		-		
1973	Week of April 15	CHN	Juvenile	11	SDC	10,000-15,000	No description of how estimate derived	Gervais, B. (1973). Stranded king salmon yearlings. Memo to Mormon Slough, Stockton Diverting Canal-San Joaquin County files. July 24, 1973. CDFG, Region 2. 3pp.
	Nov 19	RBT/SH	Juvenile	13	Cosgrove Creek	-		Wooster, T. W. (1973). Field investigation of streambed alteration and water pollution of Cosgrove Creek. Memo to Cosgrove Creek, Calaveras County file. December 6, 1973. CDFG, Region 2. 2pp.
1975	Apr 26	CHN	Adult	2	NHG to 1st bridge	-		Sazaki, M. (1975a). Creel census below New Hogan Dam. Memo to Survey Files, Calaveras River, Calaveras County. June 11, 1975. CDFG, Region 2. 1pp.
		RBT/SH	Juvenile/ Adult	291		-		
	Jun 3	CHN	Adult	166 (153A/13)	NHG to Cosgrove Creek	1,000	Estimate identified in Meyer 1984; no description of how estimate derived	Sazaki, M. (1975b). Scuba survey below New Hogan Dam. Memo to Survey Files, Calaveras River, Calaveras County. June 11, 1975. CDFG, Region 2. 2pp.
		RBT/SH	UNK	>500		-		
	Jul 8	CHN	Adult	9 (3A/6D)		-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
		RBT/SH	Juvenile/ Adult	>50	NHG to 1st bridge	-		Sazaki, M. (1975c). Scuba survey below New Hogan Dam. Memo to Calaveras River file. September 16, 1975. CDFG, Region 2. 1pp.
1976	Early Feb	CHN	Adult	8-10 (D)	One of lowermost flashboard dams	-		CDFG. (1979).
	Mid Feb	CHN	Adult	2	Just upstream of I-5 bridge	-		
	Feb	CHN	Adult	11	SDC	-		
	Apr	CHN	Adult	395		-		
1977	Feb	CHN	Juvenile	13	UNK	-		
	Apr	CHN	Juvenile	3		-		
	May	CHN	Adult	7	3 at Pacific Ave; 3 at N. Wilson Way; 1 about 1/4 mile below McAllen Road	-		
1978	March 3 and earlier	CHN	Adult	Several	Bellota Weir	<250 spawners	Additional surveys conducted between mid-May to late June (no numbers given); no description of how estimate derived	CDFG. (1979).
1979	Mar 2	CHN	Adult	Several		-		CDFG. (1979).
	Mar 5	RBT/SH	Adult	Several		-		
1982	UNK	CHN	Adult	UNK	UNK	-	According to CDFG 1996a, there were "winter-run" observed in 1982.	CDFG. (1996a). Calaveras River Chinook salmon study 1996. Prepared by Maury Fjelstad. Unpublished report. California Dept. of Fish and Game, Region 2. Sacramento, CA.
1982-1983	Winter	RBT/SH	UNK	Several	Cosgrove Creek	-		Meinz, M. (1983). Rainbow trout populations in Cosgrove Creek,

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1983	Apr 7	RBT/SH	Juvenile	28		612/mile	3-pass e-fishing depletion method	Calaveras County. Memo sent to file. May 3, 1983. CDFG, Region 2. 3pp.
			Adult	2				
	UNK (opening day creel census)	RBT/SH	Adult	Several	UNK	-	Tagged escapees from New Hogan	Meyer, F. (1984). Calaveras Fishery below New Hogan Dam. Memo sent to Calaveras River, San Joaquin County file. May 1, 1984. CDFG, Region 2. 4pp.
		CHN	Adult	1		-	Planted	
1984	Jan	CHN	Adult	Relatively large numbers (tens not hundreds)	Bellota weir	100		CDFG. (1984). Chinook salmon spawning stocks in California's Central Valley, 1984. Edited by Robert Reavis, Inland Fisheries Division. Inland Fisheries Division Administrative Report No. 85.
	Apr 28	CHN	Adult	1	UNK	-		Meyer, F. (1984).
		RBT/SH	Adult	103		-		
1987	Jun	CHN	Juvenile	1	UNK	-		USFWS. (1993). Stanislaus River Basin Calaveras River Conjunctive Use Water Program Study; A preliminary evaluation of fish and wildlife impacts with emphasis on water needs of the Calaveras River. Memo to David Lewis, Regional Director, San Joaquin Branch, Bureau of Reclamation. January 28, 1993. FWS, Ecological Services, Sacramento, CA. 24pp.
1988	Dec 15	RBT/SH	Juvenile	187	Two sections below NHG	-	Mean Fulton's CF = 1.14 for both Age 0+ (avg 116 mm) and Age 1+ (avg 194 mm); CF = 1.17 for one Age 2+ (253 mm)	Somer. B. (1990). Calaveras River fish populations sampling. Memo to Calaveras River File, Calaveras County. March 13, 1990. CDFG, Region 2. 7pp.

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
1995	Oct 1	CHN	Adult	Several trying to ascend weir; 15 salmon/ 10 redds below weir	Bellota Weir to county road 1/4 mile downstream	~300-500 migrated into river	No formal mark and recapture estimates were made; estimates based on visual surveys	Villa, N. (1996). Chinook salmon in the Calaveras River- Summary of events. Memo to L. Ryan Brodderick. February 22, 1996. CDFG, Region 2. 4pp. Koscho C. (1995). Calaveras River teeming with salmon. Calaveras Enterprise. November 7, 1995. Nickles J. (1995). Rare event for Calaveras. The Record; Sect A:1. November 4, 1995. Nickles J. (1995). Salmon get a little help from human friends. The Record. November 7, 1995.
	Oct 22	CHN	Adult	Several dozen (A)	Five mile reach downstream of Bellota			
		CHN	Redds	Over 50 redds				
		CHN	Redds	Several dozen (A)	NHG to Bellota			
	Nov 6	CHN	Adult	6-12	Bellota pool			
		RBT/SH	Adult	1		-		
1996	Feb-Jun	CHN	Juvenile	467	SDC to NHG (half upstream/half downstream of Bellota)	-	Also has condition factor information; Chinook juveniles at 1.18 higher than Mokelumne at 0.89	CDFG. (1996a). Nickles J. (1996). Salmon call Calaveras River home again. The Record; Sect A:6. March 4, 1996.
1998	Fall	CHN	Adult	UNK	UNK	-		Nickles J. (1998). October 17. Salmon making run at Calaveras. The Record; Sect A:1. October 17, 1998. Nickles J. (1998). Go Fish! New ladder helps salmon make it. The Record. November 3, 1998.
2000	Apr 16	RBT/SH	Juvenile	1	100 m downstream of Bellota	-		Baxter, R. (2000). Calaveras River smolt steelhead sampling. Memo sent to Dennis McEwan. April 21, 2000. Calif. Dept. of Fish and Game, Region 2. 3 pp.
		RBT/SH	Juvenile	3	200 m below NHG	-		
		RBT/SH	Adult	3		-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
	March	RBT/SH	Juvenile/ Adult	21	Pools below NHG	-		Titus, R. (2000). Adult steelhead collected in the Calaveras River below New Hogan Dam in March 2000. CDFG Stream Evaluation Program report. 9 pp.
2001	UNK	RBT/SH	Adult	UNK	UNK	-		NMFS. (2002). New Hogan Dam and Lake Project Biological Opinion. Prepared for USACE by NMFS Southwest Region, Long Beach, CA.
2001	Fall	CHN	Adult	11 (8A/3D)	MRS	-		FFC (Fish Foundation of California). Unpublished data (2001–2003). Field notes and summary reports on file with Anadromous Fish Restoration Program, Stockton, California. SEWD (Stockton East Water District). Unpublished data (2001-2003). Field notes and summary reports on file at FISHBIO office, Oakdale, CA.
2002	Jan 17 - Feb 14; Apr 5 - May 9	CHN	Juvenile	6	RST at Shelton Road	-		
		RBT/SH	Juvenile	1,129		2,702	80% CI= 2,613-3,151	
	April	SH	Adult	1 (D)	Bellota Weir	-		
	Mar-Oct	RBT/SH	Juvenile	UNK	NHG to Jenny Lind	-	Snorkel Surveys	
		RBT/SH	Adult	UNK		-		
	Fall	CHN	Adult	3 (D)	MRS	-		
2002-2003	Winter	CHN	Adult	15 (5A/10D)	14 MRS; 1 OCR	-		
2003	Jan 4 - Jul 17	RBT/SH	Juvenile	1,539	RST at Shelton Road	6,918	80% CI= 6,245-13,002	FFC. Unpublished data (2003–2005). Field notes and summary reports on file with Anadromous Fish Restoration Program, Stockton, California. SEWD. Unpublished data (2003-2005). Field notes and summary reports on file at FISHBIO office, Oakdale, CA.
	May	RBT/SH	Juvenile	97	OCR (54) & MRS (43)	-	Fyke nets	
	Jul 2	RBT/SH	Adult	1	Downstream of Bellota Weir	-	Electrofishing	
			Juvenile	40		-		
	Fall	RBT/SH	Juvenile	24 (A)	MRS	-		
		RBT/SH	Adult	3 (A)	OCR	-		
		CHN	Adult	16 (8A/8D)	MRS	-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
2003-2004	Winter	RBT/SH	Juvenile	57 (48A;9D)	32 MRS; 24 OCR; 1 UNK	-		
		CHN	Adult	10 (4A/6D)	7 MRS; 3 OCR	-		
	Dec 2 - May 13	RBT/SH	Juvenile	1,411	RST at Shelton Road	4,397	80% CI= 4,180-7,152	
2004	Spring	RBT/SH	Juvenile	6(A)	MRS	-		
		CHN	Juvenile	1(A)	MRS	-		
	Fall	RBT/SH	Juvenile	6 (3A/3D)	OCR	-		
		RBT/SH	Adult	20 (15A/5D)	OCR	-		
2004-2005	Winter	CHN	Adult	17 (5A/12D)	6 MRS; 10 OCR; one UNK	-		
	Dec 10 - Apr 22	RBT/SH	Juvenile	319	RST at Shelton Road	1,127	80% CI= 1,101-2,073	
2005	Spring	RBT/SH	Juvenile	17 (A)	Below lowermost dam in MRS	-		FFC. Unpublished data (2005–2011). Field notes and summary reports on file with Anadromous Fish Restoration Program, Stockton, California. SEWD. Unpublished data (2005-2015). Field notes and summary reports on file at FISHBIO, Oakdale, CA.
	Apr 20	RBT/SH	Adult	1 (UNK)	MRS near Cherokee	-		
	Spring	CHN	Juvenile	17 (A)	Below lowermost dam in MRS	-		
	Nov 23 - Dec 26	CHN	Adult	464 (A)	MRS	-		
				221 (A)	NHG to Bellota	-		
2006	Jan 19 - Mar 27; Apr 30- Jun 30	RBT/SH	Juvenile	706	RST at Shelton Road	5,029	80% CI= 4,663-9,658	
		CHN	Juvenile	5,943		39,123	80% CI= 16,158-57,322	
	Spring	CHN	Juvenile	210 (~105 D)	MRS	-		

Year	Time Year	Species	Life-stage	Number observed	Location	Number Estimated	Notes/ Uncertainty	Reference
2006	Nov 17 - Dec 20	CHN	Adult	71 (D)		-		
2006-2007	Winter	RBT/SH	Juvenile	1 (A)	MRS	-		
		CHN	Juvenile	792 (A)		-		
	Dec 14 - Jun 29	RBT/SH	Juvenile	1,197	RST at Shelton Road	7,294	80% CI= 6,718-13,279	
		CHN	Juvenile	2,124		13,777	80% CI= 12,914-25,986	
2007-2008	Nov 13-Jul 11	RBT/SH	Juvenile	1,873		11,116	80% CI= 9,651-19,681	
		CHN	Juvenile	1		-		
2008-2009	Nov 4-Jul 10	RBT/SH	Juvenile	1,312		7,794	80% CI= 6,722-13,467	
2009-2010	Nov 10-Jul 15	RBT/SH	Juvenile	2,769		13,670	80% CI=13,288-28,460	
2010-2011	Nov 2-Jul 15	RBT/SH	Juvenile	742		3,706	80% CI=3,632-8,318	
2011	Fall	CHN	Adult	186 redds	Above/below (48/138) Bellota	465	CI not reported	
2011-2012	Oct 27-Jul 7	RBT/SH	Juvenile	821	RST at Shelton Road	3,019	80% CI=3,019-3,509	SEWD. Unpublished data (2011-2015). Field notes and summary reports on file at FISHBIO, Oakdale, CA.
		CHN	Juvenile	2,311		12,132	80% CI=12,132-13,682	
2012-2013	Nov 5-Jul 12	RBT/SH	Juvenile	336		2,091	80% CI=2,057-4,142	
		CHN	Juvenile	449		4,082	80% CI=3,787-7,513	
2013-2014	Nov 5 – Jul 11	RBT/SH	Juvenile	1104		3,136	80% CI=3,077-5638	
		CHN	Juvenile	11		-		
2014-2015	Nov 17 – Jul 1	RBT/SH	Juvenile	532		884	80% CI=881-1,366	
		CHN	Juvenile	21		-		

CHN = Chinook salmon; RBT/SH = Rainbow trout/steelhead; RST = rotary screw trap; MRS = Mormon Slough; SDC = Stockton Diverting Canal; OCR = Old Calaveras River; A = Alive; D = Dead

4.2 Central Valley Spring-run Chinook Salmon

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. Central Valley spring-run Chinook salmon were listed as threatened on September 16, 1999 (64 FR 50393) and their threatened status was reaffirmed on June 28, 2005 (70 FR 37160).

Critical habitat for Central Valley spring-run Chinook salmon was designated on September 2, 2005 (70 FR 542488), and generally includes the Sacramento River and its tributaries. The spring-run critical habitat designation excludes the San Joaquin River and its tributaries, including the Calaveras River.

Central Valley spring-run Chinook salmon and their designated critical habitat currently do not occur within the Calaveras River watershed and their historic presence is unlikely. Yoshiyama *et al*. (1996; 2001) indicated that the Calaveras River lacked suitable habitat for Central Valley spring-run Chinook salmon. Nonetheless, Central Valley spring-run Chinook salmon are included in the HCP as there is a slight potential that they could be observed in the future and be affected by HCP in-water activities.

4.3 Central Valley Steelhead

The Central Valley steelhead DPS is a genetically unique population that consists of steelhead occupying the Sacramento and San Joaquin River watersheds (inclusive of and downstream of the Merced River) basins in California's Central Valley. The DPS was first listed on March 19, 1998 (63 FR 13347). The final listing determination for Central Valley steelhead as threatened was issued on January 5, 2006 (71 FR 834).

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).

4.4 Central Valley Fall-/Late Fall-run Chinook Salmon

The Central Valley fall-/late fall-run Chinook salmon ESU 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-/late fall-run Chinook salmon ESU as threatened (60 FR 30263). Listing was found not warranted and the species was 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.

The proposed HCP area is within Essential Fish Habitat (EFH) for Pacific salmon pursuant to provisions of the Magnuson-Stevens Fishery Conservation and Management Act (MSA). This designation includes Central Valley fall-/late fall-run Chinook salmon. Though the historical presence of this race of salmon in the Calaveras River is unknown, the Calaveras River downstream of New Hogan Dam frequently maintains a connection with the Delta and ocean environment and is categorized as EFH.

Chapter 5. Covered Activities

Activities requested for coverage under the ITP ("Covered Activities") include two different types: (1) activities necessary to operate and maintain Project facilities during the ITP duration, and (2) activities associated with conservation strategies.

5.1 Project Facilities Operation and Maintenance Activities

Covered activities necessary to operate and maintain Project facilities during the ITP duration are categorized by activity type (e.g., reservoir impoundment, controlled release, water withdrawals, and activities within the stream channel) in Table 5. Detailed descriptions of Project facilities associated with these covered activities and their operations and maintenance are provided in Appendix C. Impacts associated with these covered activities are discussed in Chapters 6-7.

Table 5. **Covered activities necessary to operate and maintain (OM) Project facilities during the Incidental Take Permit duration, categorized by activity type.**

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 M&I & agricultural customers through OM2, and OM3-OM5 and provide groundwater recharge through OM3; typ. releases range Apr-Oct: 75-250cfs & Oct-May: 20-86 cfs – non-flood control reasons.		
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 & remove 8' & 2' weirs/ fish ladders - start & finish of irrigation season

OM4. Artificial Instream Structures and SEWD Small Instream Dam Operations	-	See OM1	Water diverted into channels (MRS/SDC, Old Calaveras River, Mosher Creek, Bear Creek, and Potter Creek) impounded by small dams and used by agricultural customers	Install and remove flashboard dams - start & finish of irrigation season
OM5. Privately Owned Diversion Facilities Operated within the District's Service Areas	-	See OM1	Water diverted by agricultural customers primarily downstream of Jenny Lind	
OM6. SEWD Channel Maintenance	-	Reduced up to 5 days annually, as required for maintenance activities concurrent with flashboard dam installation mid-April	Dewatering during rebuilding of earthen dams	Maintenance (debris removal, vegetation erosion control, 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

5.2 Conservation Program Activities

The Conservation Program consists of conservation strategies that were developed to minimize and mitigate incidental take associated with the seven covered activities identified in Table 5 and these measures are also considered Covered Activities. As part of the CHCP development process, the District has voluntarily implemented a variety of interim and long-term conservation strategies (since 2006 or earlier) with respect to management of New Hogan water supplies. A summary of conservation strategies/mitigation measures (CS) and associated biological objectives and targets are presented in Table 6. Detailed descriptions of conservation strategies are provided in Chapter 7.

Chapter 6. Impacts from the District's Project Facilities Operation and Maintenance Activities

This chapter presents a brief overview of how the District's project facilities operation and maintenance activities may impact CHCP species either beneficially or negatively, followed by more specific details for individual activities.

<u>Irrigation Season</u>

Project Operations are frequently discussed in relation to their occurrence during either the irrigation or non-irrigation season; therefore, these seasons are defined as follows:

- The irrigation season is contingent on the water conditions of both the prior year and projections for the upcoming year. A decision as to the water year classification (i.e. Dry or Normal/Wet) for operation will be made solely by the District based on available information.

  - Dry Season Determination - Irrigation season begins on or proximally after March 15 and ends on or before October 15, dependent on weather.
  - Normal/Wet Season Determination - Irrigation season begins on or proximally after April 15 and ends on or before October 15, dependent on weather.
- Non-irrigation season begins on or about October 16 and ends on or about April 14, dependent on weather.

The principal activity is the District's flow releases that are made primarily for irrigation during summer and early fall. Prior to the District's operations, there would frequently be extremely low to no flows in the lower river in July, August, and September (Appendix B). Releases from New Hogan reservoir now result in flows within the 18-mile reach between New Hogan Dam and Bellota throughout the summer and fall. Reservoir releases for irrigation provide good quality flow conditions for salmonid spawning and rearing, resulting in benefits to any salmonids present in areas upstream of Bellota. Based on the likelihood of fish presence, steelhead juveniles are expected to receive the most benefits since they generally spend between one and three years in freshwater prior to migrating to the marine environment. Any fall-run Chinook juveniles that remain in the river throughout the summer and migrate as yearlings would also benefit. If winter-run, spring-run, or late fall-run adults were to access the reach upstream of Bellota, then adults and/or juveniles would benefit from summer and early fall flows. If late fall-run adults were to access the reach upstream of Bellota, then juveniles would benefit.

<u>Non-Irrigation Season</u>

Changes in flow patterns associated with reservoir operations during the remainder of the year may affect adult and/or juvenile migration of expected (i.e., *O. mykiss*) or uncommonly present salmonids (i.e. spring- or winter-run Chinook). The level of impacts attributable to the District's operations is unknown due to uncertainties regarding the contribution of other factors influencing flow-related impacts. For example, it is unknown to what extent the channel morphology in the artificially reconfigured Mormon Slough contributes to fish passage problems during operational flow fluctuations. It is also unknown what minimum flows are required for adequate fish passage within both Mormon Slough and the Old Calaveras River channel. Flow effects are also difficult to discern because (1) flow measurements in the lower river between pre- and post-dam years are not directly comparable due to change in the gaging station location from Jenny Lind to Bellota, and (2) flows are now released into and primarily travel through Mormon Slough, which has different channel characteristics than the historic Old Calaveras River channel.

Table 6. Summary of effects addressed, biological objectives and targets, conservation strategies, and monitoring for Central Valley steelhead and fall-run Chinook salmon related to each covered activity. Asterisk indicates non-core monitoring that may be conducted if deemed necessary through the AMP process.

Activity	Effects Addressed	Biological Objectives	Target	Conservation Strategy	Monitoring	
					Compliance	**Effectiveness**
OM1. New Hogan Reservoir Water Impoundment and Non-Flood Control Operations	Flow-related spawning, incubation, and rearing habitat	Flow	**F1.** Guaranteed minimum flow (20 cfs) maintained at Shelton Road	**CS1.** Minimum Instream Flow Commitment	**CM1.** Maintain daily flow and operation records in an operations database	**EM1.** Environmental conditions monitoring **EM2.** Adult salmonid monitoring **EM3.** Juvenile salmonid monitoring **EM12.*** Alternative fisheries monitoring
	Flow-related migration opportunities	Flow	**F2.** Under high storage conditions (storage >152,000 AF on October 15), manage fall water storage to optimize migration opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam	**CS2.** Non-Dedicated Fall Storage Management Strategy	**CM1**	**EM1, EM2, EM3, EM12***
	Flow-related spawning, incubation, and rearing habitat and migration opportunities	Flow	**F3.** During flood control season periods not covered by F2 and CS2, coordinate flood control releases with USACE to optimize salmonid migration opportunities into/out of the 18-mile spawning and rearing	**CS3.** Flood Control Release Coordination with, and Advisory Support to, the U.S. Army Corps of Engineers (USACE)	**CM1**	**EM1, EM2, EM3, EM12***

Activity	Effects Addressed	Biological Objectives	Target	Conservation Strategy	Monitoring	
					Compliance	Effectiveness
			reach between Bellota and New Hogan Dam			
	Flow-related spawning, incubation, and rearing habitat and migration opportunities	Flow	**F4.** Promote water conservation in the basin to help reduce the potential for water storage levels to fall to critical levels	**CS4.** Agriculture and Municipal Conservation Programs	**CM2.** Document implementation of Agriculture and Municipal Conservation Programs	NA
OM2. SEWD Old Calaveras River Headworks Facility Operations	Migration delays and blockage, and entrainment	Fish Passage and Avoid Entrainment	**FP1 and AE1**. Avoid migration delays and blockage, and entrainment within the Old Calaveras River Channel by constructing a non-entraining barrier at the Old Calaveras River Headworks Facility and at the downstream end of the channel near the confluence with the SDC within the first ten years of the ITP	**CS5.** Old Calaveras Headworks Facility Improvement	**CM3.** Document completion of the Old Calaveras Headworks Facility Improvement Project	**EM4.** Fish evaluation and salmonid relocation during fall flashboard dam removal operations **EM12***
	Entrainment	Avoid Entrainment	**AE2.** Prior to a permanent solution (AE1), operate a temporary barrier to prevent downstream entrainment into the Old Calaveras River	**CS6.** Temporary Fish Barrier at Old Calaveras Headworks Facility	**CM1**	**EM4, EM12***

Activity	Effects Addressed	Biological Objectives	Target	Conservation Strategy	Monitoring	
					Compliance	Effectiveness
OM3. SEWD Bellota Diversion Facility Operations	Migration delays and blockage, and Entrainment	Fish Passage and Avoid Entrainment	**FP2/AE3.** Construct and implement a combined crest gate/fishway/fish screen at the Bellota Diversion Facility to improve passage into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam and to prevent entrainment; target completion within first five years, but no later than 10 years of the ITP	**CS7.** Bellota Diversion Facility Improvement	**CM4.** Document completion of Bellota Diversion Facility Improvement Project	**EM1, EM2 EM12***
	Migration delays and blockage	Fish Passage	**FP3.** Prior to a permanent solution (FP2), operate temporary fish ladders (typically November 1-March 31) to improve passage into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam at low flows	**CS8.** Temporary Fish Ladders at Bellota Diversion Facility	**CM1**	**EM1,** **EM5.** Monitor pool downstream of Bellota for salmonids during interim fish ladder operations
	Entrainment	Avoid Entrainment	**AE4.** Prior to a permanent solution (AE3), operate temporary fish screens at the Bellota Diversion Facility to reduce entrainment	**CS9.** Temporary Fish Screens at Bellota Diversion Facility	**CM1**	**EM6.** Fish screen effectiveness monitoring. **EM12***
OM4. Artificial Instream Structures and SEWD Small Instream Dam Operations	Migration delays and blockage	Fish Passage	**FP4.** Implement improvements at artificial instream structures in Mormon Slough/SDC that block or impede fish passage (DWR 2007a) in order to increase passage opportunities	**CS10.** Artificial Instream Structural Improvements	**CM1, CM5.** Document schedules and implementation status for artificial instream structure improvement projects and flow sensors	**EM1, EM2, EM7.** Structural improvement monitoring **EM8.** Stakeholder education efforts **EM12***

Activity	Effects Addressed	Biological Objectives	Target	Conservation Strategy	Monitoring	
					Compliance	Effectiveness
			into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam; at minimum, Tier 1 structures in Mormon Slough/SDC owned and operated by Stockton East Water District (i.e., 5) will be improved			
	Stranding	Fish Passage	**FP5.** Reduce potential stranding conditions during end-of-irrigation-season flashboard dam removal by sequential removal of dams in a downstream direction	**CS11.** Fall Flashboard Dam Removal Operations	**CM6.** Document annual fall flashboard dam removal operations and any associated salmonid relocation	**EM4, EM12***
	Migration delays and blockage	Fish Passage	**FP6.** Improve juvenile downstream migration during the irrigation season by installing passage notches into otherwise impassable flashboard dams	**CS12.** Flashboard Dam Notches	**CM7.** Document annual installation of flashboard dam notches	**EM9.** Fyke net evaluation of flashboard dam notches **EM12***
	Migration opportunities	Fish Passage	**FP7.** Improve identification of fish passage opportunities and increase water use efficiency through use of flow sensors at 10 potential flashboard dam locations	**CS13.** Supervisory Control and Flow Data Acquisition System	**CM1**	**EM1, EM7, EM12***
OM5. Privately Owned Diversion Facilities Operated within the District's Service Areas	Entrainment	Avoid Entrainment	**AE5.** Through the AMP process, prioritize diversion structures within the first two years of ITP and help implement fish screens at	**CS14.** Fish Screens for Privately Owned Diversions	**CM8.** Document prioritization of fish screens for privately owned diversions	**EM8, EM12***

Activity	Effects Addressed	Biological Objectives	Target	Conservation Strategy	Monitoring: Compliance	Monitoring: Effectiveness
			privately owned diversions until priority list is exhausted, thereby preventing entrainment of salmonids into priority unscreened diversions			
	Entrainment	Avoid Entrainment	**AE6.** Educate stakeholders (workshop within first six months of ITP issuance; annual newsletters; regular website updates) regarding potential fish impacts from irrigation practices	**CS15.** Stakeholder Education Program	**CM9.** Document Stakeholder Education Program activities	**EM8, EM12***
OM6. SEWD Channel Maintenance for Instream Structures	Direct equipment-related injury and mortality; Water quality (turbidity)	Avoid Direct Injury and Mortality; and Water Quality	**AD1/WQ1.** Avoid or minimize potential mortalities or injuries associated with heavy equipment and turbidity-related impacts through implementation of approved Instream Structure Maintenance BMPs	**CS16.** Instream Structures Maintenance Timing and Actions	**CM10.** Document SEWD Instream Structures maintenance	**EM10.** SEWD Instream Structures maintenance operations water quality monitoring and/or visual assessment
OM7. Fisheries Monitoring Program	Direct handling-related injury and mortality	Avoid Direct Injury and Mortality	**AD2.** Adhere to approved handling protocols to minimize handling stress and reduce injuries and mortality	**CS17.** Fish Handling Protocols	**CM11.** Document take associated with fisheries monitoring	**EM11.** Fisheries Monitoring take assessment

6.1 New Hogan Reservoir Water Impoundment and Non-Flood Control Operations

During the irrigation season, reservoir releases average about 150 cfs and provide 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 M&I purposes ensure that some flows are provided to at least Bellota; however, flows do not continue downstream of Bellota during this season until freshet events or flood control releases occur.

The amount of reservoir storage available for the District's use is influenced by the USACE's flood control operations that can occur between December and May. Impacts to species associated with flood control have been previously addressed in a biological opinion (NMFS 2002); therefore, the USACE's flood control management is not a covered activity under this CHCP but is briefly mentioned in this section regarding its potential influence on non-flood control management.

Non-flood control management, including the storage of water in New Hogan, can result in both beneficial and adverse effects to salmonids depending on time of year, species, and life stage. Since 1978, SEWD has typically provided year-round flows between New Hogan Dam and Bellota, which has provided instream habitat in areas that would have historically gone dry during the summer months. However, there are no minimum flow requirements and future reductions in fall and winter flows are possible in the absence of a minimum flow standard. Year-round flow releases provide instream habitat conditions that support adult spawning, adult holding, and juvenile salmonid rearing upstream of Bellota. These year-round flows are particularly beneficial to any steelhead utilizing the area since they may stay in the river for up to three years before migrating to the marine environment.

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. Like other impoundments, the magnitude and duration of peak flow events have been reduced, which can affect 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.

According to the USACE (2001),

> In years of normal rainfall, flood flow releases and inflow below New Hogan Dam provide adequate river flows to meet the needs of SEWD and CCWD. However, a year, or several consecutive years (such drought periods as [1976-77] and 1988-92) of subnormal rainfall create a series of problems. At the start of the winter season, New

> Hogan must have flood control space available [i.e., reservoir level required to be 152,000 AF or less by December 1]. This requirement limits the amount of water that can be carried over from year to year. Even if it were possible to reach the fall season with a full reservoir, it would be necessary to release part of the water to obtain flood control space. If the expected rains occur, then the reservoir is refilled. If it turns out to be a relatively dry winter, then several things will happen. Agricultural and domestic irrigation demand will rise sharply due to the lack of rainfall and the inflexible nature of water demand for these purposes. If rainfall does not provide adequate water for crops, then the water districts have to provide the needed water from other sources [e.g., groundwater]. At the same time, the river levels will fall due to lack of local runoff, lack of reservoir flood control releases, and the increase in irrigation diversions. By spring, the water levels in both the reservoir and the river will be low and the reservoir will be operated to store as much water as possible over the summer against the possibility of a second dry year [resulting in increased reliance on groundwater in an already critically overdrafted basin]. By the next fall, there will be no need to pre-release water to obtain flood control storage space because there will be more storage space available than is desired. Should a second winter follow with subnormal rainfall, then by spring, the reservoir level will be approaching the minimum pool level. The water districts will be in a water storage shortage condition and will be seeking additional supplies to meet their user needs.

Due to the potential risk of successive drought years that can quickly drain the reservoir to minimum storage levels, SEWD conservatively manages the reservoir between October 15 and April 15 by releasing only those flow amounts necessary for M&I purposes. As a result, passage flows downstream of Bellota are limited to periods when freshets or flood control releases occur. Managed passage flows are infeasible not only because water supply deliveries could be negatively affected, but also because instream rearing conditions for fisheries in following years could be adversely affected as a result of reservoir storage reductions. Reduced reservoir storage conditions during key life history periods may lead to elevated water temperatures or a lack of sufficient water for fisheries purposes.

Although in most years managed fish passage flows are not practical, there are some years (i.e., when reservoir levels are high throughout the summer and are greater than 152,000 AF on October 15) that release volumes are increased above M&I needs between October 15 and December to evacuate the flood storage reserve, which can result in flows downstream of Bellota and corresponding opportunities for managed passage conditions.

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). As indicated in Chapter 3, migration opportunities occur in most years with a higher percentage of average daily fall- (Sep 1-Nov 30) and spring (Mar 1-Mar 31) flows meeting the migration opportunity criteria after New Hogan Dam was built, while the percentage of winter flows (Dec 1-Feb 28) meeting the criteria is less during the post-dam period. In recent years, salmonids have occasionally been observed entering the river as early as November. 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.

Although flows occur year-round between New Hogan and Bellota, flows can recede to very low or non-existent levels in both Mormon Slough and the Old Calaveras River channel during periods between flood control releases and/or storm events in the non-irrigation season, which can result in temporary migration delays or stranding and associated mortality of both adult and juvenile migrants. For adult salmonids, the extra cost in energy associated with temporary delays and extended migration may reduce the ability of fish to successfully spawn (Banks 1969; Mundie 1991). Juveniles that are temporarily delayed may be exposed to an increased susceptibility to predation or thermal stress. Any live fish remaining downstream of Bellota may continue their migration during a subsequent flow event.

Even though typical reservoir operations have the potential to affect flow patterns and corresponding fish passage opportunities, there are still freshet events and/or flood control releases of sufficient magnitude and duration for migration to occur during normal to above normal precipitation years, particularly for steelhead (Chapter 3; Table B-2 in Appendix B). Moreover, migration and rearing opportunities have been enhanced by water- and flow-related conservation strategies that have been ongoing for over ten years (i.e., Agriculture and Municipal Conservation Programs) and ongoing since 2005 (i.e., Instream Flow Commitment; Non-Dedicated Fall Storage Flow Management Strategy; and Flood Control Release Coordination with, and Advisory Support to, the U.S. Army Corps of Engineers). The four conservation strategies were identified during the HCP development process as conservation strategies that could be initiated prior to the issuance of the HCP. Details regarding all six ongoing conservation strategies are described below under section 7.1. Additional migration opportunities and reduced impacts will begin to occur under natural migration and flood control flow conditions once passage improvements are implemented as described in sections 7.4 and 7.5.

6.2 SEWD Old Calaveras River Headworks Facility Operations

The Old Calaveras River Headworks Facility (Headworks Facility; RM 24) consists of four buried culverts at the channel invert equipped with slide gates to control the flow of water into the Old Calaveras River channel. Podesta Reservoir, a privately owned offstream facility located approximately one mile downstream of the Headworks Facility and not within the District’s service area, impounds local inflow during winter and occasionally overtops and spills into the Old Calaveras River channel, which increases the potential for flooding within the channel. Since Podesta Reservoir is not within the District’s service areas, its operations are not included as part of the District’s covered activities. However, information pertaining to Podesta Reservoir operations is provided in the CHCP because it influences the parameters under which SEWD operates the Headworks Facility.

During periods when the Podesta Reservoir is spilling or when there are flood control releases from New Hogan, the Headworks Facility slide gates are closed to prevent flooding in the Old Calaveras River channel. These slide gates are opened during the irrigation season to provide water for agricultural diverters along the channel, and during periods when natural inflows are available between November and June for groundwater recharge. Flows diverted for groundwater recharge are limited to approximately 15 cfs in order to conserve water by preventing flows in the Old Calaveras River channel from reaching the confluence with the mainstem.

Whenever the 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 adverse effects such as 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.

For instance, 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.

Salmonids that remain or are entrained into the channel during the summer months may experience thermal stress; increased susceptibility to predation; entrainment into small, unscreened irrigation diversions; or stranding and associated mortality. However, healthy juvenile and adult *O. mykiss* have been relocated from the channel in early fall (SEWD unpublished data), which indicates that under some conditions, rearing conditions within the channel can be adequate. Moreover, the potential for entrainment into the channel and subsequent stranding has been reduced since 2005 by installation and operation of a temporary barrier at the Headworks Facility. This conservation strategy was identified during the HCP development process as an activity that could be initiated prior to the issuance of the HCP. The temporary barrier will continue to be operated until the permanent Headworks Facility improvement is implemented. Details regarding this ongoing conservation strategy are described below under section 7.4 and in Appendix C.

Adult salmonids that attempt to migrate upstream through the channel during their spawning migration are prevented from entering the Calaveras River mainstem upstream of Bellota by numerous passage impediments (e.g., 15 instream structures plus the Headworks Facility). Salmonids unable to continue their upstream migration could eventually spawn in the channel, return downstream and subsequently migrate upstream into nearby waterways including Mormon Slough, or could experience stranding and associated mortality. For those fish that spawn within the 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 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).

6.3 SEWD Bellota Diversion Facility Operations

The Bellota Diversion Facility (RM 24) is a gravity-fed diversion with an associated flashboard weir and temporary fish screens. An 8-foot high weir is generally installed at Bellota 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. The 8-foot high weir allows up to 75 cfs to be diverted throughout the irrigation season. The 8-foot high weir is replaced by October 15 with a temporary 2-foot weir that allows up to 60 cfs to be diverted for M&I purposes. The flashboard dam installation and removal process can take up to two days at Bellota and may require that flows from New Hogan be reduced for several days to about 20-25 cfs for personnel safety.

From November 1 to March 31, water released from New Hogan Reservoir is diverted at Bellota for M&I use at the District's Dr. Joe Waidhofer WTP and for groundwater recharge at groundwater recharge facilities. Approximately 5,000 to 10,000 AF throughout the year is expected to be diverted at Bellota for groundwater recharge. The WTP and groundwater recharge facilities have a substantially greater recharge rate than would occur in Mormon Slough, making recharge within Mormon Slough/SDC infeasible[8]. Only minimal flows continue past the 2-foot flashboard dam structure at Bellota Weir and into Mormon Slough/SDC until freshet events or flood control releases occur.

From April 1 through October 31, a portion of water released from the reservoir is diverted at Bellota for delivery to Potter Creek for irrigation, to the Dr. Joe Waidhofer WTP for M&I use, and for groundwater recharge at groundwater recharge facilities. Water is also delivered for irrigation in Mormon Slough and the Old Calaveras channel through the Bellota Weir slide gates and Headworks Facility, respectively. During the irrigation season, flows are provided to maintain pools behind flashboard dams for agricultural diversions in these channels and typically do not reach the confluence with the San Joaquin River.

Although deliveries into Potter Creek are typically made through the Bellota Diversion Facility, water may also be delivered to Potter Creek through the Peters Pipeline from the New Melones System or through two unscreened pumps (one 4,000 gallons per minute [8.9 cfs] and one 8,000 gallons per minute [17.8 cfs]) located approximately one mile downstream of the Bellota Weir in Mormon Slough. The latter may only occur whenever the flashboard dams are installed in Mormon Slough. Water flows from Potter Creek into Mormon Slough at two points, the old Southern Pacific Railroad Bridge and just upstream of Panella Dam.

Dependent on a variety of factors (e.g., time of year, proportion of water diverted, weir configuration, species, and life stage), salmonids may experience entrainment into the Bellota Diversion Facility; temporary migration delays or blockage; reduced spawning success; thermal stress; increased susceptibility to predation; or stranding and associated mortality.

The potential for entrainment has been reduced since 2005 by installation and operation of temporary screens at the Bellota Diversion Facility. This conservation strategy was identified during the HCP development process as an activity that could be initiated prior to the issuance of the HCP. The temporary screens will continue to be operated until a permanent solution for the

[8] During the non-irrigation season, confirmed recharge rate capacities are 26 cfs at the groundwater recharge facilities and 13 cfs at the Old Calaveras River channel. Recharge rates for Mormon Slough/SDC were estimated to be about 13 cfs more than 30 years ago (Murray, Burns, and Kienlen 1969, 1970), but these rates have not been confirmed and actual rates are considered to be less than those estimated.

Bellota Diversion Facility is implemented. Details regarding this ongoing conservation strategy are described below under section 7.4 and in Appendix C.

Adult passage at the Bellota Weir may either be impeded or blocked dependent on the time of year and associated flashboard dam configuration, and on the magnitude and duration of flows resulting from dam releases and precipitation events. The 8-foot flashboard dam at Bellota prevents adult passage under all flow conditions during the irrigation season; while the 2-foot high flashboard dam prevents the unassisted passage of adult salmonids at low flows but allows passage to occur at higher flows (i.e., >200-250 cfs) during the non-irrigation season. Higher flows are dependent on runoff and tributary inputs associated with precipitation events or on flood control releases.

Since 2000, whenever the 2-foot flashboard dam is in place, a Denil fish ladder is installed as part of the dam structure at the upstream edge of the Bellota Weir. The ladder is considered a conservation strategy designed to increase upstream fish passage opportunities from the pool on the apron of Bellota Weir to the pool upstream of the Bellota Weir under low flow conditions. Since 2002, a second fish ladder is installed on the downstream edge of the weir to assist fish passage onto the apron. A 2-foot temporary dam on the downstream side of the Bellota Weir apron was replaced in 2006 by a permanent 2-foot high rock dam in order to create a deeper pool on the apron of the weir for more effective fish passage into the upper ladder. These conservation strategies (ladders and rock dam) were identified during the HCP development process as measures that could be initiated prior to the issuance of the HCP. The temporary ladders will continue to be installed and operated until a permanent solution is implemented. Details regarding these ongoing conservation strategies are described below under section 7.4 and in Appendix C.

Although the temporary ladders assist some adults in accessing the reach upstream of Bellota, the ladders are only designed to operate under a limited range of flow conditions, so adult passage continues to be impeded under varying flows, even when the 2-foot dam and ladders are in place. The extra cost in energy associated with temporary migration delays may reduce the ability of fish to successfully spawn (Banks 1969; Mundie 1991). Fish unable to continue their upstream migration could eventually spawn in the channel or could experience stranding and associated mortality. For fish that spawn within the channel, 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 the area when the irrigation season begins, they may become entrained into small, unscreened irrigation diversions.

During flashboard dam removal and installation at the Bellota Weir, flow reductions may result in salmonids, particularly those located downstream of Bellota, experiencing thermal stress, increased susceptibility to predation, temporary migration delays, or stranding and associated mortality. Impacts associated with installation and replacements of the flashboard dams are essentially the same as those discussed below under section 6.5. In the case of Bellota Weir, the flashboards are replaced in the fall instead of removed, but the effects are similar to those identified for flashboard removal.

6.4 Artificial Instream Structures and SEWD Small Instream Dam Operations

In addition to the Bellota Weir and Headworks Facility, there are 28 flashboard dams, two earthen dams, and one headgate dam located within the covered areas of the CHCP (Table 7). 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 (Figures 2-11).

Flashboard dams are installed to facilitate irrigation diversions into numerous small, unscreened irrigation diversions (see section 6.6 below) 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.

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 percolation benefits.

Table 7. Instream Structures operated and/or maintained by SEWD; ownership varies between SEWD, San Joaquin County, or private landowners. Codes provided at end of table. Source: SEWD unpublished data.

Structure Name	Channel	River Mile	Structure Type	Ownership
Gotelli Crossing	CR	35.3	CC	Private
William Crossing	CR	33	LFC	Private
Robie Crossing	CR	32.9	CC	Private
McGurk Earth Dam	CR	27.1	Earth Dam	Private
Sitkin Crossing	CR	27.1	CC	Private
Wilson Crossing	CR	28	LFC	Private
Wilson Diverting Channel	CR	28	LFC	Private
Calaveras River Headworks	OCR	25.9	Slide Gate	SEWD
Mosher Creek Dam	OCR/MCR junction	21.6 (OCR)	Headgate	SEWD
Clements Dam	OCR	21.5	FD	SEWD
Tully Dam	OCR	17.9	FD	SEWD
Eight Mile Dam	OCR	15	FD	SEWD
Murphy Dam	OCR	12.5	FD	SEWD
Pezzi Dam	OCR	12.1	FD	SEWD
Solari Dam	OCR	10.1	FD	SEWD
Cherryland Dam	OCR	7.9	FD	SEWD
McAllen Dam	OCR	6.9	FD	
Bellota Water Intake Structure	MRS	25.1	FD/Slide Gate	SEWD
Watkin Crossing	MRS	16.9	LFC	SEWD
Motoike Dam (aka, Hwy 26 Flashboard Dam or Flashboard Dam #3)	MRS	16.6	FD	SEWD
Fine Road Dam	MRS	15.6	FD	SEWD
Avansino Dam	MRS	14.4	FD	SEWD

Structure Name	Channel	River Mile	Structure Type	Ownership
Hosie Dam	MRS	13.4	FD	SEWD
Hosie Crossing	MRS	13.2	LFC	SEWD
Bonomo Dam	MRS	12.2	FD	SEWD
Piazza Dam	MRS	12	FD	SEWD
Prato Dam	MRS	10.4	FD	SEWD
McClean Dam	MRS	8.5	FD	SEWD
Lavaggi Dam	MRS	7.5	FD	SEWD
Panella Dam	MRS	6.6	FD	SEWD
Main Street Dam	MRS	4.9	FD	SEWD
Budiselich Dam	SDC	2.1	FD	SEWD
Cotta-Ferreira Concrete Crossing	MCR	11.7[9]	FD	SEWD
Lyons Dam	MCR	14.7	FD	County
Leffler Dam	MCR	10.2	FD	County
Bear Creek Diversion	MCR	12.9	FD/DD	County
Cotta-Ferreira Dam	MCR	11.8	FD	SEWD
Billingmeier Dam	PC	3.6	FD	SEWD
Motoike Dam #2	PC	1.4	FD	SEWD
Sanguinetti Dam	PC	-	FD	SEWD
Kennedy Earth Dam	PC	4.7	Earth Dam	SEWD
Machado Crossing	PC	1.0	LFC	SEWD
Motoike Low Water Crossing	PC	6.5	LFC	Private

Codes: CC = culvert crossing, LFC = low flow crossing, FD = flashboard dam, DD = diversion dam, CR = Calaveras River mainstem between Bellota and New Hogan Dam, OCR = Old Calaveras River, MCR = Mosher Slough/Creek, MRS = Mormon Slough, SDC = Stockton Diverting Canal, and PC = Potter Creek.

[9] River mile calculated from confluence of Pixley Slough, Bear Creek, and Mosher Slough/Creek. Channel starts out as Mosher Slough downstream and turns into Mosher Creek.

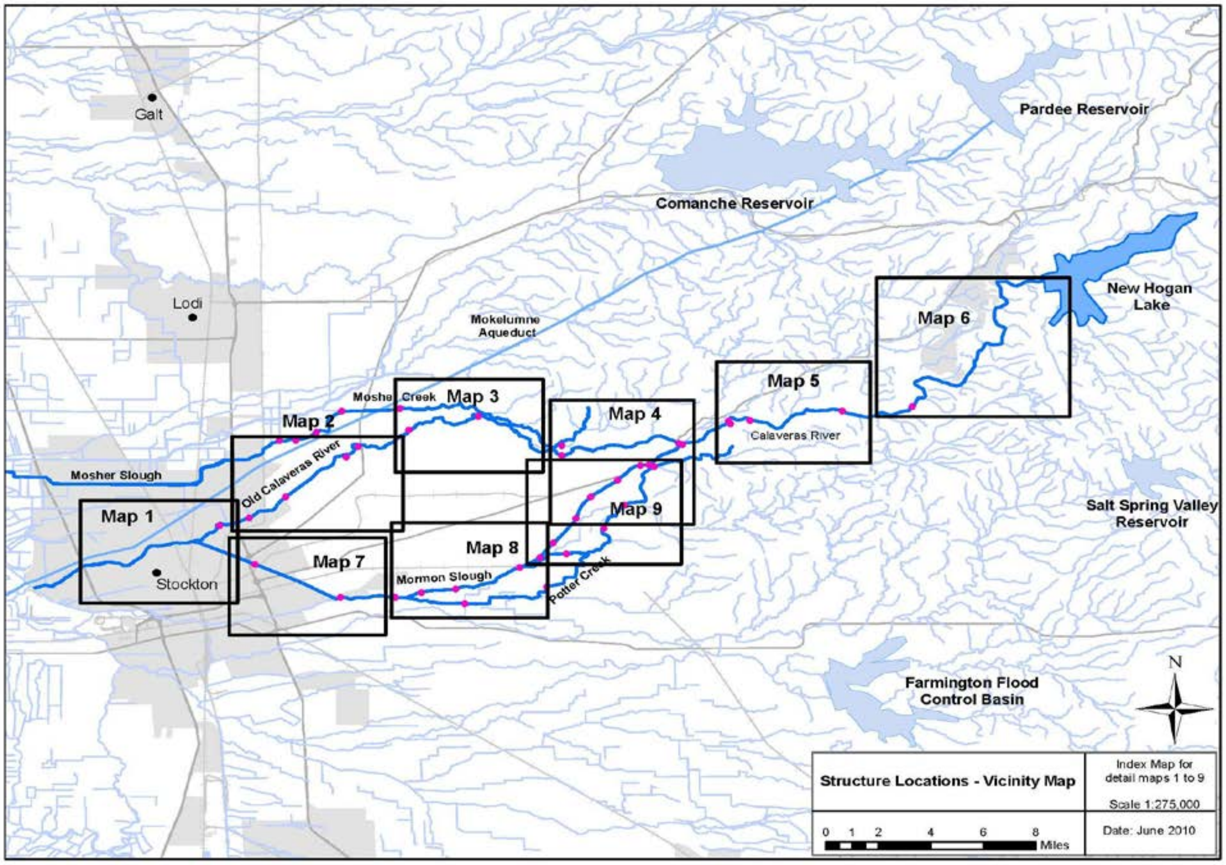

Figure 2. Calaveras River pump and structures locations - vicinity map.

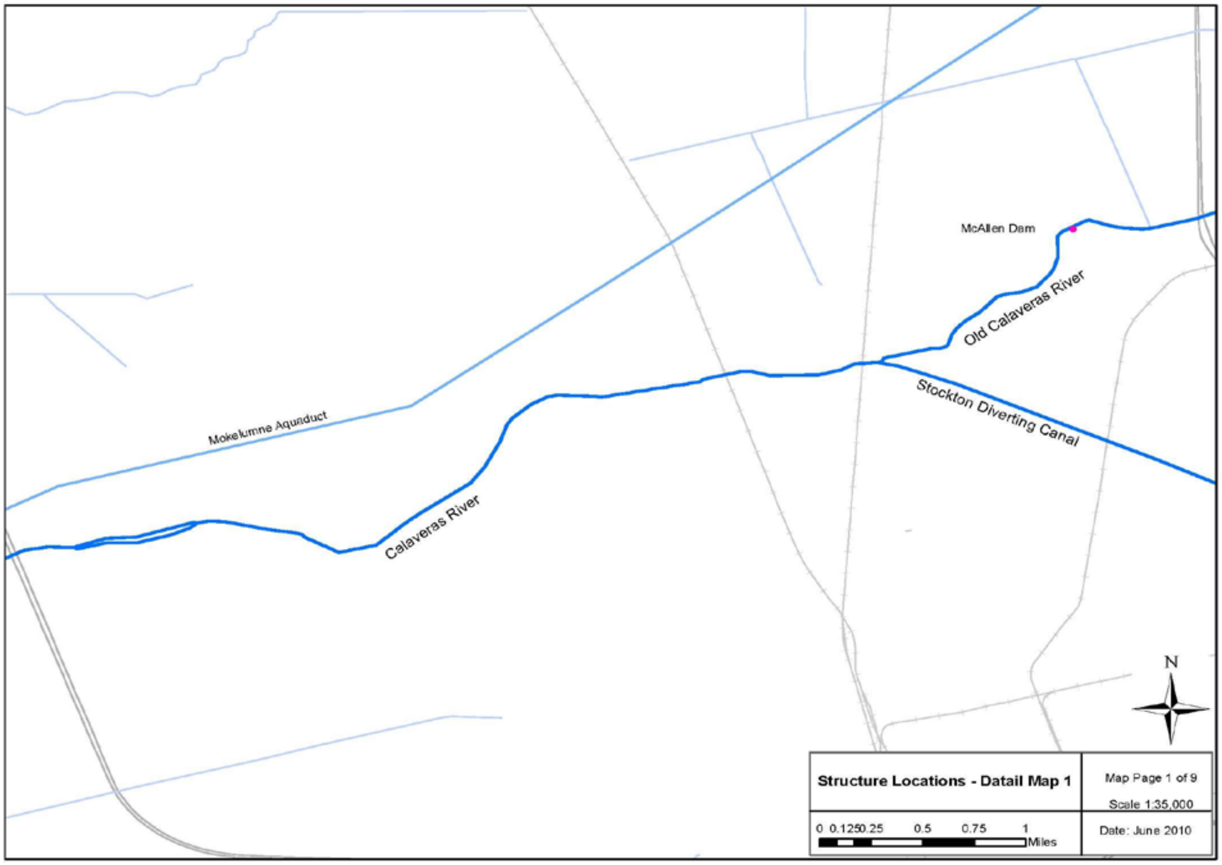

Figure 3. Calaveras River pump and structures locations - Detail Map 1.

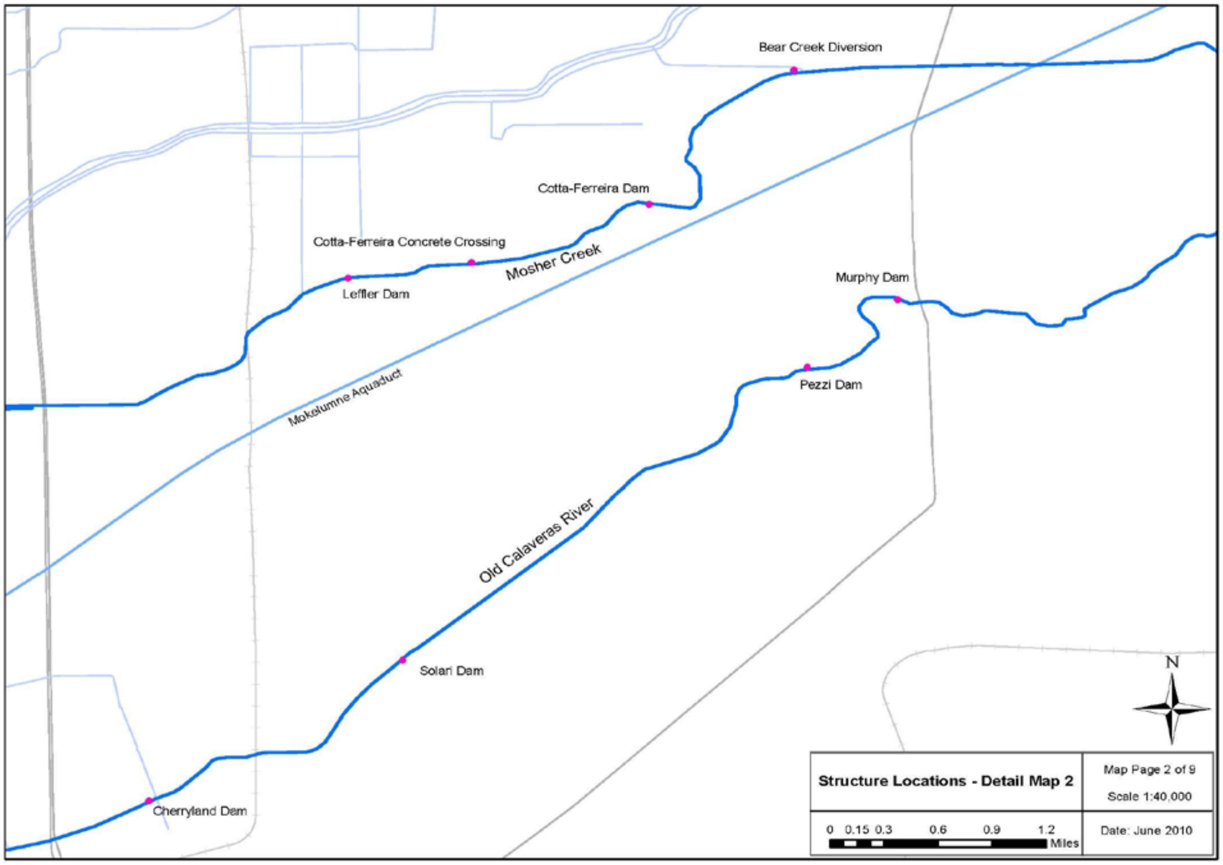

Figure 4. Calaveras River pump and structures locations - Detail Map 2.

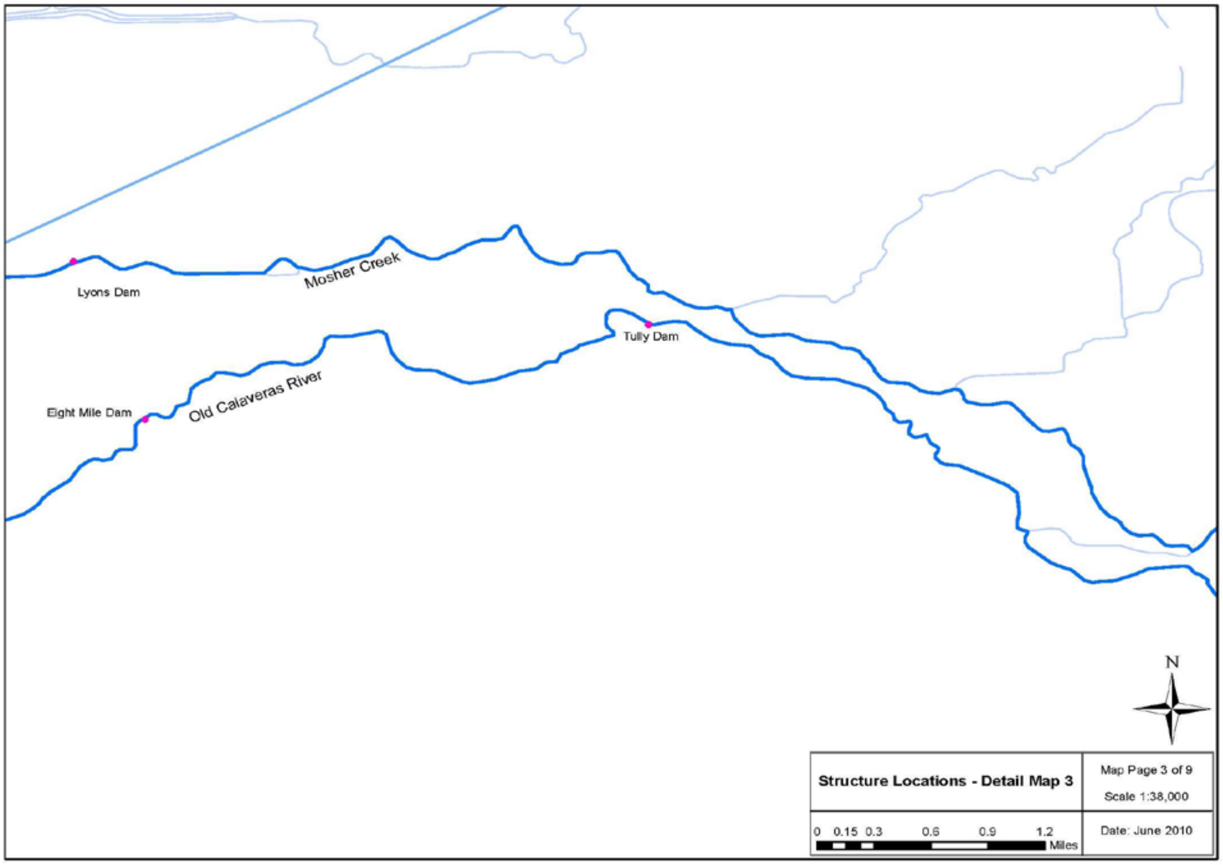

Figure 5. Calaveras River pump and structures locations - Detail Map 3.

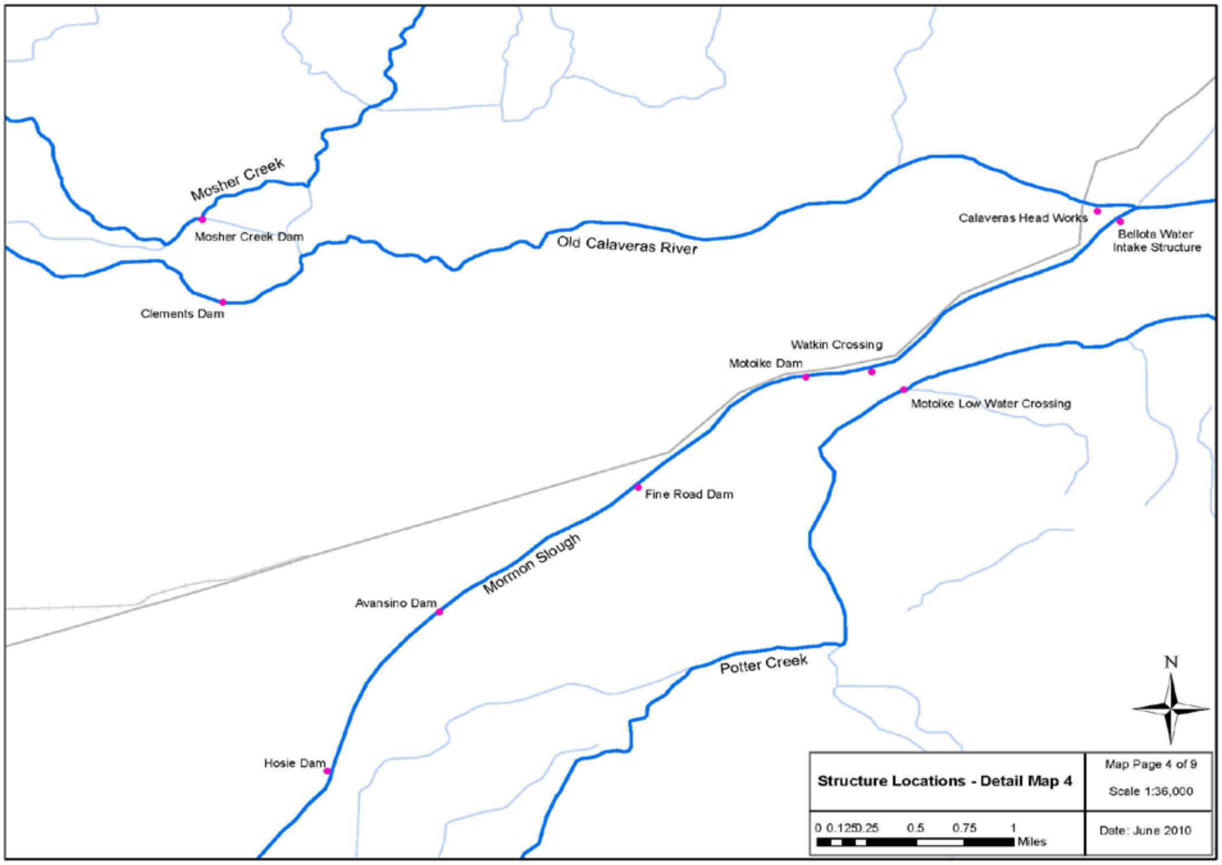

Figure 6. Calaveras River pump and structures locations - Detail Map 4.

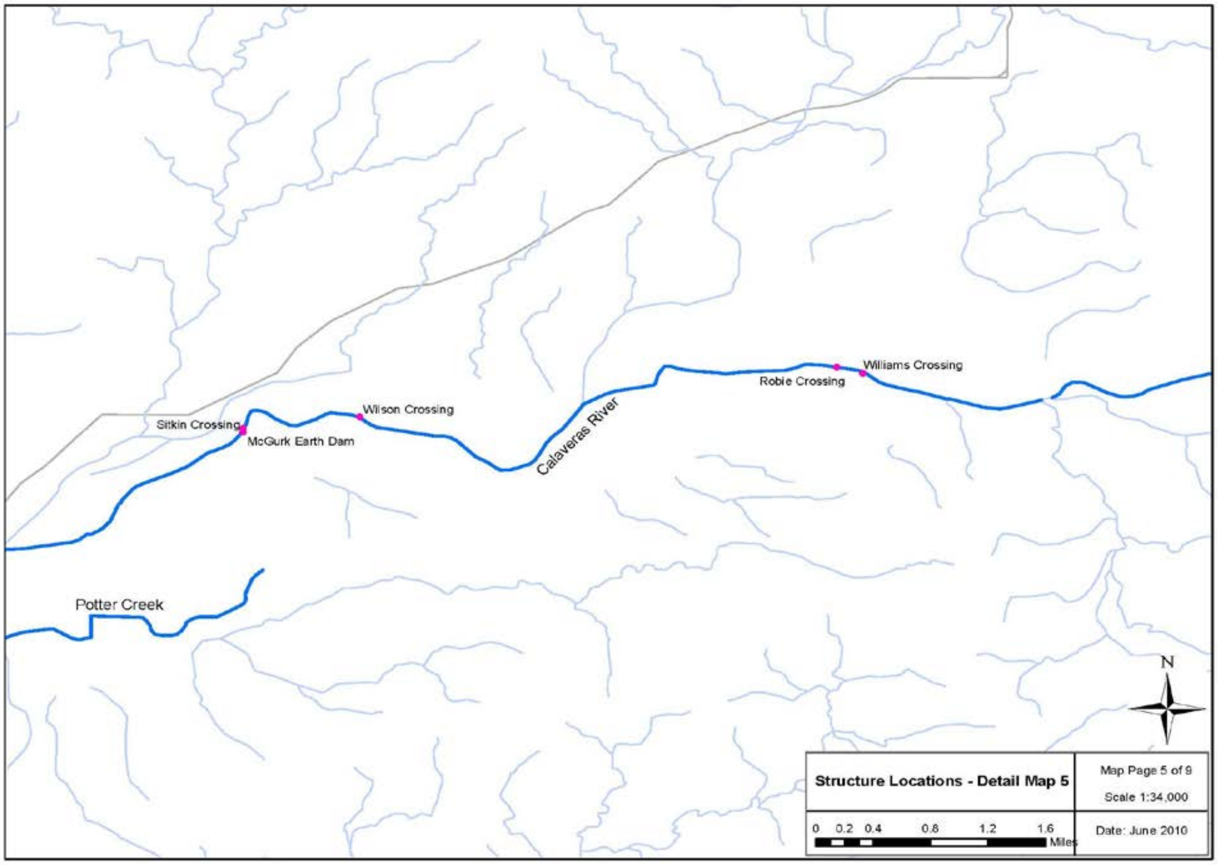

Figure 7. Calaveras River pump and structures locations - Detail Map 5.

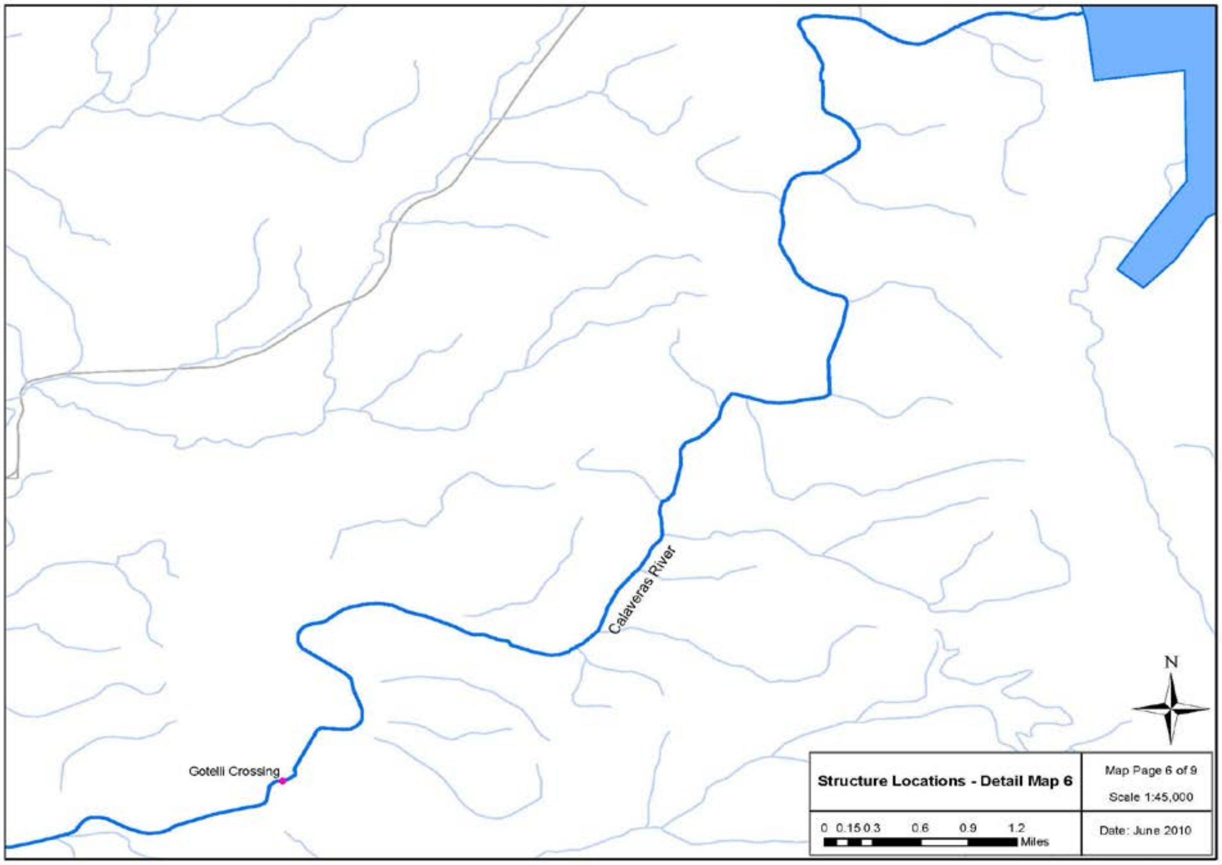

Figure 8. Calaveras River pump and structures locations - Detail Map 6.

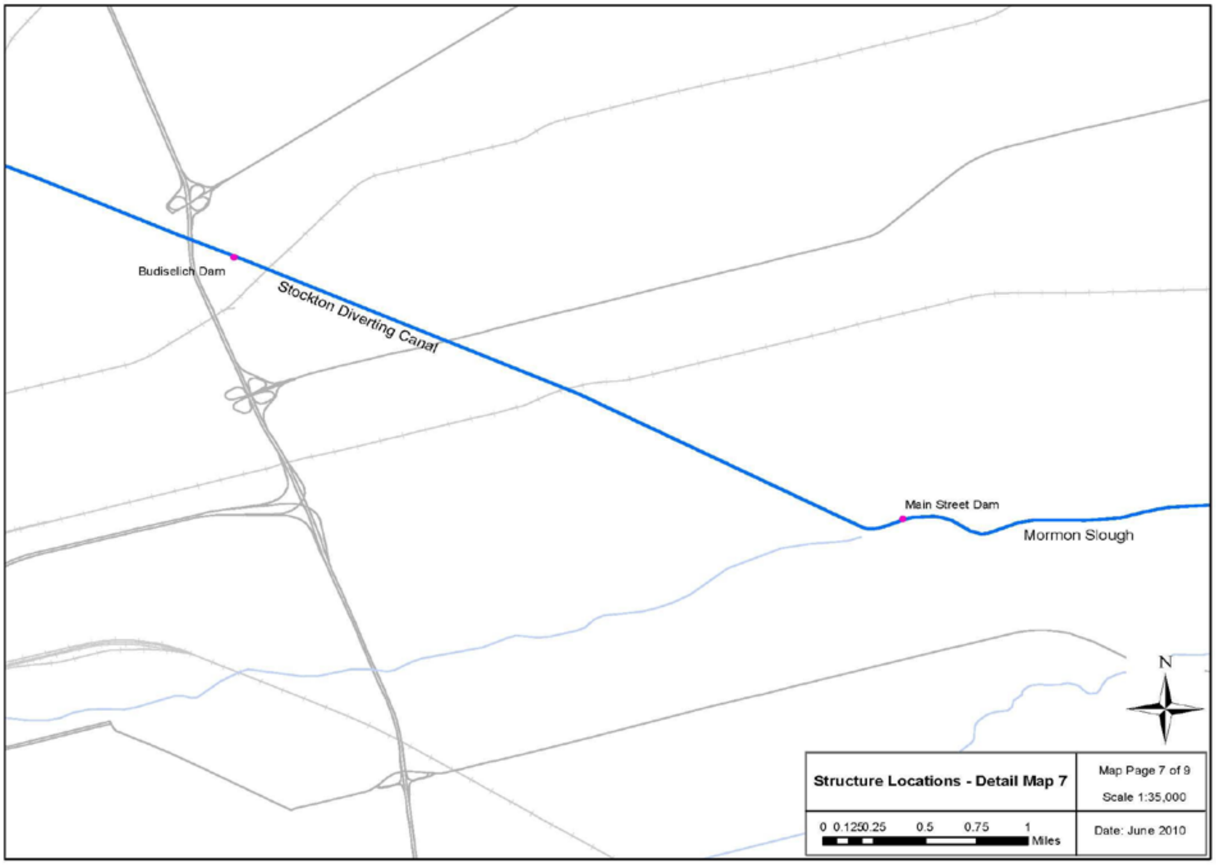

Figure 9. Calaveras River pump and structures locations- Detail Map 7.

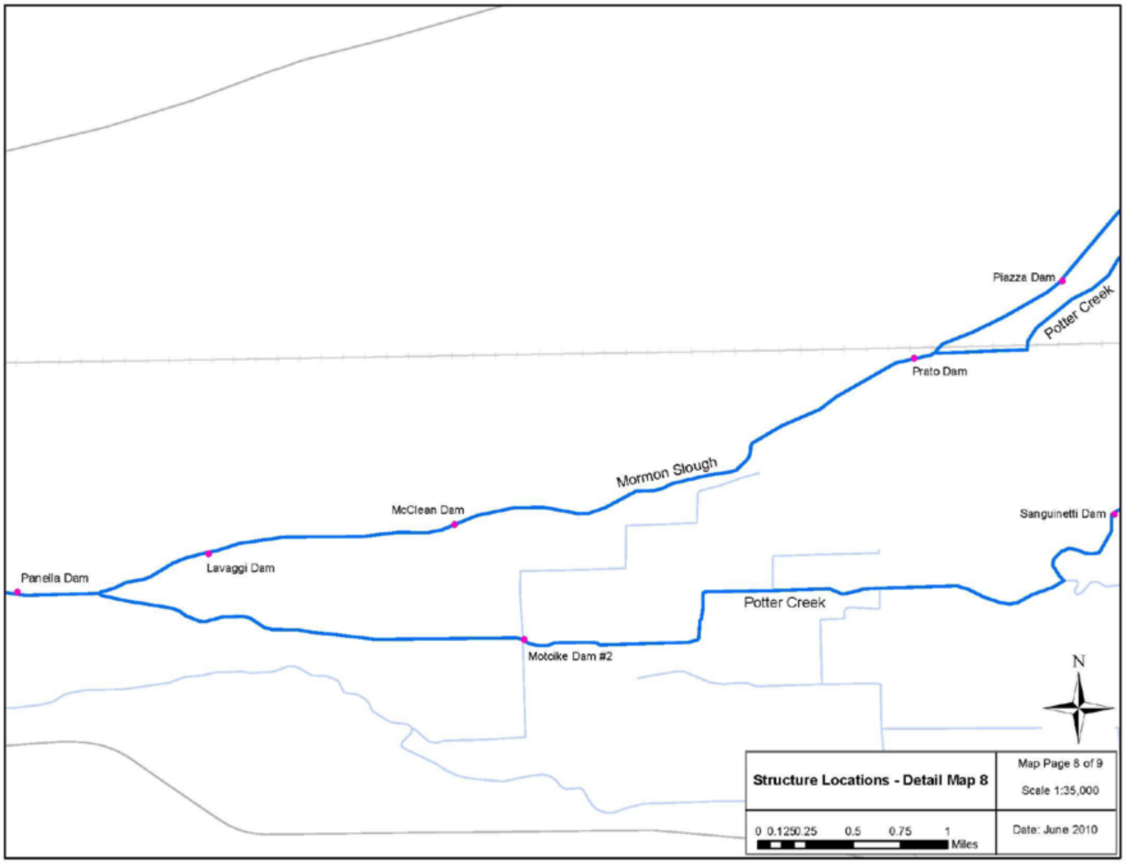

Figure 10. Calaveras River pump and structures locations - Detail Map 8.

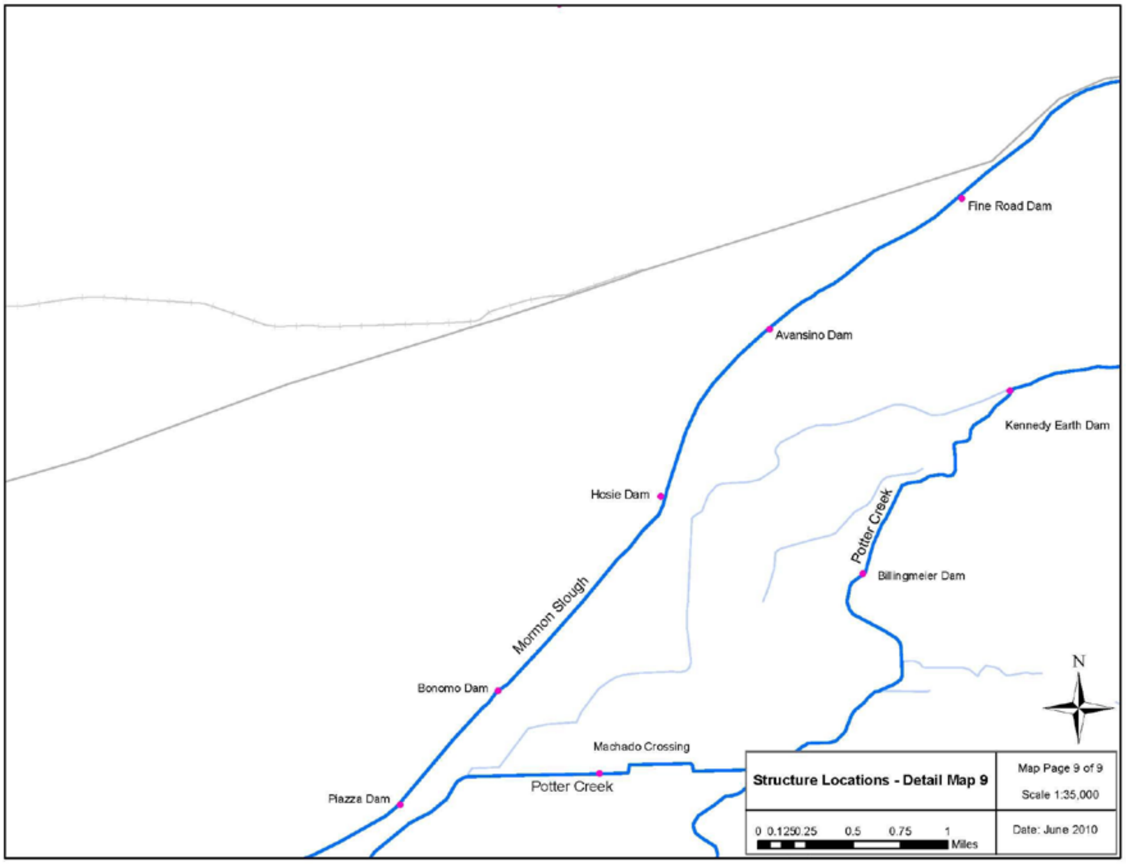

Figure 11. Calaveras River pump and structures locations - Detail Map 9.

The flashboard dam installation and removal process can take up to two weeks. Installation typically occurs when the channels are already dry (either naturally or due to flow blockage by installation of uppermost flashboard dam or closure of slide gates) and no flow changes are necessary except as noted for the installation and removal of the Bellota Weir, described under Section 6.4 above.

During the irrigation season, SEWD operates a small water control structure (i.e., Mosher Creek Dam) with a slide gate within the Old Calaveras River channel approximately three miles downstream from the Headworks Facility. This water control structure diverts water from the Old Calaveras River channel into Mosher Slough/Creek for irrigators along the creek. There is no mechanism to actively divert water from Mosher Slough/Creek into the Old Calaveras River channel and the slide gates are closed during the winter for flood control.

During the irrigation season, SEWD operates a small flashboard/diversion dam (i.e., Bear Creek Diversion Dam) at the entrance to the Bear Creek diverting canal between Mosher Slough/Creek and Bear Creek. The diversion dam is installed primarily to prevent Mosher Creek flows from entering the diverting canal and Bear Creek so that flows from the Old Calaveras River are kept within Mosher Creek for irrigators along the creek. The water that SEWD diverts into Mosher Slough/Creek from the Old Calaveras generally stays within Mosher Slough/Creek and does not reach the Bear Creek/Pixley Slough confluence where these tributaries may continue to the Delta. Occasionally during wet years (estimated occurrence about 15% of years), SEWD also diverts water through the diverting canal into Bear Creek for the North San Joaquin Water Conservation District (NSJWCD) for irrigation and increased recharge. Since flows are only diverted to NSJWCD under conditions when water is abundant, deliveries to Bear Creek do not affect deliveries to the Old Calaveras River channel or Mormon Slough/SDC channel. In order to provide water to NSJWCD, water from Mosher Creek is allowed to flow over the diversion dam into the diverting canal and siphons can be installed in the dam to increase the amount of water diverted to Bear Creek. There is no mechanism to divert water from Bear Creek into the Old Calaveras River channel through the diverting canal.

During the non-irrigation season, SEWD removes the diversion dam and Mosher Slough/Creek flows are diverted through the Bear Creek diverting canal into Bear Creek for flood control purposes under the direction of San Joaquin County. Flows are directed into Bear Creek by closing slide gates that are located across the Mosher Slough/Creek channel just below the diverting canal. Any adult salmonids that might enter Mosher Slough/Creek from the San Joaquin River during flood events or infrequent recharge activities in the winter months would be limited to spawning below the slide gates associated with the Bear Creek diverting canal. Since this winter period is not under SEWD’s jurisdiction, impacts are not considered here.

Dependent on a variety of factors (e.g., time of year, species, and life stage), salmonids may experience entrainment into small unscreened diversions, thermal stress, increased susceptibility to predation, temporary migration delays or blockage, reduced spawning success, or stranding and associated mortality. Potential impacts are similar to those described under 6.3 and 6.4 above.

Prior to 2004, flashboard dams were removed in random order, which typically resulted in several isolated pools forming within the Old Calaveras River where stranding could occur. 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 HCP development process as a conservation strategy that could be initiated prior to the issuance of the HCP. This flashboard dam removal procedure will continue to be operated throughout the life of the ITP. Details regarding this ongoing conservation strategy are described below under section 7.5 and in Appendix C.

In 2006, another conservation strategy was identified and initiated prior to the issuance of the HCP. Notches (one-foot square openings) were placed in flashboard dams within Mormon Slough during the first month of the irrigation season to assist juvenile migration. These flow conveyance openings are installed to provide a pass-through area for downstream migrating fish, particularly under those conditions whenever flashboard dams are not spilling, and fish would not have any other way to travel downstream. These flow conveyance openings will continue to be operated throughout the life of the ITP. Details regarding this ongoing conservation strategy are described below under section 7.5 and in Appendix C.

6.5 Privately Owned Diversion Facilities Operated within the District's Service Areas

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 (Table 8). 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. Diversions above Bellota are less than 5 cfs. Diversion activity occurs only as needed, generally from mid-April through mid-October, which is typically twice a month for 5-10 days. During these diversion periods, pumps may operate in a variety of different patterns (e.g., continuously, during daylight hours only, a few hours each day, or during non-peak power periods) depending on various factors such as weather, size of diversion and irrigated acreage, and type of crop.

Operation of small, unscreened diversions are not likely to result in adverse effects to adult salmonids due to a combination of factors, including operation timing relative to potential adult presence (i.e., diversions occur outside the majority of available adult migration opportunities but may occur during potential *O. mykiss*, and winter-run and spring-run Chinook spawning periods), the majority of diversions (i.e., 90%) being located outside of potential spawning areas, and the low likelihood of entraining larger and stronger swimming fish into low capacity diversions. Juvenile fish are the most susceptible to entrainment due to their limited swim speed and small size. Evaluation of small Sacramento River diversions by Vogel (2013) during peak juvenile salmonid migration periods found that diversions less than 10 cfs had a very low potential for entrainment. These diversions create reduced entrainment water velocity that is within the range that smaller fishes can swim away from when encountered. In addition, Vogel also found that the potential for interaction with smaller diversions was significantly lower when compared to large intake sizes.

During the HCP development process, fishery resource agencies, including NMFS, expressed concern regarding spring water diversion operations conducted by individual farmers within the Mormon Slough and Old Calaveras River channel. In particular, agencies questioned whether flashboard dam installations and diversions in Mormon Slough and the Old Calaveras River channel might begin earlier than is necessary. The agencies indicated that a stakeholder education conservation strategy regarding salmonid outmigration requirements and fish screening would elevate awareness among diverters that delays of spring diversions and/or installation of fish screens would benefit juvenile outmigrants. Therefore, SEWD prepared an educational article regarding steelhead issues and ways that stakeholders could potentially help protect fish within the Calaveras River Basin, which appeared in SEWD's February 2004 stakeholder newsletter. This was followed by a March 2004 educational workshop that provided a brief overview of fish issues in the Calaveras River and potential impacts of water diversion activities on juveniles as they migrate downstream, followed by a question and answer period. At this particular workshop, there was limited stakeholder participation and no changes in diversion practices were observed.

Periodic educational workshops such as this will continue throughout the term of the ITP as determined necessary by the AMP process. Details regarding this ongoing conservation strategy and plans for future screening activity are described below under section 7.6.

Table 8. Privately owned diversion facilities operated within the District's Service Areas in the Calaveras River. Source: SEWD files, CH2M Hill 2005, and CDFG 2006. Codes: [a] indicates estimated value; [b] indicates screened diversion; and "-" indicates unknown. Grey shaded cells were calculated estimates.

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
U092919A	C-3	SEWD	CR	31.5	Centrifugal	40	9	3[a]
U092918D	C-4	SEWD	CR	31.4	Slant	40	12	3.34
U092919B	C-2	SEWD	CR	31.3	Centrifugal	40	8	1.78
U092918C	C-5	SEWD	CR	30.9	Centrifugal	60	14	6.68
U092918B	C-6	SEWD	CR	30.5	Vertical	25	12	2.23
U092918A	C-9	SEWD	CR	30.1	Slant	50	8	6.68
U092919G	C-8A	SEWD	CR	30	Vertical	50	10	2.01
U092919H	C-10	SEWD	CR	30	Centrifugal	75	8	2.9
U092920A	C-13	SEWD	CR	29	Centrifugal	30	8	1.23
U092917A	C-13A	SEWD	CR	27.8	Vertical	-	16	3.79
U092916G,H	C-14	SEWD	CR	27	Vertical	10	48	5.79
U092920C	C-15	SEWD	CR	27	Vertical	15-25 est.	14	3.34
U092920D	C-16	SEWD	CR	26.4	Vertical	60	14	3.34
U092916F	C-17	SEWD	CR	26.3	Vertical	75	14	3.34
U092921A	C-18A,B,C,D	SEWD	CR	25.9	Vertical	30	16	8.91
U092921C	C-19A	SEWD	CR	25.4	Centrifugal	-	14	3.34
U092921B	C-19	SEWD	CR	25.4	Centrifugal	40	8	2.31
U092916E	C-20	SEWD	CR	25.1	Slant	20	14	1.44
U092820G	CR-1B	SEWD	OCR	24.8	Vertical	-	10	3
U092820H	CR-1A	SEWD	OCR	24.8	Vertical	75	13	3.5
U092820F	CR-1A	SEWD	OCR	24.8	Vertical	40	12	3
U092820E	CR-1	SEWD	OCR	24.4	Vertical	25	12	4.5
U092820C	CR-2	SEWD	OCR	24	Vertical	30	16	4.5
U092820D	CR-3	SEWD	OCR	24	-	-	8	1.7
U092820B	CR-5	SEWD	OCR	23.6	Vertical	10	8	1.5
U092819G	CR-6	SEWD	OCR	23	Centrifugal	15	8	1.74
U092819H	CR-5	SEWD	OCR	22.8	Vertical	30	9	2.2
U092819C	CR-8	SEWD	OCR	22.4	Vertical	40	12	3
U092819B	CR-7	SEWD	OCR	22.4	Vertical	5	8	1
U092818B	CR-11	SEWD	OCR	22.3	Vertical	5	9	1.5
U092818C	CR-10	SEWD	OCR	22.2	Centrifugal	25	6	0.5
U092819F	CR-9	SEWD	OCR	22.2	Vertical	15	14	4.5
U092819D	CR-11A	SEWD	OCR	22.1	Vertical	15	13	3.5
U092817D	CR-13	SEWD	OCR	21.8	Screwgate	-	-	-

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
U092817E	CR-15	SEWD	OCR	21.6	Vertical	15	13	3.5
U092817C	CR-17	SEWD	OCR	21.4	Slant	7.5	10	1.9
U092817B	CR-18	SEWD	OCR	21.3	Centrifugal	10	4	0.2
U092818A	CR-14	SEWD	OCR	21.2	Vertical	50	14	4.5
U092816D	CR-19	SEWD	OCR	21.2	Vertical	10	10	2.7
U092817A	CR-21B,C,D	SEWD	OCR	21	Slidegate	-	28	21.3
U092816B	CR-22	SEWD	OCR	20.9	Centrifugal	-	10	1.9
U092816C	CR-23	SEWD	OCR	20.8	Vertical	15	12	3
U092816A	CR-24	SEWD	OCR	20.5	Vertical	-	8	1
U092815B	CR-27	SEWD	OCR	20.3	Vertical	-	10	1.9
U092815A	CR-28	SEWD	OCR	20.1	Vertical	-	10	1.9
U092521B	CR-30	SEWD	OCR	19.8	Vertical	20	12	3.9
U092521C	CR-30	SEWD	OCR	19.8	Centrifugal	25	8	1.7
U092521D	CR-30	SEWD	OCR	19.8	Centrifugal	-	-	-
U092521E	CR-31	SEWD	OCR	19.7	Centrifugal	15	12	3
U092521A	CR-32	SEWD	OCR	19.5	Centrifugal	30	6	0.5
U092520E	CR-32A	SEWD	OCR	19.3	Centrifugal	20	6	0.5
U092520D	CR-31A	SEWD	OCR	18.8	Centrifugal	7.5	8	1
U092520B	CR-32C	SEWD	OCR	18.4	Vertical	25	8	1
U092520C	CR-32B	SEWD	OCR	18.4	Vertical	10	10	1.9
U092520A	CR-33	SEWD	OCR	18.2	Vertical	15	13	3.5
U092519C	CR-34	SEWD	OCR	18.1	Centrifugal	7.5	8	1
U092519B	CR-35	SEWD	OCR	17.6	Centrifugal	20	6	0.5
U092519A	CR-36	SEWD	OCR	17.4	Vertical	-	10	1.9
U092518E	CR-38	SEWD	OCR	17.1	Vertical	20	12	3
U092518D	CR-39A	SEWD	OCR	16.8	Vertical	5	12	3
U092518C	CR-40	SEWD	OCR	16.7	Centrifugal	10	6	0.5
U092518B	CR-42	SEWD	OCR	16.6	Centrifugal	10	8	1
U092518A	CR-44	SEWD	OCR	16.1	Centrifugal	10	8	1
U092517C	CR-44A	SEWD	OCR	15.9	Centrifugal	25	8	1
U092517D	CR-45	SEWD	OCR	15.7	-	-	8	1
U092517B	CR-46	SEWD	OCR	15.4	Centrifugal	15	16	6.5
U092517E	CR-47	SEWD	OCR	15.3	Vertical	15	12	3
U092517A	CR-48	SEWD	OCR	15.1	Centrifugal	10	7	0.7
U092516B	CR-49	SEWD	OCR	15	Centrifugal	-	6	0.5
U092516A	CR-52	SEWD	OCR	14.5	Centrifugal	15	8	1
U092321E	CR-51	SEWD	OCR	14.4	Vertical	25	18	8.5
U092321D	CR-63A	SEWD	OCR	14.3	-	-	-	-
U092515D	CR-52A	SEWD	OCR	14.3	Vertical	15	12	3.9

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
U092515C	CR-55	SEWD	OCR	14	Centrifugal	30	8	1
U092321C	CR-54	SEWD	OCR	13.9	Vertical	5	10	2.7
U092515A	CR-57	SEWD	OCR	13.8	Vertical	20	14	4.5
U092321B	CR-58	SEWD	OCR	13.5	Centrifugal	40	8	1
U092321A	CR-59	SEWD	OCR	13.3	Vertical	10	13	3.5
U092320H	CR-60	SEWD	OCR	13.2	Slant	7.5	9	1.5
U092320I	CR-61	SEWD	OCR	13	Centrifugal	-	8	1
U092320D	CR-63A	SEWD	OCR	12.5	Slant	5	12	3
U092320E	CR-63	SEWD	OCR	12.4	Centrifugal	-	8	1
U092320C	CR-62	SEWD	OCR	12.3	Vertical	5	8	1
U092320F	CR-66	SEWD	OCR	12.3	Slant	10	14	4.5
U092320B	CR-64	SEWD	OCR	12.2	Vertical	5	10	1.9
U092320A	CR-65	SEWD	OCR	12	Slant	7.5	10	2.7
U092319A	CR-69	SEWD	OCR	11.3	Vertical	25	13	3.5
U092319C	CR-71	SEWD	OCR	11.1	Vertical	30	10	1.9
U092821A	CR-28	SEWD	OCR	8.5	Centrifugal	-	6	1
U121516A	M-57	SEWD	MRS	-	Vertical	-	8	1
U121516B	M-56	SEWD	MRS	-	Centrifugal	-	10	2.7
U121516C	M-54A	SEWD	MRS	-	Slant	25	12	3.9
U121516D	M-51	SEWD	MRS	-	Centrifugal	-	10	1.9
U121516E	M-47	SEWD	MRS	-	Slant	20	12	3
U121516F	M-46	SEWD	MRS	-	Slant	25	9	1.5
U121517A	M-45	SEWD	MRS	-	Vertical	-	-	
U121517B	M-44	SEWD	MRS	-	Slant	30	14	4.5
U121517C	M-43	SEWD	MRS	-	Vertical	25	12	3
U121517D	M-40	SEWD	MRS	-	Centrifugal	10	10	1
U121517E	M-43	SEWD	MRS	-	Centrifugal	30	12	3.9
U121517F	M-39	SEWD	MRS	-	Vertical	-	-	1
U121517G	M-38	SEWD	MRS	-	Centrifugal	-	8	0.5
U121518B	M-37D	SEWD	MRS	-	Vertical	-	8	3
U121518C	M-36	SEWD	MRS	-	Vertical	15	4	1
U121518D	M-37E	SEWD	MRS	-	Centrifugal	-	8	1
U121518E	M-37A	SEWD	MRS	-	Vertical	15	12	3
U121518F	M-37B	SEWD	MRS	-	Centrifugal	60	10	1.9
U121518G	M-37C	SEWD	MRS	-	Slant	30	12	3
U121518H	M-35	SEWD	MRS	-	Vertical	10	10	1.9
U121519A	M-31	SEWD	MRS	-	Centrifugal	7.5	8	1
U121519B	M-30	SEWD	MRS	-	Centrifugal	10	6	0.5
U121519C	M-33	SEWD	MRS	-	Centrifugal	50	8	1

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
U121519E	M-29A	SEWD	MRS	-	Centrifugal	-	7	0.7
U121519F	M-28	SEWD	MRS	-	Centrifugal	40	14	4.5
U121519G	M-27	SEWD	MRS	-	Centrifugal	7.5	8	1
U121519H	M-29	SEWD	MRS	-	-	-	-	-
U121520A	M-26	SEWD	MRS	-	Centrifugal	-	10	1.9
U121520B	M-25B	SEWD	MRS	-	Slant	15	10	1.9
U121520C	M-26B	SEWD	MRS	-	Centrifugal	20	6	1
U121520D	M-25A	SEWD	MRS	-	Centrifugal	30	13	3.5
U121520E	M-23	SEWD	MRS	-	Centrifugal	-	10	1.9
U121520F	M-22	SEWD	MRS	-	Centrifugal	20	12	3
U121520G	M-24	SEWD	MRS	-	Vertical	60	14	4.5
U121521A	M-21	SEWD	MRS	-	Centrifugal	-	12	3
U121521B	M-20	SEWD	MRS	-	Centrifugal	15	10	1.9
U121521C	M-19	SEWD	MRS	-	Vertical	-	12	3
U121521D	M-16	SEWD	MRS	-	Centrifugal	40	7	0.7
U121521E	M-13	SEWD	MRS	-	Centrifugal	50	-	-
U121521F	M-18B	SEWD	MRS	-	Centrifugal	15	6	0.5
U121521G	M-18	SEWD	MRS	-	Vertical	15	10	1.9
U121521H	M-17	SEWD	MRS	-	Vertical	15	12	3
U121521I	M-15	SEWD	MRS	-	Vertical	40	12	3
U121521J	M-14	SEWD	MRS	-	Centrifugal	20	7	0.7
U121521K	M-15	SEWD	MRS	-	Centrifugal	20	6	3
U121522A	M-11A	SEWD	MRS	-	Vertical	60	12	3
U121522B	M-48	SEWD	MRS	-	Vertical	-	8	1
U121522C	M-49	SEWD	MRS	-	Centrifugal	-	8	1
U121523A	M-50	SEWD	MRS	-	Vertical	15	10	1.9
U121523B	M-52	SEWD	MRS	-	Centrifugal	-	7	0.7
U121523C	M-54	SEWD	MRS	-	Slant	15	8	1
U121523D	M-55	SEWD	MRS	-	Vertical	-	12	3
U121716A	M-11	SEWD	MRS	-	Vertical	-	12	3
U121716B	M-9	SEWD	MRS	-	Vertical	-	10	1.9
U121716C	M-8	SEWD	MRS	-	Centrifugal	30	9	1.5
U121716D	M-7	SEWD	MRS	-	Centrifugal	40	8	2
U121716E	M-5	SEWD	MRS	-	Centrifugal	20	10	1.7
U121716F	M-5B	SEWD	MRS	-	-	-	6	0.5
U121717C	M-4	SEWD	MRS	-	Slant	75	10	1.9
U121717D	M-1	SEWD	MRS	-	Vertical	10	8	1
U121717E	M-2	SEWD	MRS	-	Centrifugal	30	10	1.9
U121717F	M-6	SEWD	MRS	-	Centrifugal	-	8	1

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
U121717G	M-10	SEWD	MRS	-	Vertical	30	6	0.5
W092915D	MS-3	SEWD	MCR	-	Centrifugal	PTO	7	1
W092915E	MS-3A	SEWD	MCR	-	Centrifugal	-	6	1
W092915F	MS-2	SEWD	MCR	-	-	-	8	-
W092915G	MS-3B	SEWD	MCR	-	Slant	-	14	-
W092916A	MS-5	SEWD	MCR	-	Vertical	20	12	3.9
W092916B	MS-4	SEWD	MCR	-	Centrifugal	15	6	1
W092916D	MS-6	SEWD	MCR	-	Vertical	10	12	3.9
W092916E	MS-7	SEWD	MCR	-	Vertical	15	10	2.7
W092916F	MS-7A	SEWD	MCR	-	Vertical	10	10	2.7
W092917B	MS-8	SEWD	MCR	-	Vertical	-	10	2.7
W092917C	MS-9A	SEWD	MCR	-	Vertical	7.5	12	3.9
W092917E	MS-11A	SEWD	MCR	-	Centrifugal	15	12	3
W092918A	MS-8A	SEWD	MCR	-	Centrifugal	30	10	2.7
W092918C	MS-9B	SEWD	MCR	-	Vertical	10	6	1
W092918D	MS-12	SEWD	MCR	-	Centrifugal	15	16	0.5
W092918E	MS-13	SEWD	MCR	-	Vertical	-	8	1.7
W092918F	MS-14	SEWD	MCR	-	Centrifugal	20	12	0.7
W092919B	MS-14B	SEWD	MCR	-	Vertical	25	8	1.7
W092919C	MS-15	SEWD	MCR	-	Vertical	10	12	3
W092920A	MS-18	SEWD	MCR	-	Vertical	14	14	5.3
W092920C	MS-22B	SEWD	MCR	-	Vertical	20	12	3.9
W092920D	MS-22A	SEWD	MCR	-	Vertical	10	10	2.7
W092920E	MS-21	SEWD	MCR	-	Centrifugal	25	6	1
W092920H	MS-22	SEWD	MCR	-	Vertical	7.5	10	2.7
W092921A	MS-23	SEWD	MCR	-	Centrifugal	25	8	1.7
-	PC-9A	SEWD	PC	-	Vertical	-	-	3.3
-	PC-8B	SEWD	PC	-	Vertical	-	-	2.5
-	PC-6	SEWD	PC	-	Trash Pump	-	-	0.2
-	PC-5	SEWD	PC	-	Vertical	-	10	2.7
-	PC-4	SEWD	PC	-	Vertical	-	-	3.1
-	PC-3	SEWD	PC	-	Centrifugal	-	6	2.7
-	PC-3B	SEWD	PC	-	Centrifugal	-	10	3.3
-	PC-3C	SEWD	PC	-	Vertical	-	6	4.2
-	PC-3A	SEWD	PC	-	Vertical	-	10	3.1
-	PC-2	SEWD	PC	-	Centrifugal	-	-	1.6
-	PC-10	SEWD	PC	-	Vertical	-	10	3.8
-	PC-11	SEWD	PC	-	Centrifugal	-	12	3.9
-	PC-1A	SEWD	PC	-	Centrifugal	-	-	-

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
-	PC-1	SEWD	PC	-	Centrifugal	-	6	1
-	PC-4a	-	-	-	Vertical	-	8	3.1
-	PC-13	-	-	-	Vertical	-	10	3.1
U092819A	-	SEWD	OCR	22.4	Centrifugal	15	6	1
U092818D	-	SEWD	OCR	22	Centrifugal	20	6	1
U092320G	-	SEWD	OCR	12.3	Centrifugal	-	10	2.7
U092319D	-	SEWD	OCR	11.7	Slant	7.5	10	2.7
U092318E	-	SEWD	OCR	9.9	Centrifugal	-	10	2.7
U092318A	-	SEWD	OCR	9.2	Centrifugal	-	8	1.7
U092318B	-	SEWD	OCR	9.2	-	-	6	1
U092318D	-	SEWD	OCR	9.1	Centrifugal	-	4	0.43
U092318C	-	SEWD	OCR	9.1	Centrifugal	-	8	1.7
U092317D	-	SEWD	OCR	8.8	-	-	8	1.7
U092821B	-	SEWD	OCR	8.5	Centrifugal	-	8	1.7
U092317G	-	SEWD	OCR	8.4	Slant	-	9	2.2
U092317E	-	SEWD	OCR	8.3	Centrifugal	10	6	1
U092317F	-	SEWD	OCR	8.3	Centrifugal	-	-	-
U092317H	-	SEWD	OCR	7.8	Centrifugal	7.5	8	1.7
U092317C	-	SEWD	OCR	7.8	Centrifugal	10	9	2.2
U092317I	-	SEWD	OCR	7.7	Centrifugal	10	9	2.2
U092317B	-	SEWD	OCR	7.7	-	-	12	3.9
U092317A	-	SEWD	OCR	7.5	Vertical	-	12	3.9
U092316G	-	SEWD	OCR	7.3	Vertical	7.5	12	3.9
U092316F	-	SEWD	OCR	6.8	-	-	-	-
U092316E	-	SEWD	OCR	6.6	Vertical	9.5	12	3.9
U092316D	-	SEWD	OCR	6.5	Vertical	10	12	3.9
U092316C	-	SEWD	OCR	6.2	-	-	12	3.9
U121519D	-	SEWD	MRS	-	Centrifugal	-	10	2.7
U121717A	-	SEWD	MRS	-	Vertical	30	14	5.3
U121717B	-	SEWD	MRS	-	Slant	50	20	-
U121718A	-	SEWD	MRS	-	-	-	8	1.7
R041815D	-	SEWD	CR	2.4	Vertical	-	14	5.2
R041815C	-	SEWD	CR	2	-	-	12	3.9
R041817A	-	SEWD	CR	2	-	-	10	2.7
R041815B	-	SEWD	CR	1.2	Vertical	40	12	3.9
R041815A	-	SEWD	CR	1.2	Centrifugal	1	3	0.24
R041814E	-	SEWD	CR	0.6	Vertical	10	12	3.9
R041817B	-	SEWD	CR	0.6	Centrifugal	-	6	1.15
R041817C	-	SEWD	CR	0.6	Centrifugal	-	6	1
R041814D	-	SEWD	CR	0.2	Vertical	5	8	1.7
W092915H	-	SEWD	MCR	-	Vertical	-	8	1.7
W092916C	-	SEWD	MCR	-	Centrifugal	7.5	10	2.7
W092917A	-	SEWD	MCR	-	Vertical	7.5	10	2.7
W092917D	-	SEWD	MCR	-	Vertical	15	10	2.7
W092918B	-	SEWD	MCR	-	Centrifugal	-	6	1

CDFG Diversion No.	SEWD Diversion No.	District Service Area	Channel	River Mile	Diversion Type	hp Rating	Intake Size (inches)	1999 Pump Flow Value (cfs)
W092919A	-	SEWD	MCR	-	Submersible	-	8	1.7
W092920F	-	SEWD	MCR	-	Centrifugal	-	4	0.43
W092920G	-	SEWD	MCR	-	Centrifugal	-	2	0.1
W092921B	-	SEWD	MCR	-	Vertical	7.5	12	3.9
W092922A	-	SEWD	MCR	-	Centrifugal	7.5	8	1.7
R050218A	-	SEWD	MCR	-	Siphon	-	16	5.2
R050218B	-	SEWD	MCR	-	Centrifugal	-	13	3.9
R050218C	-	SEWD	MCR	-	Siphon	-	14	3.9
R050218D	-	SEWD	MCR	-	Vertical	10	14	3.9
R050218E	-	SEWD	MCR	-	Vertical	15	16	5.2
R050219A	-	SEWD	MCR	-	Siphon	-	14	3.9

6.6 SEWD Channel Maintenance for Instream Structures

Pursuant to a Routine Maintenance Agreement (RMA) with CDFW (Attachment C-2), SEWD performs routine channel maintenance as needed on numerous structures, including diversion dikes (i.e., flashboard or earthen dams); road and low-water crossings; and intake structures with slide gates and trash racks (Table 7). Routine channel maintenance becomes necessary whenever debris is deposited in these areas due to high flow events and activities may include: (1) debris removal, (2) sediment removal, (3) vegetation control, (4) repair of previous erosion control work, (5) minor erosion control work, and (6) riprap placement using heavy equipment and/or manpower.

Routine maintenance is conducted during authorized timeframes specific to each structure (Attachment C-2) and generally occurs when flows recede enough to access and remove debris outside of the wetted channel.

Typical, infrequent (historically occurs every two to four years) maintenance includes removing sediment at the entrance of Bellota and reconstruction of the McGurk Earth Dam. Whenever flow events is excess of 4,000-5,000 cfs occur, sediments can build up at the entrance to the Bellota intake structure and need to be removed. With flow events greater than 1,200 cfs, an earthen dam known as McGurk Earth Dam is intentionally designed to erode, so that flows can enter the high capacity channel overflow. After the dam is washed away, it needs to be rebuilt. Sediment removal at Bellota and reconstruction of the McGurk Earth Dam is conducted in conjunction with the installation of the flashboards at the Bellota Weir during the spring, and historically takes one to two days to complete.

Dependent on a variety of factors (e.g., time of year, species, and life stage), salmonids may experience temporary increases in stress associated with short-term increases in turbidity resulting from maintenance activities or may experience injury or death of individuals that come into contact with equipment. Juveniles or adults within the immediate area downstream of activities that result in increased turbidity may experience temporarily reduced feeding success, avoidance of rearing habitats, and impeded upstream and downstream migration (NMFS 2004). There is also a low likelihood that juveniles may be injured or killed by contact with equipment. It is unlikely that adults would be injured or killed since they are easier to see than juveniles and therefore can be more easily avoided.

Routine maintenance is conducted on dry ground and therefore no adverse effects are anticipated from these activities. Infrequent maintenance events, including sediment removal at Bellota and rebuilding of the McGurk Earth Dam, occur in flowing water, which can result in the aforementioned impacts. Additionally, McGurk Earth Dam reinstallation may result in temporary dewatering of areas immediately downstream of the dam. Dewatering occurs until enough head is created behind the newly installed dam to result in water flowing downstream through a secondary channel. Potential adverse effects 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).

6.7 Fisheries Monitoring Program

Fisheries monitoring has been conducted since 2002 and will continue throughout the term of the ITP in order to improve understanding of salmonids, particularly *O. mykiss*, within the Calaveras River (Appendix D). Different sampling methods (e.g., RST, snorkeling) will be used to address different questions. Monitoring information will be used to assist water management decisions on the Calaveras River so that a balanced management approach is achievable. It will also be used to evaluate the effectiveness of implementing various conservation strategies.

Dependent on a variety of factors (e.g., time of year, species, and life stage), 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. Any potential adverse effects due to handling stress will be minimized and the potential benefits from the information collected far outweigh the potential adverse effects.

Chapter 7. Conservation Program

The District’s project operations and maintenance activities may result in take of Covered Species in the form of “harm, harass, wound, kill, capture, or collect,” as identified in Chapter 6. Therefore, a Conservation Program consisting of biological goals and objectives, as well as corresponding conservation strategies, has been developed and will be implemented to avoid and minimize take to the maximum extent practicable, and to ensure that permitted activities will not appreciably reduce the likelihood of survival and recovery of Central Valley steelhead and fall-run Chinook salmon (Table 6). Biological goals and objectives are described below, followed by individual conservation strategies (sections 7.1 through 7.7).

The ***Biological goals*** are the broad, guiding principles for the operating Conservation Program and provide the rationale behind the conservation strategies. The ***Biological objectives*** are used to “…step down the biological goals into manageable, and, therefore, more understandable units”; while, conservation strategies “…provide the means for achieving the biological goals and objectives” (65 FR 35242). A corresponding monitoring program has also been developed and will be implemented to provide information to: “(1) Evaluate compliance; (2) determine if biological goals and objectives are being met; and (3) provide feedback information for an adaptive management strategy…” (65 FR 35242). Therefore, CHCP monitoring is divided into two types: compliance monitoring (CM) to verify that conservation strategies are being implemented as described, and effectiveness monitoring (EM) to evaluate whether the conservation strategies are achieving the biological goals and objectives as predicted (Table 6). If the desired results are not achieved, then adjustments in conservation strategies will be considered through an adaptive management process (Chapter 9).

It should be noted that SEWD has previously begun implementing a variety of conservation strategies, both *interim* and *long-term*, to assist in the conservation of Covered Species. The *interim strategies* include a Temporary Barrier at the Old Calaveras River Headworks Facility, Temporary Fish Ladders at Bellota Diversion Facility, and Temporary Fish Screens at Bellota Diversion Facility. The *long-term* strategies include a Minimum Instream Flow Commitment; Non-Dedicated Fall Storage Flow Management Strategy; Flood Control Release Coordination with, and Advisory Support to, the USACE; Agriculture and Municipal Conservation Programs; Fall Flashboard Dam Removal Operations; Stakeholder Education Program regarding Fishery Issues; Artificial Instream Structural Improvements; SEWD Small Instream Structures Maintenance Timing and Actions; and Fish Handling Protocols. Since these conservation strategies were initiated prior to completion of the CHCP, they are included under SEWD's Project Operations; however, these ongoing strategies are primarily considered to be conservation strategies designed to reduce potential incidental take of Covered Species and they will either continue to be employed until more permanent conservation strategies can be implemented (i.e., interim conservation strategies) or will continue to be applied throughout the life of the ITP (i.e., long-term conservation strategies).

In general, conservation strategies have been designed to support 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.

These Biological goals are divided into specific ***Biological objectives*** that identify the various components needed to achieve the Biological goals. Five Biological objectives have been identified (i.e., Flow, Fish Passage, Avoid/Minimize Fish Entrainment, Water Quality, and Avoid/Minimize Direct Fish Injury/Mortality) and each includes metrics, referred to as ***targets***, to track progress toward achieving the particular objective and goals, as follows:

Biological Objective: Flow. Over the term of the ITP, provide instream flows in the Calaveras River downstream of New Hogan Dam to support Central Valley steelhead conservation and the biological needs of fall-, late fall-, spring-, and winter-run Chinook salmon should they migrate into the Calaveras River system (see Biological Goal 2).

The **Flow (F) Objective** has four targets:

F1. Implement minimum guaranteed, continuous instream flows in the Calaveras River at Shelton Road (20 cfs) to protect important salmonid spawning, incubation, and rearing habitats upstream of Bellota.

F2. Under high, end of irrigation-season storage conditions (i.e., when storage is >152,000 AF on October 15), flood control releases must be undertaken by December 1 to achieve a storage level of 152,000 AF by December 1. Therefore, coordinate, as needed, with the USACE to manage flood control releases during the October 15-November 30 period that will optimize migration opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam. This water release pattern would consider the proposed release patterns for the San Joaquin River tributaries and the Mokelumne River to optimize the anadromous fish attraction flow into the San Joaquin River basin. Deviations from the scheduled water release pattern are highly unlikely; however, if substantial precipitation were to occur in October/November, there is a possibility that higher than scheduled releases could become necessary to maintain an adequate flood control reservoir level. These elevated releases would be the result of a naturally occurring weather event, to which native fishes are expected to be well-adapted.

F3. Flood control releases that occur after December 1 will be managed with the USACE to optimize fish migration opportunities (into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam) and spawning and egg incubation by reducing the peak of the release peaks and implementing ramping rates.

F4. Promote water conservation in the basin through BMPs (see page 27 for list of BMPs) to help reduce the potential for water storage levels to fall to critical levels.

Biological Objective: Fish Passage. Over the term of the ITP, improve access into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam that is within the range of the Central Valley steelhead DPS and opportunistic usage by identified runs of Chinook salmon (see Biological Goal 2).

The **Fish Passage (FP) Objective** has seven targets:

FP1. Avoid migration delays and blockage within the Old Calaveras River channel by constructing a non-entraining barrier at the Old Calaveras River Headworks Facility and at the downstream end of the channel near the confluence with the SDC within the first ten years of the ITP.

FP2. Construct and implement a combined crest gate/fishway/fish screen at the Bellota Diversion Facility no later than the first ten years of the ITP to improve passage opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam and to prevent fish entrainment.

FP3. Prior to improving passage at the Bellota Diversion Facility through use of a combined crest gate/fishway/fish screen (FP2), operate temporary fish ladders at the Bellota Weir during the non-irrigation season (typically November 1-March 31) to improve passage opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam at low flows.

FP4. Implement improvements at artificial instream structures in Mormon Slough/SDC that block or impede fish passage (DWR 2007a) to increase passage opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam; at minimum, the five Tier 1 structures in Mormon Slough/SDC owned and operated by Stockton East Water District will be improved. Additional structures in Mormon Slough/SDC identified during the AMP process (Chapter 9) may also be improved as agreed upon by the Governing Board during the course of the ITP.
FP5. Reduce potential stranding conditions during end-of-irrigation-season flashboard dam removal by sequential removal of dams in a downstream direction.
FP6. Improve juvenile downstream migration during the irrigation season by installing fish passage notches into otherwise impassable flashboard dams (i.e., >4 feet high) within Mormon Slough/SDC.
FP7. Improve identification of fish passage opportunities and increase water use efficiency through use of flow sensors at 10 potential flashboard dam locations.

Biological Objective: Avoid/Minimize Fish Entrainment. Over the term of the ITP, avoid or minimize entrainment of Central Valley steelhead, fall-, late fall-, spring-, and winter-run Chinook salmon (should they migrate into the Calaveras River system) at diversion structures identified as priority structures.

The **Avoid/Minimize Fish Entrainment (AE) Objective** has six targets:

AE1. Avoid entrainment within the Old Calaveras River Channel by constructing a non-entraining barrier at the Old Calaveras River Headworks Facility and at the downstream end of the channel near the confluence with the SDC within the first ten years of the ITP.
AE2. Prior to the construction of a permanent non-entraining barrier at the Old Calaveras River Headworks Facility (AE1), operate a temporary barrier (e.g., net, and/or rock weir) to prevent downstream entrainment into the Old Calaveras River channel.
AE3. Construct and implement a combined crest gate/fishway/fish screen at the Bellota Diversion Facility no later than the first ten years of the ITP to improve passage opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam and to prevent fish entrainment.
AE4. Prior to improving passage at the Bellota Diversion Facility through use of a combined crest gate/fishway/fish screen (AE3), operate temporary fish screens at the diversion facility to reduce entrainment.
AE5. Prioritize diversion structures and establish a recommended screening schedule within the first two years of the ITP and subsequently help implement fish screens at privately owned diversions until the priority list is exhausted,[10] thereby preventing entrainment of salmonids into priority unscreened diversions.
AE6. Educate stakeholders (workshop within first six months of ITP issuance; annual newsletters; regular website updates) regarding potential fish impacts from irrigation practices to reduce potential fish entrainment at priority, privately owned diversions.

[10] Screening at a privately owned diversion is contingent upon locating outside funding sources; accordingly, the District acknowledges this activity is not reasonably certain to occur. However, there is some indication that smaller diversions may not have much, if any effect, on salmonids (Moyle and Israel 2005); therefore, there may be a low number of diversions where screens may provide benefits.

Biological Objective: Water Quality. Over the term of the ITP, maintain adequate water quality conditions for Central Valley steelhead and identified runs of Chinook salmon (see Biological Goal 2) in the Calaveras River downstream from maintenance sites.

The **Water Quality (WQ) Objective** has one target:

> **WQ1.** Avoid or minimize potential mortalities or injuries associated with turbidity-related impacts during instream channel maintenance at numerous instream structures through implementation of Instream Structure BMPs (see Appendix C-2 for further details of BMPs).

Biological Objective: Avoid Direct Injury/Mortality. Over the term of the ITP, avoid direct injury and mortality of Central Valley steelhead and identified runs of Chinook salmon in the Calaveras River (see Biological Goal 2) during instream channel maintenance and fisheries monitoring activities.

The **Avoid Direct Injury/Mortality** (**AD) Objective** has two targets:

> **AD1.** Avoid or minimize potential mortalities or injuries associated with heavy equipment impacts during instream channel maintenance (limitation of activities to low or no flow periods) at numerous instream structures through implementation of Instream Structure BMPs (see Appendix C-2 for further details of BMPs).
> **AD2.** Conduct approved handling protocols during fisheries monitoring to minimize handling stress and reduce injuries and mortality.

7.1 Conservation Strategies for New Hogan Reservoir Water Impoundment and Non-flood Control Operations

Conservation strategies for this activity were designed to meet the Flow Objective and associated targets described above under the *Biological Objective: Flow* section. Due to natural hydrologic conditions and limited reservoir capacity, it is impossible to provide year-round flows ***downstream of Bellota*** sufficient to supporte various life stages of salmonids. The Calaveras River is a relatively small, low-elevation drainage that receives runoff mainly from rainfall during November through April (Reynolds et al. 1993), and its lower reaches historically were dry during part of the year (Carson 1852). However, year-round flows can be managed ***between New Hogan and Bellota*** in most years, and migration opportunities into the reach upstream of Bellota will be optimized to the extent practicable. The highest priority reach for habitat protection and improvement has been identified as New Hogan Dam to Shelton Road based upon: (1) typical instream flow patterns, (2) water temperature, (3) quality and suitability of existing habitat for spawning and rearing, and (4) accessibility under existing and future improved passage conditions. To minimize impacts associated with reservoir operations, SEWD will implement four conservation strategies, which will improve instream flow conditions for salmonids during different times of the year and for different life stages, including:

(1) Minimum Instream Flow Commitment. New Hogan releases will be managed to ensure a minimum of 20 cfs at Shelton Road year-round in all years, with the exception of periods during potential critical water storage levels. Minimum flows of 20 cfs or greater at Shelton Road were considered for implementation year-round in all years under all water year types and reservoir conditions. However, 20 cfs was determined to be infeasible under critical water storage periods (typically associated with successive drought years) due to the potential for reducing the reservoir to the minimum pool.

(2) Non-Dedicated Fall Storage Management Strategy. In years when suitable water storage is available on October 15 (i.e., >152,000 AF), flood control releases must be undertaken by December 1 to ensure the reservoir remains at or below 152,000 AF. SEWD will identify and, in coordination with the USACE, implement a flow release schedule designed to optimize salmonid migration opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam for the period between October 15 and November 30.

(3) Flood Control Release Coordination with, and Advisory Support to, the USACE. During the flood control season not covered by number 2 above, coordination of flood control releases with the USACE will be conducted to optimize salmonid migration opportunities and provide adequate spawning and rearing habitat.

(4) Agriculture and Municipal Conservation Programs. Agricultural and municipal water conservation programs will be implemented to help reduce the potential for water storage levels to fall to critical levels.

Implementation of these conservation strategies has already been initiated prior to completion of the CHCP, as identified in section 6.1, and will be continued throughout the term of the ITP. Details regarding these conservation strategies are provided below under the *Rationale and Ecosystem Benefits* section.

Rationale and Ecosystem Benefits: The Calaveras River has been subject to impoundment since 1930, when Hogan Dam (76,000 AF capacity) was constructed for flood control. Prior to 1949, there were no outlet controls on the dam and flows were not regulated in the lower river. In 1949, outlet controls were installed at the dam and the Stockton and East San Joaquin Water Conservation District (previous name of SEWD), together with the City of Stockton, began operating the dam in a manner to conserve runoff for later release for irrigation purposes. Immediately below the original dam, the USACE constructed New Hogan Dam (NHG) from November 1960 to June 1964. The new dam increased the 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 carryover storage pool of 15,000 AF for sediment storage, fish and wildlife, and general recreation. When NHD was originally proposed, the USFWS and CDFW agreed that releases would provide fishery benefits between the dam and Bellota, but would not support a fishery downstream of Bellota, as indicated by the following statements:

> (1) Operational studies indicate that substantial releases will be made from the reservoir March through October. The increased flow will materially improve fish habitat in the reach between the dam and Bellota. The reach between Bellota and the mouth of the Calaveras will not support a fishery with the project inasmuch as most of the water will continue to be diverted at Bellota (USFWS 1960).

(2) Project effects on fishery resources will generally be enhancement [].With New Hogan Reservoir under operation, larger and firmer flows will be released below the dam from March through October. This will eliminate the no flow problem during August, September, and October, and should greatly benefit the fishery. Due to the diversions for irrigation, this benefit would not be realized downstream of Bellota. The river downstream of Bellota will continue to be dry several months of the year (CDFG 1963).

In 1978, SEWD began operation of a 75-cfs-capacity diversion at Bellota, resulting in low but sustained flows upstream of Bellota in most years. Year-round flows upstream of Bellota have provided good habitat conditions for salmonids in priority spawning and rearing areas, as evidenced primarily by the relatively high annual abundance of *O. mykiss* and good condition factors of both *O. mykiss* and salmon observed during rotary screw trap monitoring during 2002-2015 (SEWD unpublished data).

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 downstream migrant population has been 5,206 (range: 884-13,670). These numbers are substantially higher (i.e., about 10-fold greater) than nearby tributaries such as the Stanislaus River, where annual numbers captured are about 50 and estimates of downstream migrants are 500-700 fish each year. Due to a variety of factors (e.g., differences in relative catch rates between the two rivers, differences in population estimation methods, potential underestimates on Stanislaus River due to low daily captures, potential overestimates of Calaveras River due to intermittent trap operation), the magnitude of this difference in abundance may not be as large as predicted, but even after accounting for all these factors, higher abundance on the Calaveras River is still evident.

Condition factors provide a general indicator of the overall health of an individual fish and have been used to assess overall salmonid population health and habitat conditions (e.g., prey availability) in various rivers and streams (Hanson and Bajjaliya 2005). In addition, a recent 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 low flow periods, ranged from 1.28 to 1.55 (n=1,765) each year. Also, for the two years during the same period that Chinook salmon juveniles were also captured, average K factors for salmon ranged from 1.49 to 1.62 (n=1,040). *O. mykiss* K values, coupled with high abundance, indicate that habitat conditions upstream of Shelton Road are able to support a viable population of salmonids even under low fall/winter flow conditions. A potential exception may occur during an extended drought where a prolonged period of very low flows might result in a temporary population decline.

Further evidence to support good habitat conditions in the spawning and rearing reach are provided by other recently collected data regarding 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, and Fry 1971). Based on 2001-2012 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)[11] are generally met under typical base flow releases from November through March between New Hogan and Shelton Road (Figures 12 and 13). 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)[5] are generally met between New Hogan and Shelton Road under typical fall/winter base flow (Figures 12 and 13). 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[5] at Gotelli and Shelton Road (Figure 13). These water temperatures indicate that suitable conditions are available year-round in much of the spawning and rearing reach. It is unknown whether water temperatures greater than the recommended criteria would have any effect on salmonid energetics in the Calaveras River since water criteria are considered conservative and were developed for more northern stocks where temperatures are naturally cooler. 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.

[11] Little is known about the specific responses of Central Valley salmonid species to water temperatures (Williams et al. 2007). In absence of Central-Valley-specific data, criteria developed for more northern stocks are typically used as a conservative objective. For example, a Peer Review Panel on the nearby Stanislaus River recommended that EPA Region 10 criteria (developed based on laboratory studies of Pacific Northwest and Alaskan stocks) be used as objectives to evaluate potential benefits of various operating scenarios against one another (Deas et al. 2004). These temperature criteria are believed to be conservative for Central Valley salmonids since water temperatures in more southern areas have always been naturally higher, particularly in the San Joaquin basin, and regional salmonids have likely evolved to withstand higher temperatures. Therefore, it was assumed that as long as temperatures were within the EPA criteria, which are based on a 7-day average of the daily maximum (DADM) values (i.e., <13°C [55°F] for salmonid spawning, egg incubation, and fry emergence; <16°C [61°F] for "core" rearing areas; and <18°C; 64°F for migration plus "non-core" rearing areas), the likelihood of temperature effects to salmonids would be minimized. These objectives can be applied in a similar approach to the Calaveras River.

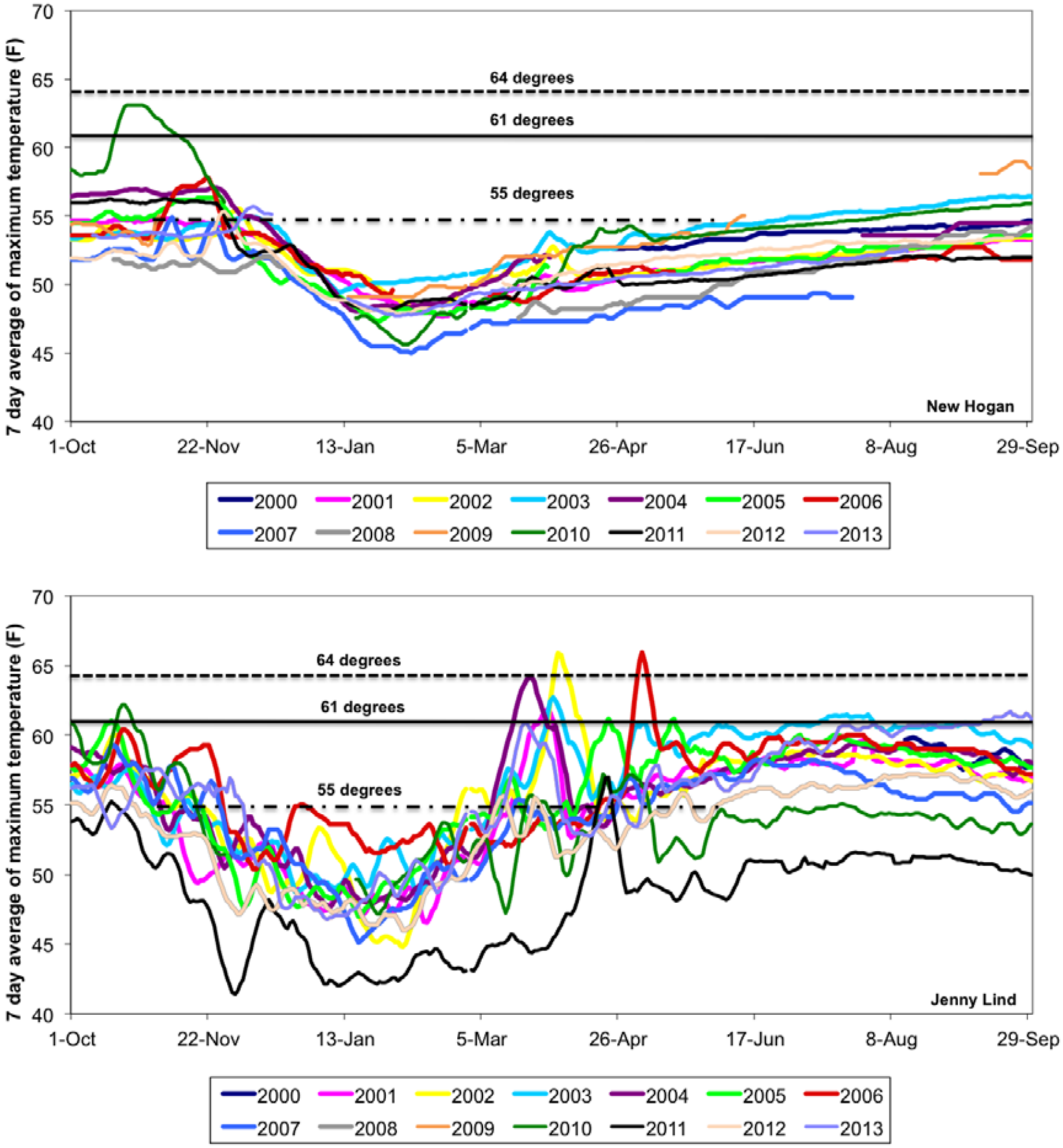

Figure 12. Seven-day moving average of the daily maximum at New Hogan (RM 42) and Jenny Lind (RM 34.6), Water Years 2000-2013.

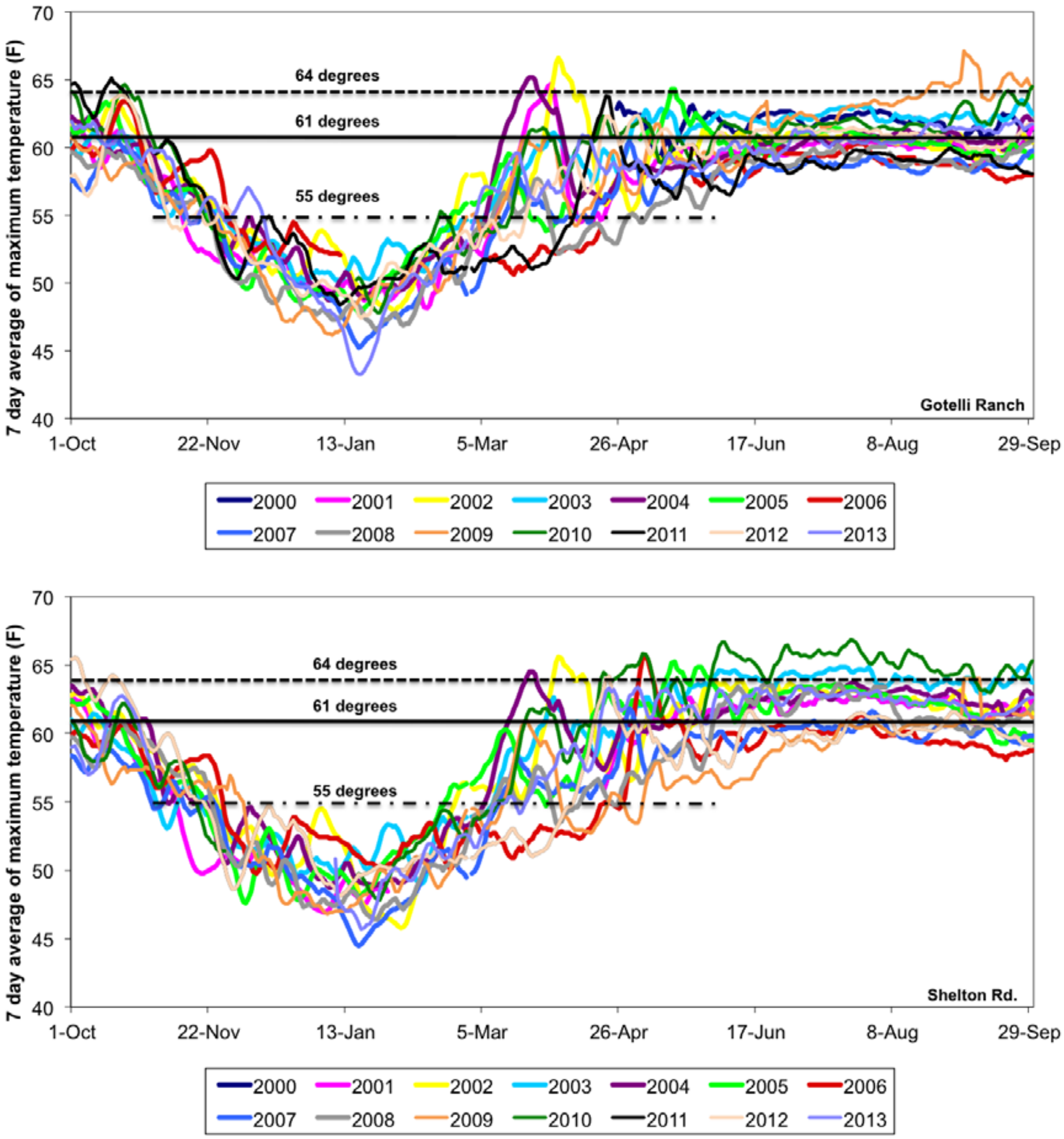

Figure 13. Seven-day moving average of the daily maximum at Gotelli Ranch (RM 32) and Shelton Road (29.3), Water Years 2000-2013.

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 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 at NHG) 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).

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 (Appendix E). 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)[12]. Irrigation flows provide a relatively high amount of suitable physical habitat in Reach 3 and maintain oversummering 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 predators (e.g., smallmouth bass), and unsuitable oversummering temperatures.

Interspecific interactions between native species and competition with introduced species can be limiting factors for salmonids. Few predator or competitive species have been observed during

[12] Refer to footnote 5 on page 24 regarding the applicability of EPA temperature recommendations in the Calaveras River.

snorkel surveys conducted from March to mid-October 2002 (FFC 2002) and in fall 2005 and 2006 (SEWD unpublished data). These surveys encompassed a range of flows from 25 to 500 cfs. Minimal predation and competition indicates that salmonids are able to fully utilize available resources.

Besides good spawning and rearing conditions, adequate salmonid migration flows generally exist in Mormon Slough, but flow magnitude and timing are different than historical conditions. For example, Marsh (2006) evaluated adult salmonid migration potential based on years and seasons in which average daily flows exceeded 25, 50, 100, and 200 cfs for periods of at least four days (the migration opportunity criteria) over the period of record for Jenny Lind, New Hogan Dam, and Mormon Slough gauges.

Marsh (2006) found that migration opportunities for flows greater than 25, 50, 100, and 200 cfs occur more often in fall and spring under post-New Hogan dam conditions (Figure 14). During the winter, salmonid migration opportunities were found to be similar between pre- and post-dam conditions for flows greater than 25 cfs but occurred less often under post-dam conditions for flows greater than 50, 100, and 200 cfs. Nonetheless, Marsh (2006) determined that migration opportunities occurred in at least 75% of years for flows greater than 50 cfs and at least 60% of years for flows greater than 100 and 200 cfs under post-dam conditions (Figure 14).

Although flows are typically suitable for spawning and rearing upstream of Bellota and flood control releases and/or freshet events generally provide a number of migration opportunities, New Hogan Dam operations can be adjusted and measures can be taken that will help minimize extremely low flow conditions and optimize migration and rearing opportunities as indicated in the following sections.

Minimum Instream Flow Commitment

Typically, average flow releases from New Hogan have been and will continue to be greater than 150 cfs during the irrigation period, while base flow releases have ranged and will continue to range from 20-60 cfs during the non-irrigation period; nonetheless, flow releases in past years have been known to decline below 20 cfs, primarily during periods within the non-irrigation season. Therefore, in order to ensure that adequate spawning, incubation, and rearing habitat conditions are maintained in the priority rearing area located upstream of Shelton Road, SEWD will ensure that flows at Shelton Road are 20 cfs or greater (equivalent to about 25 cfs released from New Hogan) year-round except during critical water storage periods, which are defined as periods when conservation storage has fallen below 84,100 AF (equivalent to reservoir storage of 99,100 AF) (note: a new flow gage will be installed upstream near Shelton Road within one year of issuance of the ITP).

When critical water storage occurs, and flows at Shelton Road are below 20 cfs, New Hogan releases may be reduced to a minimum of 10 cfs until critical water storage is no longer in effect. Actual releases will be determined by the District, 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.

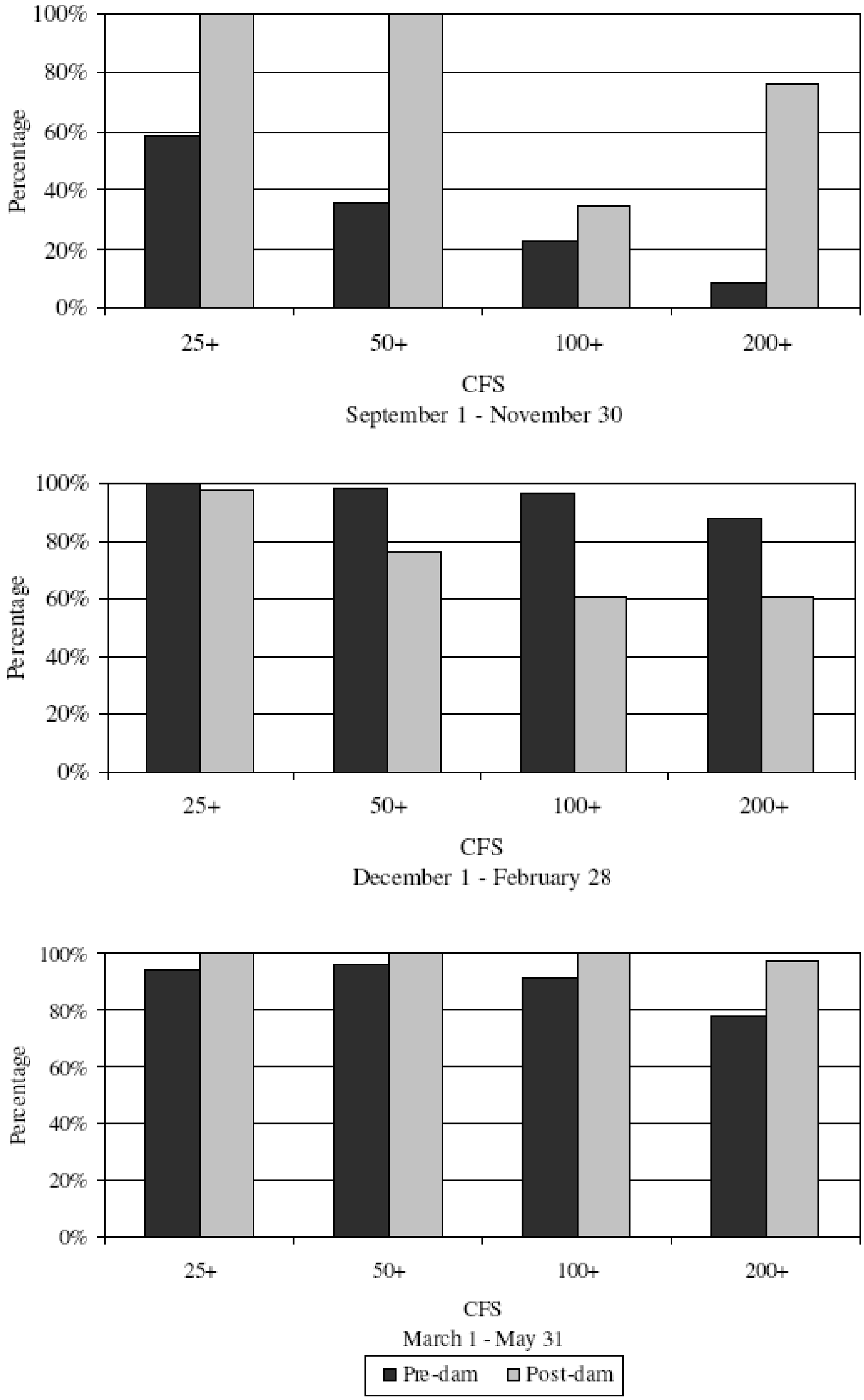

Figure 14. Percentage of years by season when average daily flows exceeded 25, 50, 100, and 200 cfs for at least four days over period of record before and after New Hogan Dam regulated the river. Data: Jenny Lind 1907-1964, USGS. New Hogan Dam 1965-2002, USACE. Source: Marsh 2006.

The reason for reduced releases during critical water storage is to ensure that some quantity of water is available for beneficial use in areas largely or completely dependent on the Calaveras River for their supply in a drought. As one example of the need for reduced releases, at the beginning of the non-irrigation season in 1976 (i.e., November), storage was 68,180 AF. Due to the 1976–77 drought, storage at the same month next year diminished to only 10,735 AF. Had the HCP been in place at that time, at least 10 cfs would have been released for fishery purposes in three non-irrigation months: Dec. 1976, Jan. and Nov. '77 (92 days). A 10 cfs release for those 92 days would have been 1,821 AF, further reducing New Hogan storage from 10,735 AF to 8,914 AF. If the 20 cfs commitment at Shelton Road had been in effect, 3,727 AF more would have been released, drawing the reservoir down to only 7,008 AF before the start of an uncertain hydrological year.

To put into perspective the need for reducing releases to a minimum of 10 cfs during critical water storage (rather than 20 cfs at Shelton Road), CCWD's Jenny Lind Service Area alone has approximately 11,000 customers whose only source of water is the Calaveras River, and the historical maximum water use in the Service Area has been nearly 3,600 AF annually.[13] The population in the Service Area could also more than double over the term of the HCP.[14] Consequently, risking a reservoir drawdown below 8,914 AF could have dire consequences for water service for a large number of people.

Based on historical flows, reducing fishery releases to a minimum of 10 cfs would be infrequent under the HCP. In the period of record (Jan. 1965 through Dec. 2013), critical water storage has occurred in only 51 of 247 (or 20.6%) non-irrigation months, or 8.9% of months in the entire 573-month period of record (Table 9). Although no gage has been maintained near Shelton Road during all 573 months,[15] historical records show that of the 24 gaged non-irrigation months during critical water storage, an average of 20 cfs was in the stream at or near Shelton Road in 11 of them—presumably due to a combination of New Hogan Dam releases and below-dam inflow—indicating that a reduction to a minimum of 10 cfs will likely occur in, at most, 46% of the critical storage non-irrigation months. In summary, reduction to the 10 cfs minimum could be expected to occur in approximately 4.0% of all months (23 months of 573).

The 20 cfs minimum flow commitment is expected to yield a viable population of *O. mykiss* and offer suitable conditions for Chinook that may occur infrequently in the Calaveras River. For example, flow releases between mid-January and early April in 2002 were less than the minimal flow releases needed to achieve the proposed 20 cfs criteria at Shelton Road (i.e., flows were less than 25 cfs) and were less than typical base flows. During this period, fish abundance (n=1,045) was close to the annual average; average fish condition factors were good (K=1.35-1.53) and were comparable to those observed under typical, higher base flows in 2003-2011; and water temperatures were generally similar to most years, with the exception of slightly higher temperatures for several days from late March to mid-April at Gotelli and Shelton Road.

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[13] CCWD, Urban Water Management Plan (2010), Tables 3-1 and 3-13.

[14] *Id.*

[15] Gage 11308900, near Shelton Road, was maintained during New Hogan operations from January 1965 to September 1990.

Table 9. New Hogan Reservoir monthly storage conditions (AF), 1965-2013. Bolding indicates months in which conservation storage was less than 84,100 AF (i.e., reservoir storage of 99,100 AF). Highlights indicate months in which NHG releases were ≤10 cfs for ≥7 days when conservation storage was less than 84,100 AF. Source: CDEC.

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1965	159,048	162,242	169,920	214,076	211,604	201,516	188,333	176,320	167,836	164,554	170,100	182,744
1966	186,233	200,277	203,813	199,497	189,882	177,266	163,177	149,272	142,244	137,953	139,026	165,440
1967	175,384	181,235	184,117	219,029	237,367	234,028	221,493	206,967	197,108	196,238	195,466	197,108
1968	203,594	202,772	200,809	199,246	190,046	178,252	164,321	151,177	142,816	139,834	141,456	155,628
1969	161,862	184,428	168,226	198,921	198,661	190,901	179,172	166,534	158,932	156,515	159,192	171,756
1970	--	172,328	172,057	173,837	169,179	160,147	147,658	134,149	125,368	122,703	134,334	158,528
1971	160,960	166,474	182,813	186,207	181,451	171,936	158,787	145,556	135,951	134,784	135,553	159,886
1972	163,206	180,063	177,425	172,539	164,527	151,656	137,124	123,436	115,091	112,044	113,780	119,895
1973	174,140	164,409	184,709	196,206	189,603	178,711	165,499	151,627	143,722	143,116	150,279	173,384
1974	184,678	192,554	234,969	272,456	267,963	255,798	244,015	228,823	218,615	215,011	194,760	172,268
1975	176,876	--	177,273	196,592	193,415	181,420	167,482	154,146	144,979	143,110	142,593	141,290
1976	140,479	136,754	137,874	129,104	116,381	103,400	**88,678**	**77,183**	**70,900**	**68,964**	**68,180**	**67,672**
1977	**68,107**	**65,006**	**56,930**	**47,769**	**41,610**	**28,806**	**16,128**	**11,578**	**11,178**	**10,844**	**10,735**	**14,624**
1978	**73,416**	118,834	171,608	220,112	222,165	206,890	189,497	171,187	161,805	152,980	151,149	151,908
1979	162,608	192,046	235,847	246,709	238,652	224,287	208,507	190,864	177,147	171,984	171,833	176,535
1980	166,519	198,991	209,746	215,633	207,270	193,905	178,957	161,441	148,801	142,039	138,776	137,627
1981	153,375	157,394	179,081	179,944	167,141	150,224	131,830	114,926	102,563	96,996	105,711	130,583
1982	170,421	184,890	252,639	276,189	275,913	264,291	249,440	232,632	221,992	220,678	208,373	158,804
1983	174,433	193,424	192,782	236,815	261,653	255,334	242,861	227,470	217,685	221,598	170,571	157,423
1984	158,084	180,438	199,905	200,494	190,991	177,239	159,266	141,307	127,828	124,448	130,143	135,186
1985	138,429	153,659	173,887	172,738	159,989	145,123	127,828	111,008	100,807	**95,426**	**96,384**	99,179
1986	108,938	186,901	195,808	202,234	194,582	179,574	162,461	145,123	135,503	131,000	127,400	125,380
1987	123,870	128,960	144,110	135,950	120,520	104,267	**87,049**	**70,078**	**59,230**	**56,202**	**54,121**	**52,652**
1988	**55,187**	**55,250**	**55,412**	**52,000**	**48,302**	**39,000**	**28,480**	**19,448**	**15,431**	**15,431**	**14,933**	**16,006**
1989	**18,065**	**19,880**	**38,518**	**41,401**	**37,473**	**32,643**	**27,756**	**22,191**	**21,706**	**21,662**	**19,673**	**17,397**
1990	**21,255**	**31,507**	**42,390**	**44,369**	**40,820**	**36,053**	**30,242**	**23,592**	**20,164**	**17,135**	**15,604**	**15,275**
1991	**15,088**	**15,438**	**54,669**	**59,050**	**54,528**	**47,795**	**40,531**	**33,453**	**27,487**	**24,046**	**20,930**	**19,265**
1992	**20,939**	**57,212**	**70,952**	**71,944**	**62,201**	**51,690**	**41,894**	**33,232**	**29,138**	**25,449**	**22,255**	**27,311**
1993	116,719	160,193	197,689	212,138	202,465	189,909	171,112	152,387	137,815	128,803	122,816	119,265
1994	117,792	128,623	127,726	118,773	107,469	**90,339**	**71,484**	**54,106**	**40,938**	**34,062**	**30,440**	**30,860**
1995	136,537	147,967	248,664	271,524	297,103	285,392	266,329	243,081	222,513	206,039	184,202	181,430
1996	190,195	194,357	221,335	223,834	218,577	202,696	182,020	160,831	148,384	143,536	144,028	172,135
1997	171,894	177,944	180,377	173,101	162,783	150,784	136,749	123,468	113,006	108,097	105,344	105,138
1998	169,524	167,854	214,307	241,188	239,665	237,859	222,652	205,042	191,247	185,581	185,675	182,331

Year	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC
1999	181,927	193,939	203,058	211,430	204,479	192,847	177,791	164,396	154,255	147,606	147,884	147,662
2000	178,497	205,906	198,959	201,741	201,052	190,386	177,545	164,425	155,678	151,908	150,840	150,364
2001	153,687	169,494	184,014	183,889	173,555	160,309	146,859	133,476	123,242	119,216	116,743	131,960
2002	147,579	158,545	181,678	180,223	174,130	163,427	150,028	138,055	128,572	124,121	122,116	134,501
2003	139,018	141,362	144,959	158,315	158,257	146,804	132,508	118,675	108,611	100,584	98,892	105,275
2004	116,160	137,735	146,528	140,013	129,705	117,915	105,046	**93,162**	**83,850**	**81,610**	**80,208**	**95,426**
2005	166,460	194,035	237,391	249,256	253,947	246,304	232,490	218,646	206,172	199,318	174,282	193,136
2006	181,275	191,726	255,072	262,455	262,990	247,888	227,857	206,937	192,975	189,210	175,803	171,954
2007	169,972	187,849	191,471	187,849	178,374	165,751	151,711	136,431	127,113	123,217	120,549	119,093
2008	138,563	156,506	157,768	150,000	139,314	126,348	111,838	**96,975**	**87,379**	**83,167**	**80,051**	**79,562**
2009	**81,472**	**93,806**	118,970	114,276	107,446	**95,600**	**81,313**	**69,462**	**61,308**	**58,869**	**55,948**	**56,762**
2010	**56,730**	**82,806**	99,981	121,991	145,289	147,856	139,932	128,469	117,353	108,938	105,413	109,641
2011	166,194	182,424	217,411	225,578	241,806	243,044	234,951	217,891	202,037	189,655	186,146	172,829
2012	167,171	168,182	168,509	183,514	200,135	191,630	179,420	165,397	151,542	141,335	136,192	134,554
2013	166,283	167,617	165,308	159,700	149,107	13,6510	122,966	111,032	102,880	**98,958**	**96,624**	**94,668**

Although temperatures were higher during this period, they were generally within the non-core rearing range. Additionally, a survey was conducted between New Hogan Dam and Shelton Road (except for the Canyon reach) in February 2014 when flow releases were reduced to 10 cfs during a critical water storage period. Little difference in river stage was observed compared to typical 25 cfs base flows and there was no evidence of stranding or dewatered redds (SEWD unpublished data).

Based on aforementioned WUA/PHI values and observations during 2002 that found relatively high numbers of *O. mykiss*, good condition factors, and suitable water temperatures at flows less than the target, it appears that the minimum flow target will provide adequate fall/winter conditions for salmonids in the priority spawning and rearing area upstream of Shelton Road. Irrigation deliveries required at Bellota and areas downstream will maintain adequate spring and summer rearing conditions. With this minimum instream flow target in place, there will be an increased percentage of days that spawning and year-round rearing conditions will be improved over existing operations. As mentioned earlier, New Hogan releases of about 25 cfs are anticipated to create flows of 20 cfs at Shelton Road. Dependent on month, the percent of monthly flows in the past that did not meet this target (i.e., less than 25 cfs released from New Hogan) when conservation storage was greater than 84,100 AF (reservoir storage 99,100 AF) ranged from 0 to 19% (Table 10).

Table 10. Number and percentage of days per month that NHG flow releases were less than 25 cfs, water years 1967-2004 (Limited to years prior to implementation of Instream Flow Commitment). Reservoir storage of 99,100 AF is equivalent to conservation storage of 84,100 AF.

	All years Combined		Only years > 99,100 AF storage		Only years < 99,100 AF storage	
Month	Number Days	Percentage Days	Number Days	Percentage Days	Number Days	Percentage Days
Oct	266	23	149	13	117	10
Nov	315	28	198	18	117	11
Dec	328	29	201	18	127	11
Jan	358	31	203	18	155	14
Feb	294	27	158	15	136	13
Mar	360	31	220	19	140	12
Apr	195	17	68	6	127	11
May	62	5	12	1	50	4
Jun	53	5	15	1	38	3
Jul	35	3	0	0	35	3
Aug	48	4	0	0	48	4
Sep	93	8	3	0.3	90	8

Prior to implementing a minimum instream flow commitment, releases below 25 cfs generally occurred for one of two reasons: (1) conservation storage dropped substantially below 84,100 AF, resulting in release curtailments to prevent storage from further declining to the minimum pool, or (2) New Melones contract water was made available to SEWD for up to 100% of M&I supplies during the non-irrigation season, resulting in release curtailments since no diversion of Calaveras River water was needed for the WTP.

In the future, if New Melones water is made available to SEWD during the non-irrigation season more often, NHG releases would not be necessary for M&I diversion at Bellota, which would then—in absence of the minimum flow commitment—cause an increased frequency in the occurrence of releases less than 25 cfs from October through March.

Establishing a minimum flow commitment at Shelton Road ensures that adequate rearing conditions will be provided in the primary rearing reach regardless of Bellota M&I diversion status under most storage conditions. During critical water storage periods, extended periods of 10 cfs (or greater) releases may be implemented by the District that may result in take (e.g., reduced spawning success or reduced juvenile survival) to an unknown extent. The extent of additional take is expected to be correlated with the seasonal timing and duration of low flow releases. For example, low flows in early fall and late spring are more likely to result in elevated water temperatures and associated impacts because of high ambient air temperatures, rather than low flows in the winter when ambient air temperatures are cool.

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 is questionable whether salmonids were able to persist below the dam, and no salmonid observations were recorded from 1989 through 1994. Despite this drought period where flows were less than 10 cfs, salmonid populations appear to have re-colonized the Calaveras River within a short period of time, as evidenced by renewed observations of salmon and steelhead beginning in 1995 and continuing until present.

It is unknown whether a 10 cfs release provided under similar drought conditions would result in cooler water temperatures that would help reduce potential impacts to fish, but it is expected that 10 cfs releases would provide a wetted channel in at least a portion of spawning and rearing habitat, which would possibly promote fish conservation compared to historical conditions. In addition, if necessary, adaptive management of flow conditions under critical water storage conditions will provide an opportunity to examine whether impacts to fisheries can be further minimized during successive dry years.

<u>Non-Dedicated Fall Storage Flow Management Strategy</u>

In preparation for the flood control season, New Hogan Reservoir storage must be no greater than 152,000 AF by December 1 each year (USACE 1983). In some years (i.e., expected frequency is about 20% based on historical records[16]), there is a substantial amount of storage above 152,000 AF (i.e., between 10,000-70,000 AF) remaining at the end of the irrigation season (i.e., October 15), which must be released to meet this December 1 requirement. However, the USACE has some discretion to retain a storage buffer of about 15% above the 152,000 AF criterion in December

[16] Frequency of occurrence is not expected to decrease in the future (since climate change projections indicate an increase in spring and fall inflows, which contribute to fall storage levels) and may increase if SEWD receives full water supply entitlements from its New Melones contract.

(i.e., about 175,000 AF), which allows SEWD to coordinate releases with the USACE between October 15 through November 30 to optimize migration opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam during this period.

By October 10, SEWD will determine the projected reservoir and conservation storage at the end of the irrigation season and the projected beneficial uses of conservation storage (i.e., M&I or groundwater recharge) during October 15 through November 30[17]. SEWD will then calculate the amount of estimated storage remaining that can be scheduled to assist fish migration (FM) between October 15 and November 30 based on subtracting the amount of storage for beneficial use (B) and 152,000 AF from the projected reservoir storage on October 15 (P), as follows:

$$FM = P - B - 152{,}000$$

Under high, end of irrigation-season storage conditions (storage >152,000 AF on October 15), the Governing Board, taking into consideration the recommendations of interested stakeholders, including, but not limited to, individual members of the Calaveras River Technical Review Group (CRTRG; see Chapter 9 for description of the CRTRG), will identify a flow release schedule by October 10 to optimize migration opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam from October 15 through November 30. The District will coordinate with NMFS and the USACE to determine the quantity of water to be released between October 15 and November 30 of each year when storage is above 152,000 AF. Based on the timing of adult fall-run Chinook salmon, if any, entering the Delta, the lower San Joaquin River and the Calaveras River, and the amount of water needed to facilitate passage through or over fish passage impediments existing at the time of release, the Governing Board will develop and approve (no later than October 10) a flow schedule for October 15-November 30 of that year to optimize flows through/over the current fish passage impediments in the lower Calaveras River, and time the releases to correlate with when adult fall-run Chinook salmon are waiting to enter the Calaveras River. Due to annual variability in the amount of water available and in migration timing, the flow release pattern will be made on a case-by-case basis but is anticipated to consist of at least one ≥5-day high flow pulse period followed by a ramped return to lower baseline flows to prevent stranding. Monitoring will be conducted to document occurrence of passage facilitation under prescribed flow releases.

To put this conservation strategy into perspective, a comparison between traditional releases under high end-of-year storage conditions is made to a year when this conservation strategy was first put into practice as one of several conservation strategies to be implemented prior to completion of the HCP. Prior to implementation of this conservation strategy, storage above 152,000 AF was typically released in the latter half of November with flows ranging from about 400 to 3,000+. Under a typical scenario, releases in 2005 (a year when NHG storage was at 203,000 AF on October 15) would have ranged from 800-1,200 cfs per day during the latter part of November in order to reduce the reservoir to 152,000 AF by December 1. Instead, SEWD coordinated with members of the Calaveras River Fish Group (CRFG; see Chapter 9 for description of group) and the USACE to retain a slightly higher reservoir storage level than the criterion for December as

[17] The amount of projected use will vary depending on hydrology, water year type, precipitation, existing carryover storage, and related factors.

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 recommended a release schedule for this period to optimize fish passage opportunities. Under the recommended flow schedule and current configuration of instream structures, several hundred fall-run Chinook salmon migrated through Mormon Slough and some were able to successfully ascend the Bellota Weir.

Once passage improvements are implemented in the lower river, particularly at the Bellota Weir, this conservation strategy as implemented through the AMP is expected to result in an increased number of salmonids (consistent with the number of salmonids that have previously been impeded by passage structures) able to access the river upstream of the Bellota Weir 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).

<u>Flood Control Release Coordination with, and Advisory Support to, the U.S. Army Corps of Engineers</u>

In a biological opinion (Opinion) regarding the USACE's New Hogan Dam and Lake Project (NMFS 2002), NMFS required the following in Term and Condition #4b: "The Corps shall agree to work cooperatively with NOAA Fisheries, the Bureau of Reclamation, and water agencies to develop a water management plan which meets the flood control requirements; the water contracts to SEWD and CCWD; and allows fish to ascend, spawn, rear, and migrate to the maximum extent possible". The existing Opinion does not apply to the District and they are currently under no legal obligation to comply with this request.

A joint water management plan between the USACE and SEWD is impractical from a logistical and legal standpoint. The USACE has no legal authority to impose water management conditions upon SEWD as Watermaster pursuant to Contract number 14-06-200-5057A. The only discretion the USACE exercises is over flood control releases when the project is in flood control operations in accordance with the Water Control Manual. The USACE has no general discretion over the storage, regulation, and release of water outside of the flood season and therefore has no ability to enter into a joint water management plan. However, the USACE has and will continue to work cooperatively with SEWD to coordinate with NMFS on an as-needed basis during the flood control season to determine whether flood control releases during the winter/early spring months can be modified to reduce impacts to salmonids. SEWD, in cooperation with the USACE, will establish criteria that will provide flexibility for releasing flood control flows and reduce impacts to fishery resources. Flexible flow management and coordination will provide benefits to salmonids by maximizing migration opportunities in both the winter and spring.

As part of the terms and conditions of the 2002 Opinion, the USACE is also required to implement actions to restore channel characteristics within the river, including activities such as channel reconfiguration, creation of low-flow channels, and gravel supplementation. To help the USACE achieve its restoration goals, SEWD will provide advisory assistance to the USACE by (1) educating streamside landowners so that owners understand the importance of proposed restoration activities and (2) obtaining landowner permission to access areas where USACE restoration activities are proposed. SEWD's advisory support to the USACE will help ensure that restoration activities will be implemented where needed, which will ultimately benefit salmonids through improved habitat conditions.

Agriculture Conservation Program

Agriculture Conservation Program BMPs will help to conserve water resources in the basin, which will ultimately help maintain adequate habitat conditions for anadromous fisheries in the Calaveras River.

SEWD distributes and sells irrigation water to SEWD agricultural users. SEWD is subject to Section 210 of the Reclamation Reform Act of 1982 because of its water contract with the United States Bureau of Reclamation (Reclamation) for water from New Melones Reservoir and is required to prepare and submit to Reclamation a Water Management Plan with definite goals, appropriate water conservation measures, and timetables, which has been implemented since 1993. SEWD implements the following Best Management Practices (BMP) for its agricultural users:

BMP A-1. Water Measurement
Volume of water delivered by SEWD to each turnout is measured with devices that are operated and maintained to a reasonable degree of accuracy, under most conditions, to +/-6%.

BMP A-2. Water Conservation Coordinator
Water Conservation Coordinator is responsible for program management, tracking, planning, documenting, and reporting on the implementation of BMPs.

BMP A-3. Water Management Service
Provide or support the availability of water management services to water users through (1) on-farm irrigation evaluations and water delivery information provided to water users, (2) real-time and normal irrigation scheduling and crop ET information via California Irrigation Management Information System (CIMIS) website, (3) surface, ground, and drainage water quantity and quality data provided to water users, and (4) agricultural water management educational programs and materials provided to farmers, staff, and the public.

BMP A-4. Price Structure
SEWD provides a quantity-based water pricing structure (cost per acre-foot).

BMP A-5. Policy Review
SEWD has three water contracts, all with different contract years. For ease of scheduling and providing the most economical water for customers, SEWD continues to negotiate for a standard contract year.

BMP A-6. Contractor Pump Efficiencies
Evaluate and improve efficiencies of district pumps.

BMP A-7. Facilitate/Promote On-Farm Irrigation System Capital Improvements Surface Water Incentive Program
Program encourages the conversion to groundwater from surface water through water pricing.

BMP A-8. Line or Pipe Ditches and Canals/Regulatory Reservoirs
Conveyance routes are often unlined but are exempt from lining since they assist in groundwater recharge. Reservoirs surrounding the treatment plant act as buffers during storm events and percolate water, recharging the aquifer at the treatment plant. Reservoir maintenance and groundwater monitoring are ongoing.

BMP A-9. Flexible Water Ordering and Delivery
SEWD operates an on-demand delivery ordering system where customers are asked to call or email 24-48 hours in advance. The Supervisory Control and Data Acquisition (SCADA) system is used to optimize management of deliveries.

BMP A-10. Construct and Operate Spill and Tail Water Recovery Systems
USBR grant funds are utilized for this BMP. SEWD will continue to apply for these grants as they become available. In 2005, SEWD applied for and was awarded a Challenge Grant in the amount of $150,255 to implement a SCADA system. SEWD's contribution was $154,553. Although SCADA is not a spill or tail water recovery system, it allows enhanced surface water management abilities to further minimize already limited system losses.

BMP A-11. Optimize Conjunctive Use
Optimize conjunctive management of surface and groundwater through recharge and surface water usage pricing incentives.

BMP A-12. Automate Canal Structures
This BMP is being implemented in conjunction with BMP A7.

BMP A-13. Facilitate/Promote Pump Testing and Evaluation
SEWD currently provides free pump tests and irrigation evaluations to its customers.

<u>Municipal Conservation Program</u>

Municipal Conservation Program BMPs are intended to reduce long-term urban demands from what they would have been without implementation of these practices. They will help to conserve water resources in the basin, which will ultimately help maintain adequate habitat conditions for anadromous fisheries in the Calaveras River. Water conservation will reduce demand on water storage in New Hogan Reservoir, which in turn is expected to reduce the period of time when the reservoir is in critical water storage, which is the threshold for when flows at Shelton Road may drop below 20 cfs.

Since 1985, BMPs have been implemented by the City of Stockton and California Water Service Company under an Urban Water Management Plan (UWMP) as required by the Urban Water Management Planning Act. The City of Stockton and California Water Service Company are also signatories to a Routine Maintenance Agreement (RMA) administered by the California Urban Water Conservation Council (CUWCC), which maintains a list of BMPs for RMA signatories to implement in order to reduce municipal water consumption across the State. CUWCC BMPs are consistent with those implemented under the UWMP. SEWD wholesales treated surface water to the City of Stockton, California Water Service Company (Cal Water), and San Joaquin County. Because of contractual requirements, SEWD cannot fund or cause the retailers to fund conservation BMPs. Currently, there are a total of five BMP measures identified. For SEWD, the urban contractors report to the CUWCC and address BMPs. Further, SEWD's water management plan does not specify direct compliance to any of the listed BMPs; however, it is important to note that SEWD does regularly perform activities during daily operations that address BMP M-1 and M-2. Relevant BMPs currently implemented by the water purveyors (considering aforementioned agency specific exemptions) serving Calaveras River water diverted by SEWD to its constituents are presented below:

BMP M-1. Utility Operations
Water conservation programs implemented by utilities that provide essential services to customers. There are four subcategories that comprise signatory utility operation program responsibilities: 1) Operational Practices; 2) Water Loss Control; 3) Metering and Billing; and 4) Retail Conservation Pricing.

BMP M-2. Public Education and School Education
Education programs to encourage wise water usage for the public or for school-aged children.

BMP M-3. Residential Programs
Effective water conservation methods and measures that residents can work to implement in conjunction with water agencies.

BMP M-4. Commercial, Institutional, and Industrial Programs
Comprehensive and flexible programs to allow for water agencies to work with businesses and tailor implementation to fit local business needs and opportunities.

BMP M-5. Landscape Programs
Programs to improve the efficiency and usage of outdoor water consumption for the purpose of irrigating urban landscapes.

Compliance Monitoring: SEWD will maintain daily flow and operation records in an operations database (CM1) to document implementation of flow and operation related conservation strategies (Attachment D-1 in Appendix D). The operations database will contain data that is recorded year-round and seasonally. Year-round data includes USACE gauging station flow records for New Hogan Dam releases, Cosgrove Creek, and Mormon Slough and precipitation records for New Hogan (data sources: California Data Exchange Center and USACE); SEWD daily diversion records, status of the temporary fish screens at the Bellota Diversion Facility, and status of the temporary fish barrier (e.g., net, rock weir) upstream of the Old Calaveras Headworks Facility. Seasonal data includes flow records collected during the irrigation season at SEWD sensors located in Mormon Slough, Old Calaveras River channel, Mosher Slough/Creek, and Potter Creek; SEWD daily diversion records at the Headworks Facility; SEWD manual flow readings at Shelton Road (to be installed) during the business week (Monday-Friday) whenever NHG flow releases are less than 35 cfs; and SEWD operational data collected during the non-irrigation season regarding the status of the Bellota interim fish ladder (data source: SEWD). The operations database will be provided to NMFS and the Governmental Resource Agencies via a monthly electronic newsletter.

To ensure compliance with the Agriculture and Municipal Conservation Programs, implementation efforts will be documented (CM2).

Effectiveness Monitoring: Fisheries and environmental conditions monitoring will be performed to collect information that will be used to determine whether biological goals are being met (Appendix D). A core suite of fisheries and environmental conditions monitoring will be conducted to determine adult and juvenile migration and rearing opportunities, which will include (1) one or more adult monitoring components (e.g., automated fish passage monitoring system, redd counts, carcass surveys); (2) RST monitoring to infer spawning and rearing success, as well as determine juvenile migration opportunities; and (3) flow, water temperature, and turbidity measurements recorded during fishery monitoring (EM1 through EM3 in Appendix D).

If deemed necessary through the AMP process, additional or alternative monitoring activities to document spawning and rearing success, such as seining, snorkel surveys, electrofishing, and telemetry (EM12 in Appendix D), will be conducted within funding constraints (i.e., an annual monitoring budget is identified in Chapter 12 and various monitoring activities can be selected each year, taking into consideration the recommendations of interested stakeholders including, but not limited to, individual members of the CRTRG).

Fisheries and environmental conditions monitoring data will be provided to NMFS and any other interested parties via a monthly electronic newsletter.

7.2 Conservation Strategies for SEWD Old Calaveras River Headworks Facility Operations

Conservation strategies for this activity were designed to meet the Fish Passage and Avoid/Minimize Fish Entrainment Objectives and associated targets described above under the *Biological Objective: Fish Passage* and *Biological Objective: Avoid/Minimize Fish Entrainment* sections. Existing data indicate that it is infeasible to operate the Old Calaveras River as a secondary migration route for salmonids (see *Rationale and Ecosystem Benefits* below); thus, the conservation strategies are focused on preventing entrainment of salmonids into this channel. To minimize impacts associated with the Old Calaveras River Headworks Facility operations, SEWD will implement three conservation strategies that will prevent entrainment, associated passage delays, and stranding at instream passage impediments, including:

(1) Old Calaveras Headworks Facility Improvement. A permanent non-entraining barrier will be implemented within the first ten years of the ITP to prevent entrainment into the Old Calaveras River and subsequent migration delays or stranding at numerous instream structures within the channel.

(2) Temporary Fish Barrier at Old Calaveras River Headworks Facility. In the interim period prior to implementing a permanent non-entraining barrier, SEWD will install and maintain a temporary barrier (e.g., net) on the upstream side of the Headworks Facility whenever water is diverted down the Old Calaveras River channel for irrigation or groundwater recharge to prevent juvenile salmonids from migrating into the channel. The barrier will be installed prior to water diversion and will remain in place during diversion activities. Implementation of this conservation strategy began in 2005, as described previously in section 6.2, and will continue until a permanent non-entraining barrier is implemented at the Headworks Facility.

The temporary barrier currently consists of a net that extends perpendicularly across the entire width and depth of the channel, and is held in place by a pulley system. The pulley system allows the net to be pulled to the streambank for cleaning, debris removal, or repair. Prior to pulling the net aside for maintenance, a back-up net is extended in front of the barrier net using a separate pulley system, which ensures that a barrier is always in place. Maintenance activities occur as needed, which is typically once a week. The net barrier reduces the possibility that juvenile salmonids and/or steelhead kelts migrating downstream are entrained into the Old Calaveras River channel downstream of the Headworks Facility.

3) Non-Entraining Upstream Passage Barrier Near Confluence of Old Calaveras River/SDC. A permanent non-entraining, upstream passage barrier (e.g., rock weir or flashboard dam) will be installed at the downstream end of the Old Calaveras River near the confluence with the SDC to prevent adult salmonids from inadvertently entering the channel during the few occasions when there is connectivity with the SDC.

Rationale and Ecosystem Benefits: Since 1934, when the Linden Irrigation District built the Old Calaveras Headworks Facility and flows were primarily directed into Mormon Slough (Crow 2006), the Old Calaveras River has been considered a secondary channel that is only used for irrigation and groundwater recharge. Due to its smaller channel size and configuration (i.e., some areas with overhanging vegetation), it has been suggested that this channel could potentially provide a better migration route for salmonids under low flow conditions compared to the wider, minimally vegetated Mormon Slough/SDC channel. However, existing data (including results of fish passage evaluations [DWR 2007a], flow data from the USACE gauges at New Hogan Dam and Bellota, and rotary screw trap data collected seasonally since 2002) indicate that it would be infeasible to operate the Old Calaveras River as a secondary salmonid migration route.

Numerous fish passage impediments throughout the Old Calaveras River channel (i.e., five in addition to the Headworks Facility) would need to be improved for the channel to become functional as a migration corridor. Based on improvements to structures in Mormon Slough, it is anticipated that the total cost to improve all six structures would be at least $5 million (assuming $3 million for the Headworks facility and an average of $300,000 for each of the other structures). According to DWR's (2007a) evaluation of structures in the Calaveras River, at least 67 cfs would be necessary to provide unimpaired passage for adult Chinook and *O. mykiss* at the modeled structures in the Old Calaveras River downstream of the Headworks Facility. Results of the flow duration analysis for the Clements Road flashboard dam (the structure most likely to cause impairment) indicate that adult Chinook have unimpaired passage only 2% of the time between September and December (DWR 2007a) and juvenile salmonids have unimpaired passage only 15% of the time between January and June (DWR 2007a). Furthermore, DWR (2007a) cautions that more than 67 cfs is likely needed because channel roughness (caused by accumulated sediment deposits, woody debris, riprap, or excessive instream vegetation) may result in energy losses. Considering that flows actually need to be greater than 67 cfs for adequate passage and given that these existing constraints will be met less than 2% of the time, there are very few periods in which the Old Calaveras River channel would benefit salmonids under current, unimproved passage conditions.

Additionally, the range of flows that may potentially provide passage opportunities under improved passage conditions is 25-150 cfs, since diversions through the Headworks Facility during the flood season are limited to about 150 cfs because of flooding concerns associated with the Podesta Reservoir. The frequency of passage opportunities (>25 cfs for 4 days) that may occur under these passage conditions where all structures are improved would remain low (average=8%, median=4%, range=2-23%) and may result in increased potential for stranding in both Mormon Slough and the Old Calaveras River as a result of alternating flows between the two channels under highly fluctuating, uncertain flow conditions that often occur in the Calaveras River. The latter may result under various scenarios, such as whenever fish enter the Old Calaveras River after the Headworks Facility is opened, because it appears that flows will be within the passage range for the minimum migration period (i.e., 4 days), but flows drop suddenly to <25 cfs prior to fish being able to migrate through the entire channel. This narrow flow range (i.e., 25-150 cfs) and the inability to effectively prevent stranding associated with alternating flow deliveries between channels limits the Old Calaveras River's utility as a migration corridor, particularly given the frequency that flows in the Calaveras River are within this range.

Considering the limited benefits to salmonids and the costs to improve passage impediments prior to any benefits, it is infeasible to operate the Old Calaveras River as a secondary migration route. Consequently, to prevent entrainment, either a permanent non-entraining barrier (e.g., rock weir) will be installed at the Headworks Facility or the facility will be decommissioned within the first 10 years of the ITP.

Additionally, adult salmonids that are inadvertently attracted into the Old Calaveras River by flows resulting from Headworks Facility operations may experience migration delays or stranding at the numerous instream structures within the channel. Therefore, a non-entraining upstream passage barrier will be installed at the downstream end of the channel near the confluence with the SDC to prevent adults from inadvertently entering the channel during the few occasions when there is connectivity with the SDC.

Compliance Monitoring: SEWD will document completion of the Headworks Facility Improvement project, and whether the project was completed in accordance with the project objectives and timeframes (CM3). SEWD will maintain daily flow and operation records in an operations database to document implementation of flow and operation-related conservation strategies including the status of the temporary fish barrier (e.g., net). Details regarding the operations database are provided under section 7.1 and CM1 in Appendix D.

Effectiveness Monitoring: (EM4 in Appendix D). Prior to construction of permanent improvements at the Headworks Facility, SEWD will implement salmonid relocation protocols associated with flashboard dam removal in the Old Calaveras River as described under section *7.4 Effectiveness Monitoring*. SEWD will annually document whether salmonid relocation was necessary, which will provide an indication of the effectiveness of interim salmonid entrainment reduction measures (e.g., net).

Once permanent improvements are made at the upstream (non-entraining barrier or Headworks Facility is decommissioned) and downstream end (non-entraining barrier) of the Old Calaveras River channel, salmonids will no longer be entrained into the Old Calaveras River and no monitoring in the channel will be necessary.

7.3 Conservation Strategies for SEWD Bellota Diversion Facility Operations

Conservation strategies for this activity were designed to meet the Fish Passage- and Avoid/Minimize Fish Entrainment Objectives and associated targets described above under the *Biological Objective: Fish Passage* and *Biological Objective: Avoid/Minimize Fish Entrainment* sections. To minimize impacts associated with the Bellota Diversion Facility operations, SEWD will implement three conservation strategies that will improve passage conditions into/out of the spawning and rearing reach between Bellota and New Hogan Dam and/or entrainment, including:

(1) Bellota Diversion Facility Improvement. CH2M Hill (2005), on behalf of SEWD, completed preliminary designs and an environmental assessment for a combined crest gate/fishway/fish screen that will improve salmonid passage opportunities and prevent entrainment at the Bellota Diversion Facility. Details are provided in a *Preliminary Design Report: Calaveras River Anadromous Fish Protection Project* and an Initial Study/Negative Declaration (CH2M Hill 2005; SEWD 2009; copies available from SEWD). The preliminary designs were developed in close coordination with CDFW, NMFS, USFWS, USACE, and DWR. This project will complement other fish passage improvements on the lower Calaveras River and Mormon Slough that were evaluated by DWR in collaboration with SEWD. The proposed improvement identified for the Bellota Diversion Facility (CH2M Hill 2005; SEWD 2009) is targeted to be completed within the first five years, but will be implemented no later than the first ten years of issuance of the ITP. The improved facility will include the following:

- The existing SEWD intake will remain in operation at its current position on the south side of the channel during construction. A new intake structure and fish screen will be constructed immediately upstream, and the new structure will screen flows for the Bellota pipeline, the fishway attraction water system (AWS), and irrigation releases into Mormon Slough.
- A pneumatically operated crest gate will be installed on the bottom sill of the Bellota Weir, partially replacing the existing flashboards. This configuration will increase the efficiency and safety of the weir operations.
- A fishway will be constructed on the south bank to provide volitional fish passage when the crest gate is in both the raised and lowered positions. An auxiliary steep-pass fishway will be provided to enable upstream fish passage during the "shoulder" seasons when the pool elevation is raised, and downstream juvenile fish passage is undesirable.

This project represents one of the most important elements that will improve the ability of anadromous fish runs to access the reach upstream of Bellota and to survive their downstream migration. Although SEWD has committed to implementing the proposed CH2M Hill (2005) permanent solution for the Bellota Diversion Facility, the exact implementation schedule is dependent on a variety of factors (e.g., final engineering designs, permitting, and construction);

therefore, the project will be implemented as soon as practicable within the first ten years of issuance of the ITP.

The schedule for completion of fish passage and protection facilities at Bellota will be affected by the normal timetables required for completing final facility designs, conducting environmental assessments and obtaining associated permit authorizations, obtaining sufficient funding, and performing construction activities. These activities are anticipated to take anywhere from five to ten years. Although these activities will likely take several years to accomplish, SEWD recognizes the potential importance of providing better migration opportunities for salmonids into spawning and rearing reaches immediately below New Hogan Dam. Therefore, SEWD will make every effort to complete the planning design, environmental permitting, and construction of fish passage and protection facilities at Bellota within the first five years, but no later than the first ten years, of the ITP. In the meantime, interim measures identified below will continue to be implemented in order to reduce impacts to salmonids associated with passage problems and entrainment.

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 CRTRG. Initiation of construction will be subject to SEWD’s ability to fund, gain the necessary permits, and complete the necessary NEPA/CEQA review process as described above. Until construction begins, SEWD will continue to implement interim conservation strategies, 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). Since construction would be implemented behind the cofferdam, potential impacts are expected to be minimal and only associated with dispersal and relocation efforts during cofferdam installation, and with temporary turbidity increases during cofferdam installation and removal.

(2) Temporary Fish Ladders at the Bellota Diversion Facility. Until the permanent combined crest gate/fishway/fish screen at Bellota is implemented, SEWD will increase migration opportunities for salmonids by operating two Denil fish ladders at the Bellota Weir during the non-irrigation season whenever minimum fish ladder passage flows are available (>10 cfs). The ladders are designed to assist passage under low flow conditions and details regarding the operating protocols are provided in the *Bellota Fish Ladder Operating Criteria* (Attachment C-1 in Appendix C).

SEWD will install a 2-foot temporary dam and a Denil fish ladder at the upstream edge of the Bellota Weir. The ladder is designed to increase upstream fish passage opportunities from the pool on the apron of Bellota Weir to the pool upstream of the Bellota Weir under low flow conditions. SEWD will also install a second 2-foot temporary dam on the downstream side of the Bellota Weir apron in order to create a deeper pool on the apron of the weir for more effective fish passage into the upper ladder.

A second Denil fish ladder will also be installed on the downstream side of the weir. The lower ladder is designed to allow fish to pass over the initial portion of the weir structure and onto the apron of the weir under low flow conditions. At this point, fish can rest and orient themselves in the pool created by the lower 2-foot temporary dam before entering the upper fish ladder.

(3) Temporary Fish Screens at the Bellota Diversion Facility. SEWD has installed a temporary screen system at Bellota, which became fully operational in 2006, to help reduce entrainment of juvenile salmonids until a permanent solution is fully implemented. A permanent screen, which will meet screening criteria for all life stages, requires more extensive designs and construction, than could be reasonably implemented prior to implementation of the permanent combined crest gate/fishway/fish screen. The temporary screen system consists of two individual screens that can be operated independently, dependent on whether one or both diversion intakes are open. One of the screens was originally installed in December 2005 and modifications were made over several months to improve its operational range. Since early 2006, the temporary screen system has been fully operational.

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 will not meet fry screening criteria, the fishery agencies (i.e., NMFS, USFWS, and CDFW) agreed that they will 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.

Rationale and Ecosystem Benefits: Since 1933, Mormon Slough channel has been the primary migration route for salmonids because flows in the historical Old Calaveras River channel are generally too low for passage. The Bellota Diversion Facility, located at the upstream end of Mormon Slough, has been operational since 1978. The Bellota Weir, operational since 1967, creates a complete or partial migration barrier to anadromous salmonids dependent on flashboard dam configuration (i.e., 8-foot dam typically installed between April 15 and October 15, but may be installed as early as mid-February under critical water storage conditions; and 2-foot dam installed during the remainder of the year) and flow conditions.

In the fall of 1998, SEWD installed a temporary fish ladder on the upper side of the Bellota Weir to help facilitate adult upstream passage over the 2-foot flashboard dam under low flow conditions but the ladder did not perform well. An improved fish ladder was designed by CDFW and was installed during the following fall migration season. In 2001, an additional ladder was added to the downstream end of the weir to help fish access the original upper ladder. However, these temporary ladders are both limited to assisting fish passage under a small range of low flows, and a permanent solution has been investigated that will provide passage opportunities under a wider range of flow conditions.

CH2M Hill, on behalf of SEWD, completed a preliminary design report in 2005 for a permanent fish passage solution whereby a pool-and-weir fishway will operate when flows in Mormon Slough are between 10 cfs and 2,100 cfs (the 5 and 95 percent streamflow exceedances). The steep-pass fishway would be operated during the “shoulder” seasons [i.e., at the beginning and end of the irrigation season whenever the Bellota Pool is above the maximum headwater level for the pool and weir fishway (116.0 feet)] to facilitate upstream fish passage when the crest gate is raised but downstream juvenile fish passage is undesirable. The steep-pass fishway would operate with approximately 7 cfs of screened water pumped from the existing intake. Upmigrating fish would enter the pool and weir fishway at this 7-cfs flow and continue up the steep-pass fishway section from the upper fishway pool area.

Once the pool-and-weir fishway is completed, fish passage opportunities at Bellota will be available under a majority of flow conditions (i.e., between the 5 and 95 percent streamflow exceedances). In contrast, current passage opportunities only occur under a narrow range of flows and are limited to periods when the temporary fish ladders are functional (currently unknown but design capacity between 10 and 24 cfs) and when there are sufficient hydraulic conditions during weir overtopping events (currently unknown). 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 5.6 cfs to 251 cfs (FFC 2007). In the future, it is anticipated that fish passage improvements at the weir will 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 conditions that the weir is passable (i.e., 90% of streamflow conditions). Increased passage opportunities at the weir are expected to substantially increase the number of adult salmonids that are able to access the spawning reach upstream of Bellota and reduce the potential for stranding and migration delays that can occur under current conditions. In addition, improvements at fish passage impediments downstream of Bellota (section 7.5) will complement the increased passage opportunities at Bellota to provide even more benefits to migrating salmonids.

In addition to the fishway, a permanent fish screen has also been included as part of the Bellota Diversion Facility Improvement Project. Currently, two temporary screens have been installed and have reduced the potential for entrainment. However, they do not fully meet the NMFS and CDFW criteria and some fry may be entrained. Once the permanent fish screen is completed, all size classes will be protected from entrainment.

Compliance Monitoring: SEWD will document completion of the Bellota Diversion Facility Improvement project, and whether the project was completed in accordance with the project objectives and timeframes (CM4). SEWD will maintain daily operation records in an operations database (CM1) to document implementation of operation-related conservation strategies (e.g., temporary ladder installation and operation). Details regarding the operations database are provided under section 7.1 and CM1 in Appendix D.

Effectiveness Monitoring: Prior to construction of improvements at the Bellota Diversion Facility, SEWD will implement protocols established in the *Interim Bellota Ladder Operating Criteria* (Attachment C-1 of Appendix C), which includes monitoring the pool downstream of Bellota for salmonids to ensure that the ladder is open when salmonids are present (EM5). An infrared scanner or similar device will be used to monitor fish passage through the permanent fishway (EM2 in Appendix D), and flow data will be collected (EM1). Information regarding the effectiveness of the fishway may also be gathered from alternative fisheries monitoring activities (EM12). Monitoring data will be provided to NMFS and any other interested parties via monthly electronic newsletters.

A fish screen effectiveness monitoring plan for Bellota is provided in EM6 and Attachment D-5 in Appendix D.

7.4 Conservation Strategies for Artificial Instream Structures and SEWD Small Instream Operations

Conservation strategies for this activity were designed to meet the Fish Passage Objective and associated targets described above under the *Biological Objective: Fish Passage* section. In order to minimize impacts associated with artificial instream structures and flashboard dam operations, SEWD will implement four conservation strategies that will improve passage conditions into/out of the spawning and rearing reach between Bellota and New Hogan Dam, including:

(1) Artificial Instream Structures Improvements. SEWD has been working collaboratively with DWR to identify specific fish passage problem areas, including those associated with flashboard dams, low flow crossings, and bridge aprons in the Old Calaveras River channel and Mormon Slough/SDC. Thirty-seven instream structures have been identified as potential passage impediments to salmon and steelhead trout in the lower Calaveras River downstream of Bellota Weir via both the Mormon Slough/SDC and Old Calaveras River channel routes (DWR 2007a). Twenty-two structures are located in the Mormon Slough/SDC route while 15 are located in the Old Calaveras River channel. Based on impairment scores developed by DWR (2007a), three priority tiers have been identified where structures with the highest potential to impair fish passage are assigned to Tier 1, those with a moderate potential assigned to Tier 2, and those with the lowest potential assigned to Tier 3, as follows:

1) Tier 1- structures with a score of five or above (nine structures, including two in Old Calaveras River channel);
2) Tier 2- structures with a score of three or four (15 structures, including four in Old Calaveras River channel);

3) Tier 3- structures with a score of one or two (13 structures, including nine in Old Calaveras River channel)[18].

SEWD is committed to implementing the replacement or retrofitting of all Tier 1 structures in Mormon Slough/SDC owned and operated by Stockton East Water District (i.e., five). Additional structures in Mormon Slough/SDC identified during the AMP process (Chapter 9) may also be improved as agreed upon by the Governing Board during the course of the ITP. As described under section 7.2, a permanent non-entraining structure will be implemented at the upstream end of the Old Calaveras River channel (barrier or decommissioning of the Headworks Facility); therefore, salmonids will no longer be entrained or inadvertently migrate into the Old Calaveras River, making additional structural improvements within this channel unnecessary.

Improvements were completed in 2011 at Budiselich Flashboard Dam and in 2013 at Caprini Low Flow Crossing. It is expected that improvements to additional SEWD-owned Tier 1 structures in Mormon Slough/SDC will be completed within the first ten years of the ITP. An implementation schedule for individual Tier 1 structures in Mormon Slough/SDC, as well as for any additional structures agreed upon, will be identified each year through the AMP Process (Chapter 9) during the pre-irrigation season meeting (March).

Construction activities for structural improvements will generally take up to four weeks to complete for each structure, and construction activities will be implemented during the non-irrigation season between October 15 and December 31, when the channel is “dry” downstream of Bellota (i.e., reach is dewatered and there is no connection between confluence and reach above Bellota) and flows are generally lowest in the New Hogan to Bellota reach. The fall construction timeframe was chosen for the lower Calaveras River because it minimizes the potential for impacts to listed species by occurring outside of breeding and rearing periods for various species, as well as outside of salmonid migratory periods (i.e., flood control releases or freshet flows). Provisions will be made to allow migrating salmonids to bypass construction work areas in the channel in the event that flood control releases or freshets occur. For projects that will occur in flowing water, a cofferdam (either earthen or sheet pile) will be installed and dewatered prior to construction to route water and any aquatic species around the project activity. The cofferdam will be constructed starting at the upstream end and ending at downstream end so that fish have an opportunity to disperse downstream during installation. 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.

During construction activities, no more than 3.5 acres (with up to 80%, or 3 acres, instream) will be disturbed at a project site as a result of staging and implementation. Completed instream project footprints for individual projects are expected to be ≤3 acres. The typical amounts of material removal include: 50-1,000 cubic yards of concrete (maximum of 4,000 cubic yards at some

[18] Structures in the Old Calaveras River Channel may not be improved or may be reassigned to different tiers, because their implementation is dependent on whether a fish passage solution can be developed and implemented for the Old Calaveras Headworks Facility through a separate process. Structures not owned by SEWD may not be improved or may be reassigned to different tiers, because their implementation is dependent on receiving written landowner approval; SEWD will make every effort to obtain landowner approval, particularly in the case of Tier 1 structures within Mormon Slough/SDC.

structures), 100-1,000 cubic yards of riprap (maximum of 2,000 cubic yards at some structures), 500-2,000 cubic yards of soil near structure (maximum of 10,000 cubic yards at some structures), and 500-2,000 cubic yards of soil upstream of structure (maximum of 10,000 cubic yards at some structures). The typical amount of imported material (fines to 4-foot boulders) incorporated ranges between 400-2,500 cubic yards (maximum of 4,000 cubic yards at some structures). Structural elements that may be installed at some sites include, but are not limited to, new culverts (up to 48' bankwidth X 12' high X 12' long), concrete full-span bridge, new piles at existing abutments, and new screens. Since construction activities will either occur when the project area is naturally dry or would be implemented behind a cofferdam, potential impacts are expected to be minimal and only associated with dispersal and relocation efforts.

(2) Fall Flashboard Dam Removal Operations. Each year after the irrigation season is over in October, SEWD removes flashboard dams within and drains the Mormon Slough/SDC. Flashboard dams in the Old Calaveras, Potter Creek, Mosher Slough/Creek, and Bear Creek are generally removed at the same time as those in Mormon Slough. However, in some years (<15% frequency expected occurrence), flashboards are left in place in these latter waterways through November for percolation benefits.

Regardless of removal timing, dams will be removed beginning upstream at the head of each channel and continuing in sequential order downstream in a fashion that will allow water and any salmonids present to travel downstream over a two-to-three-day period (Attachment D-4 in Appendix D). Based on past experience, no fish are anticipated to be found in Mormon Slough/SDC, Potter Creek, Mosher Slough/Creek, and Bear Creek during these activities throughout the term of the ITP. Also, sequential removal should allow any salmonids encountered within the Old Calaveras River channel prior to the permanent Headworks facility improvement to voluntarily travel downstream as water recedes, eliminate or reduce the incidence of salmonid stranding, and alleviate the need to relocate fish.

(3) Flashboard Dam Notches. At the beginning of the irrigation season, SEWD installs flashboard dams in Mormon Slough. Since 2006, with exception of critical water storage conditions (i.e., 2014), SEWD has installed flow conveyance openings (one square foot notched openings) located about 3-4 ft above the base and 6-10 ft from the south abutment of each dam. These outlets have been created to be as "fish friendly" as possible in that they spill into pool areas and not onto exposed riprap or concrete. They are 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. The outlets are typically operated from the beginning of the irrigation season (on or about April 15) to around May 15[19] to encompass the majority of the salmonid outmigration period; outlets are targeted for removal during mid-May because juvenile migration is typically reduced after this period (according to rotary screw trap data) and water conservation becomes necessary[20]. Under critical

[19] Modifications to outlet installation and removal periods may be made through the AMP process. The Governing Board will consider factors such as environmental conditions, numbers of fish observed migrating at Shelton Road, and water conservation needs to determine whether installation may be delayed or cancelled for the season and whether removal may occur earlier or later in the season.

[20] As ambient temperatures begin rising and irrigation needs increase, full head is required between flashboard dams for irrigators to divert enough water for their crops.

water storage conditions, these openings would not be installed, and water would be routed around—instead of over—Bellota weir, which will prevent juvenile salmonids from travelling downstream of Bellota; these measures will reduce the possibility of strandings downstream of Bellota under low flow conditions associated with critical water storage releases (e.g., 10 cfs).

(4) Supervisory Control and Flow Data Acquisition System. In 2005, SEWD received a $150,255 contribution from a *Water 2025 Challenge Grant* to implement a SCADA project totaling $335,236. Installation of this system was completed in mid-2007 and consists of two new automated flow sensors (sensor programmed with a known cross section and measures velocity and height to automatically determine flow) and 10 automated level sensors (sensor programmed with a known cross section and measures depth to-water to automatically determine flow) at 10 potential flashboard dam locations, including two in Mormon Slough, five in Old Calaveras River channel, four in Mosher Slough/Creek, and one in Potter Creek (Figure 15); note: one flow sensor already in place and operated by USACE at Bellota and one flow sensor already in place and operated by SEWD at the Old Calaveras Headworks[21]. The project also provides for off-site water gate control at three locations, including Bellota Weir, Old Calaveras Headworks, and Mosher Creek Dam. The SCADA system improvement will allow gate control and monitoring of key pumping pools on a 24-hour/day-basis during the irrigation season (generally mid-April to mid-October). It will also provide a measurement of the water that enters or leaves the conveyance system. Trend information will be analyzed from all sites and used to provide better water management. For example, many irrigation pumpers only run for 12 hours (6 AM to 6 PM). By analyzing the trends and using the gate controllers, water will be stored when pumping demand decreases and then released before pumping demand increases the next day. Reduction in system-end losses will increase water availability for agricultural, urban, and/or groundwater recharge uses; reduce current and potential conflict caused by a lack of efficient water management capabilities for the delivery system; and may have a beneficial effect on reservoir storage with the potential for increased opportunities to manage New Hogan flood control releases in the fall. Although conserved water could result in carryover storage in both New Hogan and New Melones, a more likely scenario is that more water will be made available for groundwater recharge operations. This recharged groundwater will address symptoms of the critically overdrafted groundwater basin, and equally important, be available in dry years when surface water supplies are limited. The benefits of recharge would be realized in the event of drought or limited surface water supply situations. The availability of real-time data during the irrigation season and ability to operate gate structures automatically will increase the efficiency of SEWD's agricultural water delivery system with an estimated 75% water savings, or 3,600 AF of water per year (SEWD 2005). Merced Irrigation District has implemented similar systems and realized up to 90% water savings (Dr. Stuart Styles, ITRC Cal Poly, as cited in SEWD 2005). Data will also be used to provide an indication of flow levels associated with juvenile migration, which will allow documentation and evaluation of fish passage opportunities. In the event that one or more SCADA system sensors are not functioning as intended, SEWD will manage water deliveries according to procedures used prior to the system being in place that are based on visual inspections of water levels, air temperatures, and requests from farmers.

[21] It is anticipated to take up to three years of data collection to begin efficient remote operation of the system, including efficient operation of the existing Old Calaveras Headworks sensor.

A manual flow level sensor was installed at Shelton Road Bridge and has been operated since November 2009. A manual sensor is being employed at this location since San Joaquin County denied a permanent sensor on the bridge. Visual data, along with a rating table, were established to reflect flow levels in the 20 cfs general range. Visual data is manually collected whenever New Hogan Dam releases are less than 35 cfs during the business week (Monday-Friday; no personnel available on Saturday and Sunday) to determine whether the minimum flow of 20 cfs is being maintained at Shelton Road.

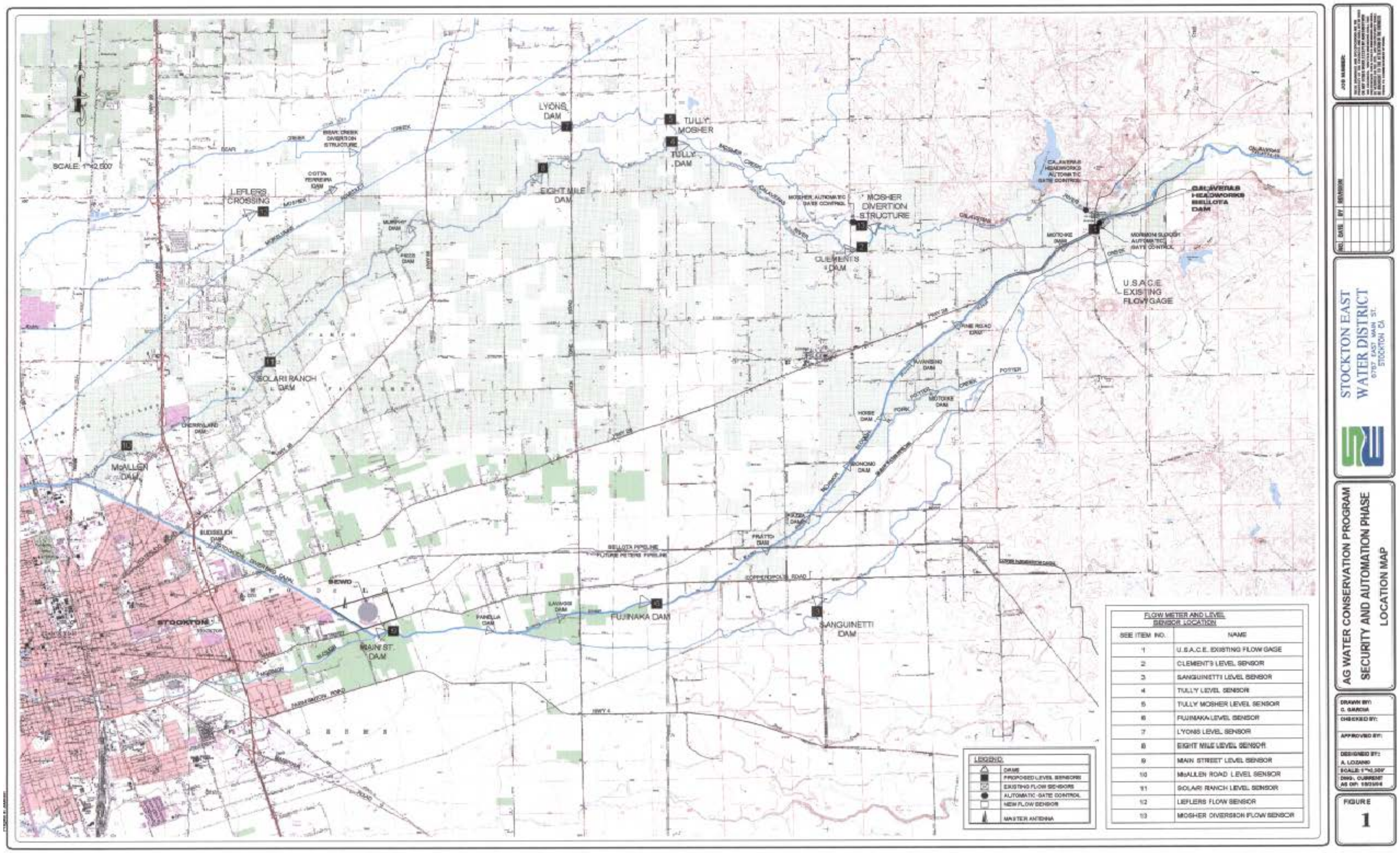


Figure 15. Location of three automated gate structures, three automated flow sensors, and 10 potential automated level sensors in the lower Calaveras River.

SEWD will investigate the feasibility of installing a flow-measuring device(s) downstream of the junction of the Old Calaveras River channel and the Mormon Slough/SDC within six months of issuance of the ITP. The ability to measure flow at this location during the migration season, combined with measurements recorded for flows entering Mormon Slough at Bellota, will provide a measure of passage opportunities for adults entering and juveniles migrating out of the river. Due to the potential for tidal influence and vandalism at this location, it may be determined that this site is not feasible. In this event, a site within the Mormon Slough/SDC that is closest to the confluence with the mainstem will be investigated. Dependent on the outcome of this investigation, SEWD will seek technical assistance from the USACE and DWR to install and operate a flow-measuring device immediately downstream of the junction of the Old Calaveras River channel and the Mormon Slough/SDC within the first five years of the ITP. If installation and operation of a lower flow measuring station is found to be technically infeasible, flows recorded at entering Mormon Slough at Bellota will continue to provide some information regarding passage opportunities.

Under this scenario (i.e., no new downstream flow station), a preliminary study will be conducted to determine whether a rough estimate of flows at the lower end of the Calaveras river near the confluence with the San Joaquin River can be calculated by using existing flow data at Old Calaveras Headworks and/or Bellota, coupled with some targeted, manual measurements in the lower channel. If preliminary measurements indicate that an approximate relationship can be developed between flows recorded at the upper end of each channel with measurements at the lower end of the channel, and that manual measurements need to be taken periodically to continue to derive rough estimates of lower channel flow, then additional manual measurements will be taken in the lower channel on a frequency determined necessary during the preliminary study.

Rationale and Ecosystem Benefits: For decades, flashboard dams have been used in the lower Calaveras River, Potter Creek, and Mosher Slough/Creek to assist agricultural diversions during the irrigation season. Actual timing of installation and removal is variable and is influenced by the type of water year, location, and Central Valley Flood Protection Board (CVFPB) and CDFW Streambed Alteration Agreements. For instance, in wet water years irrigation demands do not begin until later in the year and flashboards may not be installed until as late as mid-May. Conversely, in dry water years, irrigation demands may begin earlier in the year and agricultural users may request that flashboards be installed as early as mid-February under critical water storage conditions. Installation of flashboards earlier than identified in permits is done through a waiver. As for timing of flashboard removal, flood control requirements require that flashboard dams in Mormon Slough be removed by October 15, but the other channels do not have this requirement. In practice, SEWD removes all flashboards in conjunction with the schedule restrictions for Mormon Slough. However, in some years, the flashboards in the Old Calaveras River channel, Mosher, and Bear creeks may be left in place for up to 45 days longer to increase percolation benefits. During periods when flashboards are not installed, fish passage may be prevented or impeded by flashboard foundations. Once structural improvements identified under 7.4(1) above are made, salmonids passage opportunities will be increased under a wider range of flow levels.

Flow sensors and automated gates allow more efficient use of limited water resources so that limited New Hogan storage supplies are conserved; and sensors will provide data used to evaluate fish passage opportunities by identifying flows occurring during migration.

Compliance Monitoring: SEWD will maintain daily flow and operation records in an operations database year-round to document implementation of flow and operation-related conservation strategies. Details regarding the operations database are provided under section 7.1 and CM1 in Appendix D. SEWD will document the schedules and implementation status for artificial instream structure improvement projects and flow sensors (CM5). Compliance monitoring for the fall flashboard dam removal process will include the documentation of the process and a record of whether the dams were removed in accordance with project objectives (CM6). Compliance monitoring for the installation of notches in the flashboards dams in the spring will include documentation of the process (CM7). A Stakeholder Education Program will inform stakeholders regarding the potential benefits of artificial instream structure improvements, and compliance monitoring will document the process.

Effectiveness Monitoring: As part of flashboard dam removal operations, SEWD will notify NMFS (currently Monica Gutierrez), CDFW (currently Chris McKibbin), and its fishery biologist (currently FISHBIO) a minimum of three days prior to the initiation of the de-watering process. The dam removal process itself will begin at the upstream end of each channel and proceed downstream, which will allow any fish within the channel to voluntarily travel downstream over a two-to-three-day period as the water recedes, alleviating the need for relocation of any salmonids that may be present. SEWD personnel will visually monitor the drainage of water from each dam and its movement downstream to identify whether any fish have entered the waterway and may become stranded. In the event that salmonids are observed stranded, a salmonid relocation protocol developed and approved by CDFW and NMFS in 2004 (CDFG 2004; EM4 and Attachment D-4 in Appendix D) will be implemented. SEWD's fisheries biologists will implement salmonid relocation either under a directly issued long-term scientific collecting permit received from CDFW or under the authorization of an on-site federal representative (requires either a USFWS or NMFS representative to be on site during the relocation efforts). For the latter, a point-of-contact list for federal representatives (in order of priority) will be established by October 10 each year to ensure that at least one federal representative is available in the event that salmonid relocation becomes necessary. SEWD will annually document whether salmonid relocation was necessary, which will provide an indication of the effectiveness of salmonid stranding reduction measures.

Effectiveness of instream structure modifications in meeting passage design criteria will be evaluated using as-built surveys and streamflow records (EM7). This information will also be used to identify duration and frequency of passage opportunities. Information regarding the effectiveness of instream structure modifications for passage may also be gathered from alternative fisheries monitoring activities (EM12).

A fyke net evaluation of flashboard dam notches will also be conducted during at least one season to determine the effectiveness of notches for passage improvement (EM9 and Attachment D-6 in Appendix D).

SEWD will document the completion of Stakeholder Education Program activities (periodic workshops, annual newsletters, and a regularly updated website) under EM8 and will document individual stakeholder's willingness to participate in conservation activities to determine effectiveness of education. These efforts will ensure that local landowners understand the Calaveras River basin's fishery issues and have the information available to make informed choices regarding how they can contribute to fish conservation efforts.

7.5 Conservation Strategies for Privately Owned Diversion Facilities Operated within the District's Service Areas

Conservation strategies for this activity were designed to meet the Avoid/Minimize Fish Entrainment Objective and associated targets described above under the *Biological Objective: Avoid/Minimize Fish Entrainment* section.

(1) Fish Screens for Privately Owned Diversions. CH2M Hill, on behalf of SEWD, completed an evaluation of 28 unscreened diversion facilities between New Hogan Dam and Bellota (27 privately owned within the District's service areas and included in this CHCP) in 2005. For each facility, CH2M Hill identified preliminary fish screen design recommendations and anticipated costs. Although this evaluation only considered diversions upstream of Bellota, the same types of fish screen designs and costs are anticipated to apply to various diversions downstream of Bellota. Results from CH2M Hill's evaluation will help the Governing Board, taking into consideration recommendations from interested stakeholders including, but not limited to, individual members of the CRTRG, to prioritize representative types of diversions for screening through the AMP process (see Chapter 9). The priority of individual diversions located throughout the river will follow the process established by the CVPIA Anadromous Fish Screen Program (AFSP), which evaluates and prioritizes fish screening projects based on "…biological benefits, the size and location of the diversion, project costs, and the availability of cost-share funding partners." Biological benefits to fish will need to be identified through a targeted evaluation of representative diversion types.

The next step is to develop a recommended implementation schedule for individual facilities under the District's authority that receive a recommendation for a fish screen. The District will provide advisory assistance to the landowner to ensure that they understand the ESA issues and requirements necessary for installing a screen at their facility. In addition, the District will help the landowner to locate and apply for funding opportunities that will allow cost-effective placement of screens at their facility. Screening of any of these diversions will be dependent upon the landowner successfully obtaining outside funding for the individual structures.

Due to the large number of diversions, the prioritization effort is anticipated to take up to two years, followed by several years for implementation. Although the number of individual structures determined to need screens and the timeframe for completing fish screening at these structures is unknown at this time, SEWD is committed to helping implement fish screen projects that are deemed beneficial through the AMP and will coordinate with NMFS, members of the CRTRG, and private landowners to complete the planning design, environmental permitting, and construction of individual projects during the ITP period.

While the participation of individual landowners is uncertain, the District will provide some certainties to facilitate take coverage of private diversions. For existing diversions above Bellota and below New Hogan Reservoir, any diversion greater than 10 cfs will be screened within 2 years of execution of the HCP. Existing diversions within the same reach that are less than 10 cfs will be reviewed within the first two years by a biologist to see if any modifications are merited that may further reduce the potential of interaction with a pump. Juvenile fish are the most susceptible to entrainment due to their developing swim speed and small size. Evaluation of small Sacramento River diversions by Vogel (2013) during peak juvenile salmonid migration periods found that diversions less than 10 cfs had a very low potential for entrainment. These diversions create reduced entrainment water velocity that is within the range that smaller fishes can swim away from when encountered. In addition, he also found that the potential for interaction with smaller diversions was significantly lower when compared to large intake sizes. Any modification will be coordinated and implemented by SEWD and the landowner. All future diversions, regardless of size, both above or below Bellota will be screened. SEWD will work with landowners to ensure that these requirements are met.

(2) Stakeholder Education Program regarding Fishery Issues. SEWD will implement a stakeholder educational program via periodic workshops, annual newsletters, and a regularly updated website to ensure that local landowners understand Calaveras River basin fishery issues and how they can assist in implementing conservation measures, which is anticipated to result in fish screens being installed at private diversions more rapidly than in the absence of stakeholder education. The educational program may also result in landowners being able to delay flashboard dam installation and water diversions, if they determine that watering of certain crops can be initiated later in the spring.

The first stakeholder workshop will be held within six months of the ITP issuance. This workshop will be designed to educate private diverters regarding fish entrainment issues and how they can obtain funding for screening individual diversions. Similar workshops may be held up to once a year if deemed necessary through the AMP process.

Rationale and Ecosystem Benefits: According to Moyle and Israel (2005):

> ...diversions from streams are often screened to prevent loss of fish. Because construction of fish screens competes for scarce dollars with other fish conservation projects, the widely accepted premise that fish screens protect fish populations merits thorough examination…The impact on fish populations of individual diversions is likely highly variable and depends upon size and location…Studies are needed to determine which diversions have the greatest impact on fish populations in order to set priorities for screening, and to make the best use of limited public funds available for restoration and conservation. (abstract excerpt).

During CH2M Hill's evaluation of unscreened diversion facilities between New Hogan Dam and Bellota, they identified preliminary fish screen design recommendations and anticipated costs for representative diversion types. Preliminary designs indicated that several different screen types would be necessary to accommodate individual site characteristics. Five different screen types were identified in 2005 ranging in cost from approximately $65,000 to $170,000. Total cost in 2005 to screen all 27 diversions was estimated at a little over $2.4 million. Details can be found in

CH2M Hill's preliminary design report (2005) available at the offices of SEWD. Due to the expected costs, it is anticipated that individual owners will need governmental assistance to implement.

No preliminary design evaluations were conducted for any of the diversions located downstream of Bellota in Mormon Slough/SDC, Old Calaveras River channel, and the Calaveras mainstem below the SDC junction, Mosher Slough/Creek, Bear Creek, and Potter Creek; however, diversion sizes and attributes are likely similar to those identified upstream of Bellota, so screen types and range of costs are expected to be similar. In the absence of specific data, it is not possible to estimate total costs for screening all diversions, but total costs could range from $12.6 million ($65,000 * 194) to $33 million ($170,000 * 194).

Compliance Monitoring: SEWD will document the AMP planning process outcomes (e.g., priority list and recommended schedule for screening diversions) (CM8). Additionally, SEWD will document the completion of periodic workshops, annual newsletters, and website updates related to the Stakeholder Education Program (CM9).

Effectiveness Monitoring: No site-specific monitoring is planned at this time for evaluating the effectiveness of screening at individual privately owned diversions. As individual structures are proposed for screening improvements, a monitoring plan for representative projects will be prepared (see additional fisheries monitoring, EM12) if deemed appropriate by NMFS and will be developed through the AMP process (see Chapter 9).

7.6 Conservation Strategies for SEWD Channel Maintenance for Instream Structures

Conservation strategies for this activity were designed to meet the Avoid Direct Injury/Mortality and Water Quality Objectives and associated targets described above under the *Biological Objective: Avoid Direct Injury/Mortality* and *Biological Objective: Water Quality* sections. SEWD, in coordination with CDFW, has established BMPs (conservation strategy equivalents) in an RMA (Attachment C-2), which will be implemented during instream channel maintenance activities, including:

(1) Timing Restrictions. Routine maintenance activities covered under the Agreement shall be confined to the period between July 1 and October 15. Work period for identified water crossings (Gotelli, Sitkin, Wilson, McGurk, and the Bellota Intake Structure) and the installation and removal of the flashboard dams will be allowed from April 1 to October 15. However, if work must be completed outside these authorized windows SEWD may request authorization from the Department by submitting a Verification Request Form (VRF) as described in the RMA.

(2) "Mitigation Measures." Various BMPs identified as "mitigation measures" (see attachment C-2) including, but not limited to, BMPs related to debris removal methods, proper disposal of excavated materials, and limitation of activities to low or no flow periods. If work will occur in flowing water, then additional measures will be required, including diverting flows around the site. In addition, if fish are observed in the area, SEWD personnel will disperse

fish out of the work area by wading the river ahead of heavy equipment as recommended by NMFS.

Rationale and Ecosystem Benefits: SEWD and CDFW worked cooperatively to identify the most protective BMPs possible for minimizing potential impacts to fisheries associated with instream maintenance activities. Implementation of these BMPs will ensure that there are limited to no opportunities for salmonids to be injured or killed during instream maintenance.

Compliance Monitoring: SEWD will document compliance with BMPs, including notation of whether any salmonids were observed (CM10). If any *O. mykiss* mortalities are observed, SEWD will notify NMFS (currently Monica Gutierrez) and CDFW (currently Chris McKibbin) immediately and will make arrangements with CDFW (currently George Edwards) for turning carcass(es) over to the agency/department.

Effectiveness Monitoring: If work occurs when no water is within the vicinity of the maintenance site, then no monitoring will be conducted. If work occurs in water, SEWD personnel will visually assess work areas for fish as work proceeds and will disperse any fish observed to ensure that fish are not impacted by equipment (EM10 in Appendix D).

7.7 Conservation Strategies for Fisheries Monitoring Program

Conservation strategies for this activity were designed to meet the Avoid Direct Injury/Mortality and associated targets described above under the *Biological Objective: Avoid Direct Injury/Mortality*. To minimize impacts associated with fisheries monitoring, SEWD's fisheries biologists will implement CDFW and NMFS-approved capture and handling protocols (conservation strategy equivalents) designed to minimize handling stress and reduce mortality, including:

(1) All investigators must be well qualified and have provided evidence of experience working with salmonids and the concepts outlined in the project.

(2) NMFS has developed nondiscretionary conditions that are necessary and appropriate to minimize take of ESA-listed salmonids, as described in the ITP and Appendices A and B of the Central Valley research opinion. The investigators will ensure that all persons operating under the incidental take permit are familiar with the terms and conditions therein. In addition to the terms and conditions of the aforementioned opinion, the District will ensure compliance with any additional terms and conditions described in the ITP.

(3) NMFS will receive monitoring information from the District concerning its project activities; this monitoring information will indicate whether the project is operating satisfactorily or not. NMFS will monitor actual annual take of ESA-listed species associated with the proposed monitoring and/or research activities (as provided in annual reports or by other means) and will adjust annual permitted take levels if they are deemed to be excessive or if cumulative take levels are determined to excessively impact listed fish.

(4) All persons operating under the CHCP permit will be properly trained and have access to properly maintained state-of-the-art equipment.

(5) All listed fish captured will be processed immediately and returned to the water before any other fish are processed.

(6) All traps will be checked and cleared of fish and debris daily.

(7) All Central Valley steelhead unintentionally killed during sampling activities will be preserved as voucher specimens and sent to CDFW (currently George Edwards).

Rationale and Ecosystem Benefits: NMFS has previously identified the most protective fish handling protocols possible for minimizing potential impacts to fisheries associated with research activities. Implementation of these protocols will ensure that there are limited to no opportunities for salmonids to be injured or killed during fish monitoring activities.

Compliance and Effectiveness Monitoring: During each sampling season, monthly data summaries will be provided to NMFS and/or CDFW to ensure that take does not exceed expected values (CM11, EM11).

Chapter 8. Quantifying Impacts from the District's Project Facilities Operation and Maintenance Activities

On the Calaveras River, there are currently no existing populations of Endangered Sacramento winter-run, Threatened Central Valley spring-run Chinook, and Species of Concern Central Valley late fall-run Chinook. Naturally reproducing Threatened Central Valley steelhead and Species of Concern Central Valley fall-run Chinook salmon have been observed opportunistically using the basin when natural migration conditions occur. Due to limited data and numerous uncertainties pertaining to steelhead and fall-run Chinook in the basin, estimates of "population" abundance have been roughly calculated for each.

Information currently available for use in calculating population and take estimates consists primarily of (1) sporadic visual observations of salmon and *O. mykiss* during the last 40 years and (2) sampling events of limited geographic and/or temporal scope (Table 4). Other information in the basin includes relatively recent reports related to physical factors, such as CH2M Hill's (2005) screening and passage evaluation, Stillwater Science's (2004) limiting factors analysis, Tetra Tech's (2005) baseline water quality monitoring, and DWR's (2007a) fish passage evaluation. There is a high level of uncertainty regarding visual observations prior to 2002 due to: (1) inherent problems with observer bias (e.g., species identification, estimated number observed); (2) typically no standardized sampling protocol was followed, and repeat sampling or sampling in other areas was not conducted for comparison; (3) fish were observed whenever people were in the area at the right time and may or may not have been present in other areas and/or at other times. Therefore, information prior to 2002 could not be used to calculate population or take estimates.

Since there are also numerous uncertainties regarding the potential for impacts associated with most project operations and maintenance activities, quantifying the level of incidental take resulting from these activities is difficult. Nonetheless, some level of incidental take is expected to occur for expected (*O. mykiss*) and uncommonly (spring- and winter-run Chinook) occurring salmonids even though conservation strategies will be implemented to reduce the likelihood and amount of incidental take, and take may occur under the following conditions:

(1) Temporary migration delays, temporary isolation, or stranding and mortality may occur between November and mid-April resulting from the impoundment of surface water into New Hogan and limited flow releases from New Hogan (i.e., <10 cfs) and/or little to no flows reaching areas downstream of Bellota. Limited flow releases are only expected during temporary periods where conservation storage has fallen below 84,100, which have occurred in 13 of 44 years [29.5%] between 1965 and 2008.
(2) Entrainment into privately owned, small (e.g., ≤4-inch intakes) unscreened diversions may occur whenever diversions take place during the irrigation season (pumping generally occurs during intermittent periods from April 15-October 15 but can begin earlier in dry years). In general, diversions occur only as needed during the irrigation season (e.g., typically twice a month for 5-10 days depending on various factors such as weather, size of diversion and irrigated acreage, and type of crop).
(3) Entrainment into the Headworks Facility may occur whenever the slide gates are intermittently opened for groundwater recharge (i.e., occurs only when natural inflows are available between November and June, and Podesta Reservoir is not spilling) or whenever the slide gates are opened during the irrigation season.
(4) Entrainment of fry into the Bellota Diversion Facility may occur whenever the facility is operating, and fry are within the vicinity. Impingement of fry/parr/smolts may occur whenever the facility is operating, and they are in the vicinity.
(5) Migration blockage may occur at the Bellota weir whenever the 8-foot weir is in position from mid-April to mid-October, and migration delays whenever the 2-foot weir is in position from mid-October through mid-April.
(6) Isolation and secondary impacts (e.g., thermal stress, increased susceptibility to predation, increased susceptibility to entrainment), or stranding and associated mortality may occur downstream of Bellota during flashboard dam removal in the fall (on or about October 15), replacement in the spring (on or about April 15), or operation during the irrigation season.
(7) Injury due to contact with heavy equipment, behavioral impairment due to temporary increases in turbidity, or harassment associated with dispersal efforts may occur during maintenance activities within the wetted channel. Maintenance activities in the wetted channel occur infrequently (i.e., only occurs in years when flows greater than 1,200-5,500 cfs result in damage or sedimentation/debris buildup at instream structures), are typically completed in less than five days, and are conducted concurrently with flashboard installation during early to mid-April.
(8) Injury/death due to contact with heavy equipment, behavioral impairment due to temporary increases in turbidity, or harassment/injury/death associated with relocation and dispersal efforts may occur during construction activities within the wetted channel. Construction activities that may occur in the wetted channel include those associated with Bellota Diversion Facility Improvement and Artificial Instream Structure Improvements within Mormon Slough.

Although the exact percentage of each ESU/DPS that will be affected cannot be determined, it is expected that only a small percentage of each ESU may be taken in the form of "…harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect…," because the number potentially taken from the Calaveras River population is estimated to be low. As more information becomes available from the ongoing monitoring programs and from any other studies that may be conducted, estimates may be adjusted through the AMP during the term of the ITP.

8.1 Population Estimates of O. mykiss and Chinook salmon

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) and for fall-run Chinook using estimated numbers of adults ascending Bellota during 2005 (FFC unpublished data). The presence of late fall-, spring-, and winter-run Chinook is unlikely. Therefore, there is no population to estimate for any of these runs. 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.

8.1.1 *O. mykiss* Abundance

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. Young-of-year (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). 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 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, a formula developed for the Sacramento River (Hallock 1989) was used to estimate the abundance of this age class as follows:

O. mykiss YOY= [(Females*Egg potential)*95%]*30%

The number of females is equal to the number of adults/2 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).

Table 11. Estimated numbers of adult (>300 mm) and Age 1+ (100-299 mm) *O. mykiss* based on observed densities per 100 m^2. Observed densities approximated from FFC density graphs (FFC 2002).

Size Class	Surveyed Location	Observed densities (avg. sightings per 100 meter^2)	Estimated meters squared (*11m average width)	Estimated number of *O. mykiss*
>300 mm	Hogan reach	1.15	12,397	143
	Canyon reach	0.9	118,613	1,068
	Jenny Lind	0.4	880	4
	Jenny Lind to Shelton*	0.4*	105,600	422*
Total				**1,637**
100-199 mm	Hogan reach	10.0	12,397	1,240
	Canyon reach	9.0	118,613	10,675
	Jenny Lind	2.0	880	18
	Jenny Lind to Shelton*	2.0*	105,600	2,112*
Total				**14,045**
200-299 mm	Hogan reach	5.2	12,397	645
	Canyon reach	2.9	118,613	3,440
	Jenny Lind	0.9	880	8
	Jenny Lind to Shelton*	0.9*	105,600	950*
Total				**5,043**

*extrapolated from observed densities at Jenny Lind

Table 12. Estimated number of *O. mykiss* YOY. Estimate based on information from Hallock 1989 (i.e., standard fecundity of 2,800 eggs per female and average survival rates of 95% for eggs and 30% for fry) applied to the number of females estimated from FFC 2002 snorkel survey data.

Life stage	Estimated number of *O. mykiss*
Females (Number adults ⁄ 2)	818
Egg Potential (Number females * 2,800)	2,290,400
Eggs (95 % survival)	2,175,880
YOY (30% survival)	**652,764**

8.1.2 Fall-Run Chinook Salmon Abundance

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 (FFC personal communication, 2006). A juvenile production estimate of 140,000 (Table 13) 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 = (Females*Egg potential)*25%

The number of females is equal to the number of adults/2 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.

Table 13. Estimated number of fall-run Chinook salmon juveniles produced upstream of Bellota. Estimate based on information from Beltman and Cacela 2002 (i.e., 1:1 male:female spawner ratio, average fecundity of 5,000 eggs/female, and average egg-to-fry survival rate of 25%) applied to the number of females estimated from the FFC 2005 carcass survey.

Life stage	Estimated number of Chinook
Females (Number adults ⁄ 2)	112
Egg Potential (Number females * 5,000)	560,000
Juveniles (30% survival)	140,000

Based on RST sampling conducted annually from 2002-2015 at Shelton Road (SEWD unpublished data), there have been 319-2,769 juvenile *O. mykiss* and anywhere from zero to 5,943 juvenile fall-run Chinook salmon observed migrating to at least Shelton Road between late October and mid-July (Tables 14 and 15). Abundance estimates were calculated for *O. mykiss* each year based on the proportion of flow sampled (as described in Attachment D-3 in Appendix D) and for fall-run Chinook using trap efficiency data combined with missing value calculations (described in Attachment D-3). For 2005, *O. mykiss* numbers 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. In 2006, high flows also made it impossible to sample for an extended period between March 27 and April 30. It is likely that considerable fish movement occurred during these high flow events; therefore, numbers of fish in 2005 and 2006 were likely underestimated.

8.1.3 Late Fall-, Spring-, and Winter-Run Chinook Salmon Abundance

The pre-dam and current conditions have not historically supported late fall-, spring-, or winter-run Chinook salmon. A population does not currently exist for these runs; however, there remains a slight potential that an individual could occasionally stray into the basin and be affected by water management activities in the river. Therefore, these races are included in this CHCP.

8.2 Estimated Levels of Take of O. mykiss and fall-run Chinook for Covered Activities

The estimated take for each CHCP covered species is summarized and justified by activity. *O. mykiss* currently maintain a viable population in the river and fall-run Chinook have intermittently occurred. Both species have sufficient records to address take for each CHCP activity and provide an analytical justification as is presented in this section. Late fall-, spring-, and winter-run Chinook have only a slight chance of occurring. As a result, for these species a broad and very low take is prescribed for each activity and summarized further below.

The Covered Activities generally have the potential to affect more juvenile fish than adult fish. The larger effects to the juvenile population within the Calaveras River, in terms of numbers of juveniles subjected to project activities compared to adults, will result in a lower impact to the population because individual adult fish have a higher contribution to the cohort replacement rate than individual juvenile fish. In particular, adult fish that return to freshwater have survived the risks during their freshwater and ocean residence (e.g., predation, competition, water diversions, etc.) that outmigrating juvenile fish have yet to face, and, correspondingly, adult abundance is considerably lower. For example, Bradford (1997) estimated juvenile Chinook salmon survival in freshwater to be between 5 and 25 percent and ocean survival to be between 1 and 10 percent. Thus, overall survival of juveniles to adults would range from 0.05 percent (5% * 1% = 0.05%) to 2.5 percent (25% * 10% = 2.5%) and the abundance of juveniles in freshwater to maintain a cohort replacement of 1.0 with an example population level of 1,000 adults would range between 40,000 (1,000/0.025) and 2,000,000 (1,000/0.0005) juveniles.

Table 14. Migration timing of juvenile *O. mykiss* observed at the Shelton Road (RM 28) rotary screw trap, 2002-2015. Young-of year (YOY) indicates fish ≤100 mm and Age 1+ indicates fish >100 mm (forklengths). Dash indicates not sampled and parentheses indicate number of days sampled.

	Age	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total	Grand Total
2002	**YOY**	-	-	-	0 (9)	1 (6)	-	811 (23)	80 (6)	-	-	892	**1,129**
	Age 1+	-	-	-	159 (9)	20 (6)	-	54 (23)	4 (6)	-	-	237	
2003	**YOY**	-	-	-	7 (13)	40 (11)	126 (12)	559 (15)	453 (14)	116 (12)	14 (9)	1,315	**1,539**
	Age 1+	-	-	-	67 (13)	20 (11)	70 (12)	29 (15)	11 (14)	15 (12)	12 (9)	224	
2004	**YOY**	-	-	2 (27)	2 (15)	4 (19)	4 (9)	40 (14)	37 (6)	-	-	89	**1,411**
	Age 1+	-	-	859 (27)	197 (15)	180 (19)	54 (9)	30 (14)	5 (6)	-	-	1,325	
2005	**YOY**	-	-	0 (12)	4 (17)	1 (16)	52 (17)	39 (12)	-	-	-	96	**319**
	Age 1+	-	-	14 (12)	111 (17)	52 (16)	42 (17)	4 (12)	-	-	-	223	
2006	**YOY**	-	-	-	0 (10)	0 (15)	11 (12)	35 (1)	307 (16)	119 (18)	-	472	**706**
	Age 1+	-	-	-	47 (10)	100 (15)	45 (12)	2 (1)	17 (16)	23 (18)	-	234	
2007	**YOY**	-	-	0 (12)	0 (14)	3 (17)	70 (21)	374 (16)	403 (19)	139 (17)	-	989	**1,197**
	Age 1+	-	-	15 (12)	7 (14)	36 (17)	101 (21)	9 (16)	7 (19)	33 (17)	-	208	
2008	**YOY**	-	2 (10)	3 (16)	25 (14)	89 (14)	111 (18)	444 (18)	482 (18)	251 (16)	30 (7)	1,437	**1,873**
	Age 1+	-	27 (10)	93 (16)	95 (14)	60 (14)	27 (18)	30 (18)	79 (18)	22 (16)	3 (7)	436	
2009	**YOY**	-	2 (12)	0 (8)	6 (19)	3 (18)	77 (15)	341 (18)	394 (17)	76 (17)	19 (7)	918	**1,312**
	Age 1+	-	25 (12)	16 (8)	104 (19)	76 (18)	124 (15)	25 (18)	13 (17)	5 (17)	6 (7)	394	
2010	**YOY**	-	0 (12)	0 (18)	3 (16)	21 (17)	98 (17)	1,507 (18)	567 (16)	123 (18)	9 (8)	2,328	**2,769**
	Age 1+	-	14 (12)	132 (18)	176 (16)	61 (17)	18 (17)	28 (18)	2 (16)	7 (18)	3 (8)	441	
2011	**YOY**	-	0 (17)	0 (15)	0 (16)	0 (16)	3 (2)	76 (17)	30 (17)	43 (21)	4 (8)	156	**742**
	Age 1+	-	136 (17)	327 (15)	45 (16)	56 (16)	3 (2)	6 (17)	1 (17)	11 (21)	1 (9)	586	

	Age	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total	Grand Total
2012	**YOY**	0 (5)	0 (21)	0 (24)	0 (23)	1 (17)	237 (25)	225 (28)	117 (31)	52 (30)	8 (6)	640	**821**
	Age 1+	9 (5)	10 (21)	9 (24)	36 (23)	25 (17)	48 (25)	7 (28)	5 (31)	28 (30)	4 (6)	181	
2013	**YOY**	-	0 (18)	0 (16)	0 (19)	0 (16)	44 (22)	28 (17)	58 (18)	43 (16)	2 (7)	175	**334**
	Age 1+	-	7 (18)	60 (16)	20 (19)	12 (16)	28 (22)	7 (17)	13 (18)	8 (16)	4 (7)	159	
2014	**YOY**	-	0 (16)	0 (20)	0 (20)	0 (16)	145 (22)	266 (22)	62 (17)	11 (17)	0 (7)	484	**1,104**
	Age 1+	-	26 (16)	50 (20)	34 (20)	93 (16)	351 (22)	58 (22)	5 (17)	3 (17)	0 (7)	620	
2015	**YOY**	-	0 (9)	0 (21)	0 (17)	1 (19)	5 (16)	14 (18)	7 (16)	11 (17)	0 (1)	38	**530**
	Age 1+	-	136 (9)	208 (21)	9 (17)	111 (19)	3 (16)	14 (18)	1 (16)	10 (17)	0 (1)	492	

Table 15. Migration timing of juvenile fall-run Chinook salmon observed at the Shelton Road (RM 28) rotary screw trap, 2002-2015. Dash indicates not sampled and parentheses indicate number of days sampled.

Year	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Grand Total
2002	-	-	-	0 (9)	0 (6)	-	6 (23)	0 (6)	-	-	**6**
2003	-	-	-	0 (13)	0 (11)	0 (12)	0 (15)	0 (14)	0 (12)	0 (9)	**0**
2004	-	-	0 (27)	0 (15)	0 (19)	0 (9)	0 (14)	0 (6)	-	-	**0**
2005	-	-	0 (12)	0 (17)	0 (16)	0 (17)	0 (12)	-	-	-	**0**
2006	-	-	-	4 (10)	400 (15)	2,805 (12)	105 (1)	2,069 (16)	560 (18)	-	**5,943**
2007	-	-	1 (12)	0 (14)	91 (17)	151 (21)	414 (16)	1,258 (19)	209 (17)	-	**2,124**
2008	-	0 (10)	1 (16)	0 (14)	0 (14)	0 (18)	0 (18)	0 (18)	0 (16)	0 (7)	**1**
2009	-	0 (12)	0 (8)	0 (19)	0 (18)	0 (15)	0 (18)	0 (17)	0 (17)	0 (7)	**0**
2010	-	0 (12)	0 (18)	0 (16)	0 (17)	0 (17)	0 (18)	0 (16)	0 (18)	0 (8)	**0**
2011	-	0 (17)	0 (15)	0 (16)	0 (16)	0 (2)	0 (17)	0 (17)	0 (21)	0 (9)	**0**
2012	0 (5)	0 (21)	0 (24)	0 (23)	1 (17)	241 (25)	432 (28)	1,304 (31)	331 (30)	2 (6)	**2,311**
2013	-	1 (18)	1 (16)	0 (19)	0 (16)	2 (22)	34 (17)	365 (18)	45 (16)	1 (7)	**449**
2014	-	11 (16)	0 (20)	0 (20)	0 (16)	0 (22)	0 (22)	0 (17)	0 (17)	0 (7)	**11**
2015	-	0 (9)	0 (21)	0 (17)	0 (19)	0 (16)	1 (18)	20 (16)	0 (17)	0 (1)	**21**

Table 16. Estimated numbers of *O. mykiss* migrating past the Shelton Road (RM 28) rotary screw trap, 2002-2015. Young-of year (YOY) indicates fish ≤100 mm and Age 1+ indicates fish >100 mm in forklengths. Dash indicates not sampled. Asterisk indicates partial month estimated due to limited sampling. Parentheses indicate 80% confidence intervals.

Year	Age	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Total	Grand Total
2002	YOY	-	-	-	0*	2*	-	1,970	307*	-	-	2,279 (2,228-2,495)	2,702
	Age 1+	-	-	-	249*	61*	-	99	14*	-	-	423 (385-656)	
2003	YOY	-	-	-	42	137	456*	1,910	2,287	1,061	113	6,006 (5,390-11,006)	6,918
	Age 1+	-	-	-	162	79	222*	111	65	175	98	912 (855-1996)	
2004	YOY	-	-	3	14	21	8*	278	213*	-	-	537 (513-1,093)	4,397
	Age 1+	-	-	1,784	1,014	663	219*	151	29*	-	-	3,860 (3,667-6,059)	
2005	YOY	-	-	0*	16	9	165*	126*	-	-	-	316 (313-506)	1,127
	Age 1+	-	-	52*	413	181	149*	16*	-	-	-	811 (788-1,567)	
2006	YOY	-	-	-	0*	1	98*	72*	2,418	1,316	-	3,905 (3,577-7,656)	5,029
	Age 1+	-	-	-	238*	442	150*	4*	87	203	-	1,124 (1,086-2,002)	
2007	YOY	-	-	0*	0*	20	303	2,314	2,427	1,020	-	6,084 (5,531-10,901)	7,294
	Age 1+	-	-	115*	56*	261	410	88	43	237	-	1,210 (1,187-2,378)	
2008	YOY	-	4*	14	132	350	573	2,834	2,907	1,930	209*	8,953 (7,597-15,193)	11,116
	Age 1+	-	66*	267	520	306	145	263	400	175	21*	2,163 (2,054-4,488)	
2009	YOY	-	7*	0*	23	19	837	1,688	2,487	675	81*	5,817 (4,837-9,800)	7,794
	Age 1+	-	103*	80*	370	318	801	136	85	65	19*	1,977 (1,885-3,667)	
2010	YOY	-	0*	0*	10	74	295	7,084	3,416	780	75*	11,734 (11,408-24,456)	13,670
	Age 1+	-	73*	513	821	233	89	119	13	52	23*	1,936 (1,880-4,004)	
2011	YOY	-	0	0	0	0	36*	350*	263	188	38*	875 (870-1,635)	3,706
	Age 1+	-	459	1,692	350	195	23*	23*	8	72	9*	2,831 (2,762-6,683)	
2012	YOY	0*	0*	0	0	4	771	802	469	220	41*	2,307 (2,307-2,459)	3,019
	Age 1+	21*	48*	50	142	93	174	25	20	119	20*	712 (712-1,049)	
2013	YOY	-	0*	0	0	0	189	184	530	361	10*	1,274 (1,244-2,438)	2,091
	Age 1+	-	29*	252	72	55	134	41	125	82	27*	817 (813-1,704)	
2014	YOY	-	0*	0	0	0	463	930	448	91	0*	1,932 (1,873-3,716)	3,136
	Age 1+	-	100*	157	137	155	534	57	39	25	0*	1,204 (1,204-1,922)	
2015	YOY	-	0*	0	0	1	11	34	20	45	0*	111 (111-236)	884
	Age 1+	-	149*	363	22	158	4	37	4	36	0*	773 (770-1,130)	

Table 17. Estimated numbers of juvenile fall-run Chinook salmon migrating past the Shelton Road (RM 28) rotary screw trap, 2006, 2007, 2012 and 2013. Abundance estimated based on an average trap efficiency of 26.6% in 2006 and 2007 and on percent flow sampled in 2012-2013. Dash indicates not sampled. Asterisk indicates partial month estimated due to limited sampling. Note: April 2006 substantially underestimated due to only one day of sampling. Parentheses indicate 80% confidence intervals.

Month	2006	2007	2012	2013
Oct	-	-	0*	-
Nov	-	-	0*	6*
Dec	-	10*	0*	2
Jan	15*	0*	0	0
Feb	5,435	1,018	8	0
Mar	14,017	1,255	1,257	12
Apr	395	4,766	1,317	343
May	15,582	11,488	6,452	3,297
Jun	3,679	2,264	3,021	411
Jul	-	-	77*	11*
Total	**39,123** (16,158-57-322)	**20,801** (19,507-38,821)	**12,132** (12,132-13,682)	**4,082** (3,787-7,513)

Take was estimated using a variety of methods that are described under individual activities below. All take estimates are annual, with the exception of maintenance and construction activities under OM 3, OM 4, and OM 6, for which take is estimated per maintenance or construction event. Overall, annual steelhead take is estimated at 83 adults, 1,749 Age 1+, and 35,520 YOY; and fall-run Chinook take is estimated to be 466 adults and 16,373 juveniles (Table 18). Of note, lethal take amounts to only a small fraction of these overall take estimates (Table 18).

8.2.1 Potential Level of Take associated with New Hogan Reservoir Water Impoundment and Non-flood Control Operations

Temporary migration delays, temporary isolation, or stranding and mortality may occur from November through March as a result of impoundment of surface water into New Hogan and little to no flows reaching areas downstream of Bellota or no flows being released from New Hogan reservoir. The latter condition is only expected during temporary periods in drought years.

The amount or extent of adult salmon and/or steelhead take associated with this activity is difficult to predict because of uncertainties associated with:

(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 District’s control, including passage problems associated with channel morphology resulting from reconfiguration of Mormon Slough by the USACE, or due to flood control operations; and
(3) amount of natural migration delay or blockage that would occur under a natural hydrologic regime.

Table 18. Estimated levels of take for *O. mykiss* and fall-run Chinook salmon for individual activities. All take estimates are annual, with the exception of Activities 2 and 7, for which take is estimated per maintenance event.

Activity	*O. mykiss*						Fall-run Chinook			
	Estimated Take			Estimated % Population			Estimated Take		Estimated % Population	
	Adult	Age 1+	YOY	Adult	Age 1+	YOY	Adult	Juvenile	Adult	Juvenile
OM1. New Hogan Reservoir Water Impoundment and Non-flood Control Operations	21	81	137	1.28	0.42	0.02	464	210	24.4	0.2
OM2. SEWD Old Calaveras Headworks Facility Operations	(21)	169	218	(1.28)	0.89	0.03	(464)	2,437	(24.4)	1.7
OM3. SEWD Bellota Diversion Facility Operations										
Operations Activities	(21)	(81)	251[a]	(1.28)	(0.42)	0.04	(464)	3,650[a]	(24.4)	2.6
Construction Activities	(11)	(41)	126[a]	(0.64)	(0.21)	0.02	(234)	1,825[a]	(12.2)	1.3
OM4. Artificial Instream Structures and SEWD Small Instream Dam Operations										
Operations Activities	(21)	(81)	(137)	(1.28)	(0.42)	(0.02)	(464)	(210)	(24.4)	(0.2)
Construction Activities	(11)	(41)	(69)	(0.67)	(0.21)	(0.01)	(232)	(105)	(12.4)	(0.1)
OM5. Privately Owned Diversion Facilities Operated within the District's Service Areas										
New Hogan-Bellota Reach	0	9	60	0	0.05	0.009	0	401	0	0.3
Old Calaveras River channel	0	23	(159)	0	(0.12)	(0.02)	0	(1,075)	0	(0.8)
Mormon Slough	0	35	225	0	0.18	0.03	0	1,789	0	1.3
OM6. SEWD Channel Maintenance for Instream Structures	2	30	550	0.12	0.16	0.08	2	118	0.1	0.08
OM7. Fisheries Monitoring Program	60	1,402	33,953	3.67	7.36	5.2	0	5,943	0	4.3
TOTAL ESTIMATED	83	1,749	35,520	5.1 [1.8]	9.1 [1.6]	5.3 [<1]	466	16,373	24.4 [100]	11.78 [5.8]
• Non- Lethal	*79*	*1,662*	*33,744*	*4.8*	*8.6*	*5.0*	382	8,267	20.0	5.9
• Lethal	*4*	*87*	*1,776*	*0.3*	*0.5*	*0.3*	84	8,106	4.4	5.8

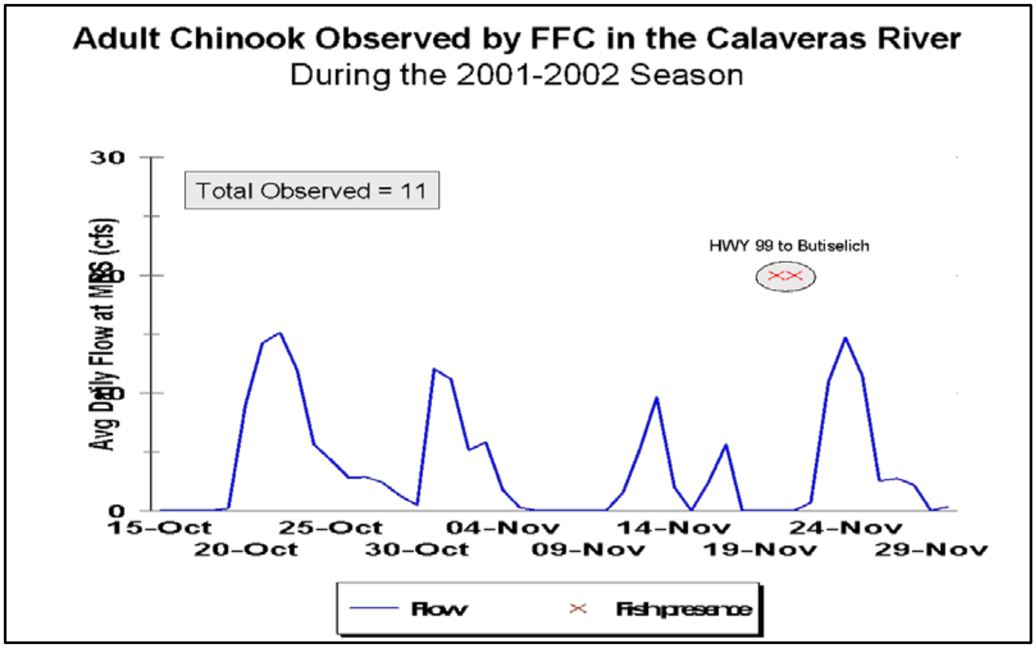
Note: Numbers in parentheses indicate that take has already been accounted for under another activity and this number is not included in totals. And, percentages in brackets indicate the percentage of incidental take associated with Project activities versus total take that includes direct take associated with research activities.

[a] Under critical water year scenario, these totals are anticipated to be doubled due to low flow conditions and increased risk of exposure.

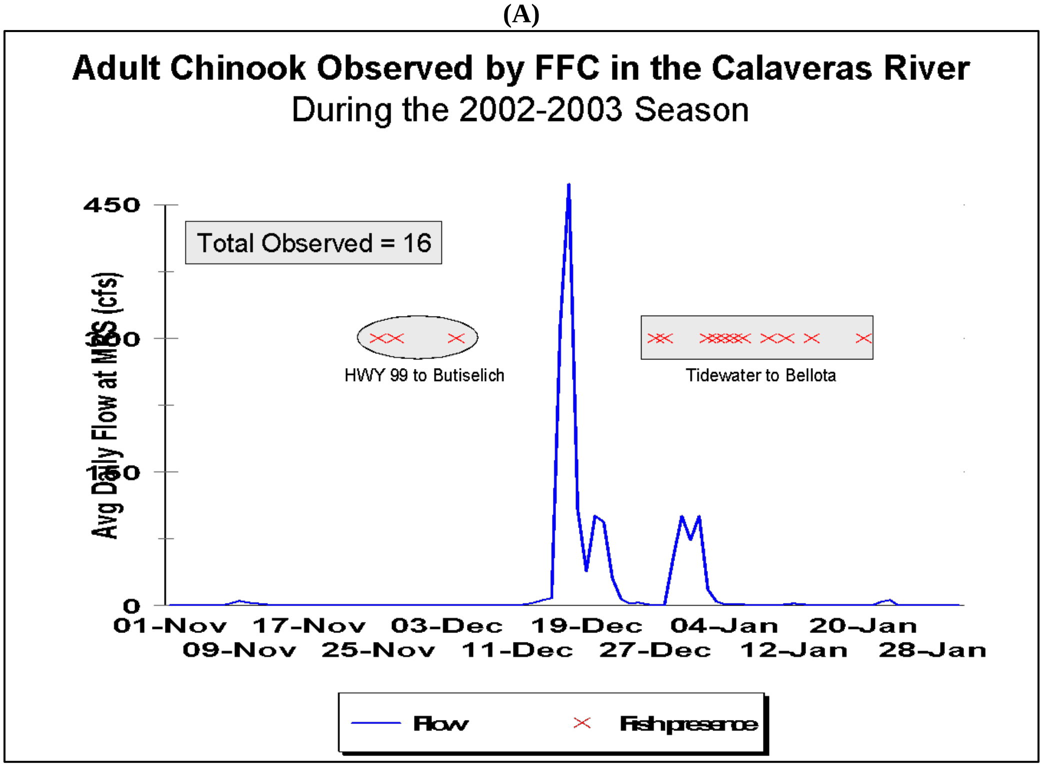
Nonetheless, surveys conducted from 2001 to 2012 indicate the potential number of adult and juvenile salmonids delayed or stranded downstream of Bellota during flow fluctuations in the fall, winter, and spring (Table 4). Between 2001 and 2012, the FFC conducted periodic passage surveys and observed some juvenile and adult salmonids within Mormon Slough and the Old Calaveras River (Table 4). 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 (Table 4). For passage surveys, the location and timing of adult observations (Figures 16-18) 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 prevented.

Using these survey results, take was estimated assuming that *O. mykiss* juveniles observed in fall/winter were Age 1+ and in spring were fry. 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* (Table 18); and 210 juvenile and 464 adult fall-run Chinook (Table 18) could be affected by New Hogan non-flood control operations.

To the extent that other CHCP activities involve the diversion and use of water, any potential take associated with such activities is addressed by this Section 8.2.1.

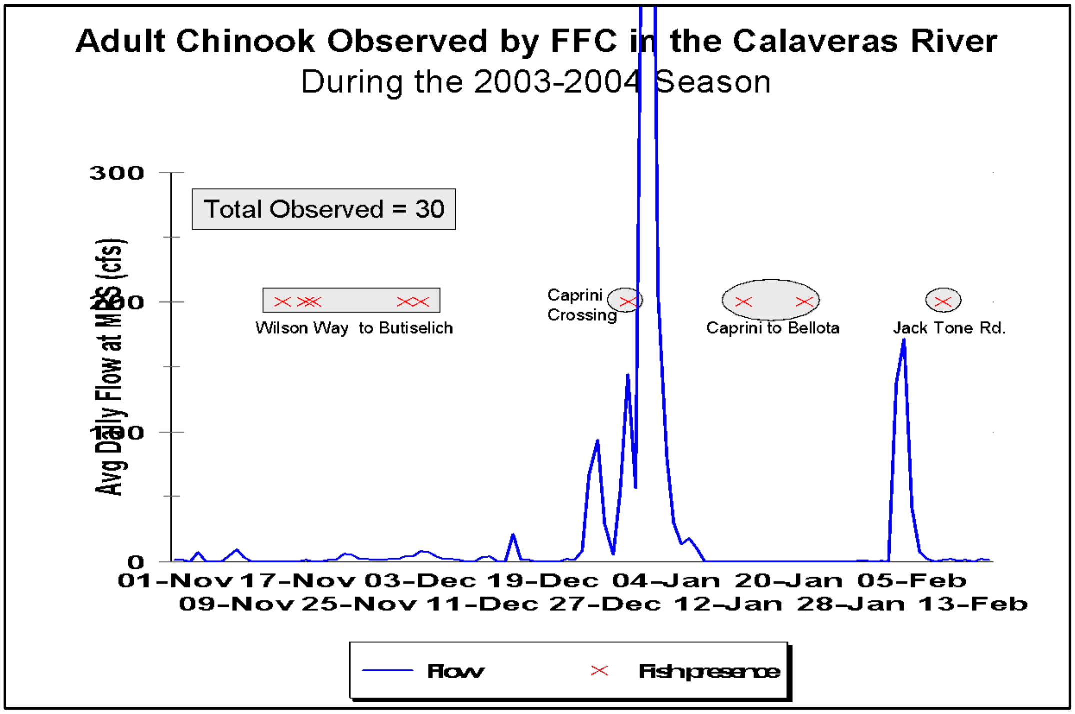


(A)

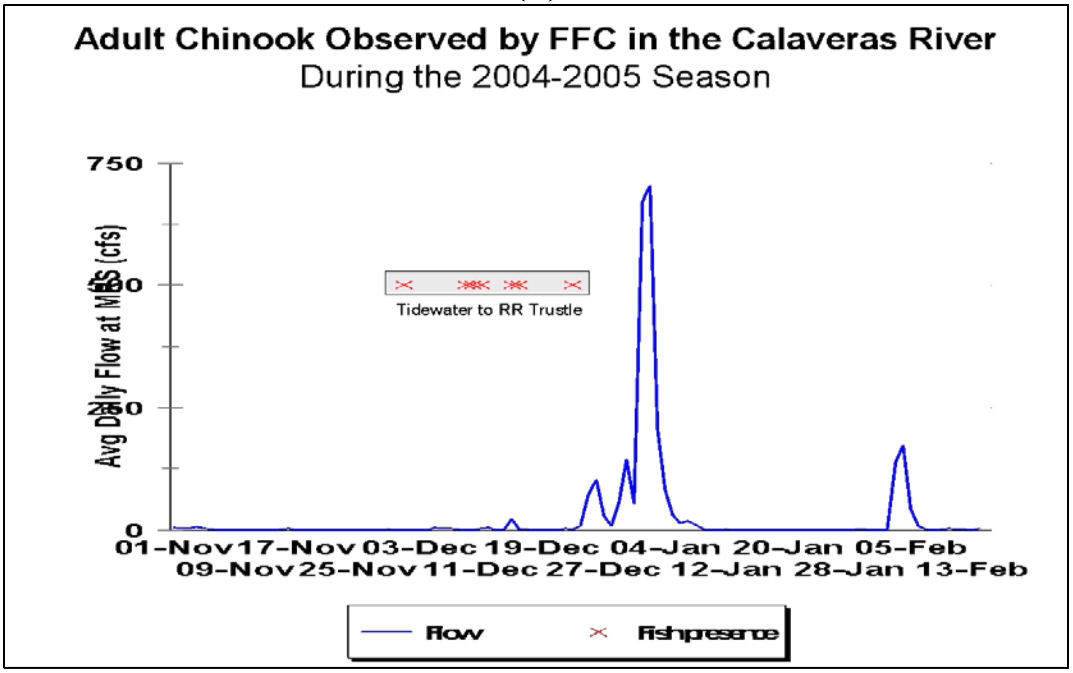


(B)

Figure 16. Location and timing of adult fall-run Chinook observed in the lower Calaveras River during FFC passage surveys, 2001-2002 season (A) and 2002-2003 season (B).

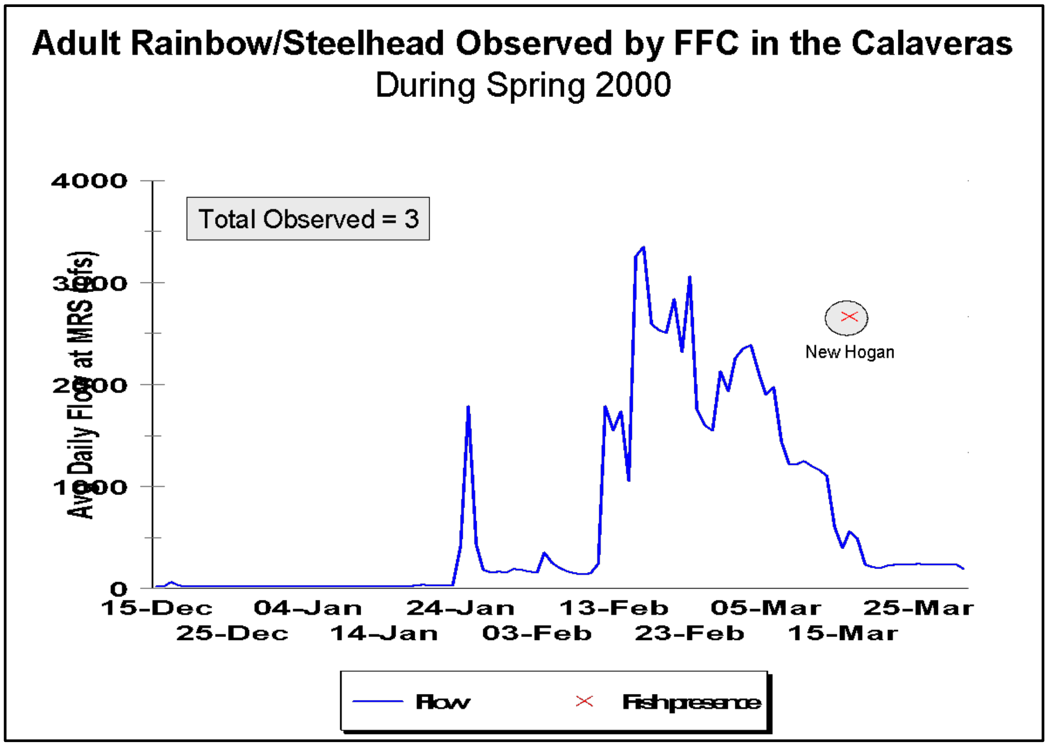


(A)

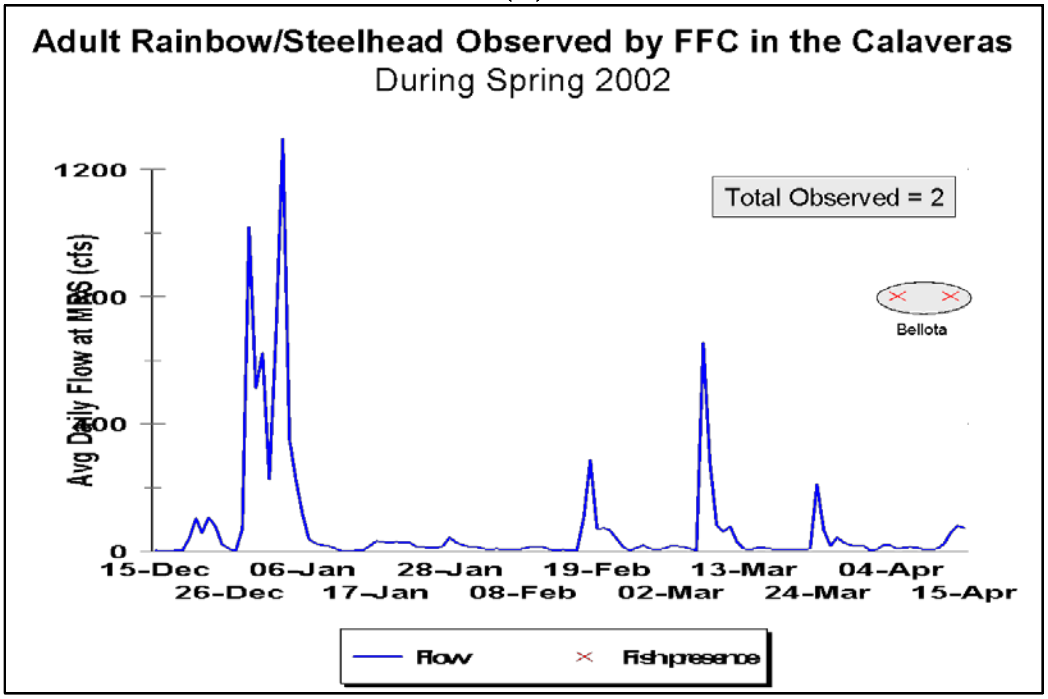


(B)

Figure 17. Location and timing of adult fall-run Chinook observed in the lower Calaveras River during FFC passage surveys, 2003-2004 season (A) and 2004-2005 season (B).



(A)



(B)

Figure 18. Location and timing of adult *O. mykiss* observed in the lower Calaveras River during FFC passage surveys, spring 2000 (A) and spring 2002 (B).

8.2.2 Potential Level of Take Associated with SEWD Old Calaveras River Headworks Facility Operations

Since 2005, a temporary barrier (i.e., net) has been operated upstream of the Headworks Facility to reduce the number of downstream juvenile salmonid migrants entering the Headworks Facility. However, until a permanent solution at the Headworks Facility is implemented, entrainment of fry sized (<60 mm according to NMFS screening criteria) steelhead or salmon may occur at the Headworks Facility whenever it is operating while fry-sized fish are in the vicinity of the structure. Entrainment may occur whenever the slide gates are intermittently opened for groundwater recharge (i.e., occurs only when natural inflows are available between November and June, and Podesta Reservoir is not spilling) or whenever the slide gates are opened during the irrigation season (generally mid-April to mid-October).

No direct entrainment studies have been conducted at the facility; 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 (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 (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.

To estimate the number of fry-sized salmonids that may be entrained into and be susceptible to impacts within the Old Calaveras River channel, several assumptions were made, including:

1) all fry-sized salmonids observed at Shelton Road continue downstream towards the confluence and are equally susceptible to entrainment;
2) only a proportion of fry-sized migrants arrive in the vicinity of Bellota (accounting for an estimated number diverted into unscreened diversions between Shelton Road and Bellota);
3) 25% of all juvenile salmonids migrate along each channel margin while 50% migrate mid-channel (HBMWD 2004); and
4) juvenile salmonids are entrained at a rate directly proportional to the percent of flow diverted.

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 (Table 18).

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, 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 potentially be entrained into the Old Calaveras River.

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) (Table 18).

The amount or extent of adult salmon and/or steelhead take associated with this activity is difficult to predict because of uncertainties associated with:

1) lack of direct observations of adults being impeded or blocked by the Headworks Facility during their upstream migration;
2) magnitude and duration of flows necessary for fish passage at numerous individual structures in the Old Calaveras River channel downstream of the Headworks facility;
3) effectiveness of the temporary barrier net for kelts.

Therefore, the adult take estimate of 20 *O. mykiss* and three fall-run Chinook salmon was based on the maximum number of fish observed during previous surveys (Tables 14 and 15).

8.2.3 Potential Level of Take Associated with SEWD Bellota Diversion Facility Operations

Since early 2006, temporary screens at Bellota 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 (<60 mm according to NMFS screening criteria) steelhead 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.

To estimate the number of fry-sized salmonids that may be entrained into the Bellota Diversion during the interim (i.e., temporary screen) period, several assumptions were made including:

1) all fry-sized salmonids observed at Shelton Road continue downstream towards the confluence and are susceptible to entrainment;
2) only a proportion of fry-sized migrants arrive in the vicinity of Bellota (accounting only for an estimated number diverted into unscreened diversions between Shelton Road and Bellota);
3) 25% of all juveniles migrate along each edge of the channel while 50% migrate mid-channel (HBMWD 2004);
4) juveniles are entrained at a rate directly proportional to the percent of flow diverted; and
5) no juveniles greater than 60 mm (i.e., juvenile Chinook migrating April-July and Age 1+ *O. mykiss*) juveniles will be entrained due to the temporary screens.

Based on these assumptions, 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 (Table 18). 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 502 YOY *O. mykiss* and 7,300 Chinook juveniles <60 mm could encounter the Bellota Diversion Facility and potentially be entrained.

The proposed permanent fish screen is designed to meet NMFS's mesh screen requirements to prevent entrainment of juvenile salmonids (NMFS 1997). However, the sweeping velocity will not always be met so impingement of some juvenile salmonids may occur at the Bellota intake, resulting in injury or mortality of affected individuals. Additionally, individuals that survive impingement are expected to be more vulnerable to predation due to injury or disorientation. Take associated with impingement is anticipated to be substantially lower than that from entrainment.

Besides entrainment, take could occur at the Bellota Weir similar to that described for small instream dam operations under section 8.2.4. Therefore, any potential take associated with the Bellota Weir is addressed by Section 8.2.4.

Additionally, take could occur during construction activities conducted within the wetted channel for Bellota Diversion Facility improvements under Conservation Strategies 7 (CS7). Due to the timing of cofferdam installation and removal (couple of weeks in early April and in late October, respectively), the estimated number of YOY salmonids that may be affected by heavy equipment and fish dispersal and relocation efforts during cofferdam installation and by turbidity during cofferdam installation and removal is anticipated to be less than half of those that may be entrained into the diversion, which would be up to 126 YOY *O. mykiss* and 1,825 Chinook juveniles <60 mm in most water years and 251 YOY *O. mykiss* and 3,650 Chinook juveniles <60 mm in critically dry years. The estimated number of Age 1+ *O. mykiss* is 41 and juvenile Chinook >60 mm is 899 in most water years, and is 82 Age 1+ *O. mykiss* and 1,798 Chinook juveniles >60 mm in critically dry years.

8.2.4 Potential Level of Take Associated with Artificial Instream Structures and SEWD Small Instream Dam Operations

Take could occur in areas downstream of Bellota resulting from migration delays or blockage due to flashboard dam installation, removal, and operation or due to passage problems over flashboard dam foundations under low flow conditions. Isolation and secondary impacts (e.g., thermal stress, increased susceptibility to predation, increased susceptibility to entrainment), or stranding and associated mortality may occur in areas downstream of Bellota during flashboard dam removal in the fall (about five days beginning on or about October 15), replacement in the spring (about five days beginning on or about April 15), or during operations in the irrigation season (mid-April to mid-October). Temporary migration delays, temporary isolation, or stranding and mortality events may occur in areas downstream of Bellota from mid-October through mid-April associated with some flashboard dam foundation structural configurations that result in passage problems at low flows.

The amount or extent of adult salmon and/or steelhead take associated with this activity is difficult to predict because of uncertainties associated with:

(1) individual habitat use in areas where impacts may occur (note: these areas function as migration corridors, so individual fish usage is infrequent).

Nonetheless, surveys conducted from 2001 to 2006 by the FFC and SEWD fisheries biologists indicate the potential number of adult and juvenile salmonids delayed or stranded downstream of Bellota associated with flashboard dam removal in the fall and flashboard dam installation/operation in the spring (Table 4). Between 2001 and 2006, the FFC conducted periodic passage surveys and observed some juvenile and adult salmonids within Mormon Slough and the Old Calaveras River (Table 4). In addition, the FFC operated fyke nets in the Old Calaveras and Mormon Slough during the first three weeks of May and conducted one electrofishing survey with CDFG downstream of Bellota in early July during 2003 (Table 4). For passage surveys, the location and timing of adult observations (Figures 16-18) indicates that adults may be falsely attracted into the river by runoff from storm drains in the lower Mormon Slough/SDC area. Storm runoff can occur even when there are no corresponding freshets and/or flood control releases in the river upstream of the point of discharge. This 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 prevented.

In 2003 and 2004, SEWD fisheries biologists conducted salmonid relocation operations in the Old Calaveras River channel during flashboard dam removal operations (Table 4). Salmonids captured and relocated in fall of 2004 were likely entrained during groundwater recharge operations that occurred during the first few months of the year when there was no net barrier in place, and then these fish reared within the channel oversummer. Since salmonids in 2004 likely reared in the channel for several months prior to being rescued and were noticeably healthy, it appears that conditions within the Old Calaveras River channel may be adequate, at least in some years, for over-summer rearing.

Using these survey results, take was estimated assuming that juveniles observed in fall/winter would be Age 1+ and in spring would be fry. Take was identified as the maximum annual number of individuals observed 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 encounter and be affected by small instream dam structures (Table 18). Note that these take estimates also overlap with estimated take for New Hogan non-flood control operations.

Additionally, take could occur during cofferdam installation and removal within the wetted channel for Artificial Instream Structure improvements under Conservation Strategies 10 (CS10). Due to the short timeframe of possible effects, take was identified as one half of the maximum annual number of individuals observed during the aforementioned surveys. Therefore, up to approximately 41 Age 1+, 69 YOY, and 11 adult *O. mykiss* and 105 juvenile and 232 adult fall-run Chinook could encounter and be affected by construction activities (Table 18). Note that these take estimates also overlap with estimated take for New Hogan non-flood control operations.

8.2.5 Potential Level of Take associated with Privately Owned Diversion Facilities Operated within the District's Service Areas

Take could occur resulting from entrainment into unscreened diversions. Entrainment into privately owned, small unscreened diversions may occur whenever diversions take place (pumping generally occurs during intermittent periods from April 15-October 15 but can begin earlier in dry years). In general, diversions occur only as needed during the irrigation season (e.g., typically twice a month for 5-10 days depending on various factors such as weather, size of diversion and irrigated acreage, and type of crop).

According to snorkel surveys conducted by the FFC (FFC 2002), most juvenile *O. mykiss* were observed rearing in the upper river, within the Hogan and Canyon reaches (i.e., first five miles below the dam). The FFC (2002) also determined that summer habitat conditions (e.g., water temperatures) for juveniles are less optimal downstream of Jenny Lind (RM 37). Based on this information, it appears that most juvenile salmonid rearing can be expected to occur upstream of Jenny Lind (FFC 2002); therefore, most rearing juvenile salmonids will not be exposed to potential entrainment in the vicinity of irrigation diversions because there are only two diversions that are upstream of Jenny Lind (Appendix C). Both of these diversions also have low flow volumes (1-3 cfs) and intakes with diameters $\leq$4 inches, which further reduces the likelihood of take.

Data from RST sampling at Shelton Road (RM 28) was used to calculate an estimated number of salmonid juvenile migrants that may be entrained into small, privately owned diversions in the Calaveras River. These estimates were calculated using several assumptions, as follows:

1) all salmonids observed at Shelton Road RST continue migrating downstream and are susceptible to entrainment;
2) juvenile migrants are entrained at a rate directly proportional to the percent of flow diverted;
3) 25% of all juveniles migrate along each channel margin while 50% migrate mid-channel (HBMWD 2004);
4) irrigation diversions operate up to a maximum of 20 days per month;
5) flow released from New Hogan for agricultural usage is diverted equally into all 143 diversions located downstream of Bellota (Potter Creek and Mosher Slough/Creek diversions excluded); and
6) no adults will be entrained.

Based on these assumptions, up to approximately 67 Age 1+ (nine in the New Hogan to Bellota Reach, 23 Old Calaveras River channel, and 35 in Mormon Slough) and 444 YOY (60 in the New Hogan to Bellota Reach, 159 in Old Calaveras River channel, and 225 in Mormon Slough) *O. mykiss* and 3,265 juvenile fall-run Chinook (401 in the New Hogan to Bellota Reach, 1,075 Old Calaveras River channel, and 1,789 in Mormon Slough) could encounter privately owned, small unscreened diversions within the Calaveras River and potentially be entrained into these diversions (Table 18). Note that these take estimates also overlap with estimated take for fish potentially encountering instream dam structures.

8.2.6 Potential Level of Take associated with SEWD Channel Maintenance for Instream Structures

Injury due to contact with heavy equipment, behavioral impairment due to temporary increases in turbidity, or harassment associated with dispersal efforts may occur during maintenance activities within the wetted channel. Maintenance activities in the wetted channel occur infrequently (i.e., only occurs in years when flows greater than 1,200-5,500 cfs result in damage or sedimentation/debris buildup at instream structures), are typically completed in less than five days, and are conducted concurrently with flashboard installation during early to mid-April.

In order to estimate the number of salmonids that may be affected by maintenance activities, the zone of influence of maintenance activities was assumed to be 200 square meters. Based on FFC average density data for the Jenny Lind to Shelton reach (Table 11), *O. mykiss* Age 1+ and adult take was estimated to be equivalent to 3 Age 1+ /100 square meters (2.0 + 0.9 for 100-199 mm and 200-299 mm, respectively) and 1 adult/100 square meters (0.4 rounded to one fish). As density data for *O. mykiss* fry and juvenile fall-run Chinook salmon are not available, a rough estimate of average density per 100 square meters was calculated by dividing the estimated fry/juvenile production by the total estimated area from New Hogan Dam to Bellota. Therefore, up to approximately 30 Age 1+, 550 YOY and two adult *O. mykiss*, as well as 118 juvenile and two adult fall-run Chinook could be affected by maintenance activities conducted in the wetted channel (Table 18).

8.2.7 Potential Level of Take associated with Fisheries Monitoring Program

Take will occur during trapping and handling, but mortality is expected to be less than 5% of fish captured and released. *O. mykiss* take estimates are based on an estimated population with 652,765 YOY, 19,087 Age 1+, and 1,636 adult *O. mykiss*; and on results from previous RST monitoring. Based on the estimated population, up to 5% of the juvenile population (i.e., 32,638 YOY and 954 Age 1+) and up to 3% of the adult population (i.e., 49) may be captured and handled through a combination of seining and electrofishing. Past RST studies indicate that up to 1,315 YOY, 448 Age 1+, and 11 *O. mykiss* adults may be captured and handled during trapping. Total estimated take for research is up to 33,953 YOY, 1,402 Age 1+, and 60 *O. mykiss* adults. Up to 500 (470 Age 1+ and 30 adults) may be PIT tagged annually, and all may be photonically dye marked, assuming they are larger than 30 mm.

No direct mortality will occur, but indirect 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 unpublished data, available upon request), little mortality is expected as a result of capturing and marking fish (i.e., < 5%). PIT tagging is not expected to result in any additional 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 our own experience with photonic marking and PIT tagging (i.e., less than 5%). Applying expected mortality rates to expected take numbers results in up to 1,698 YOY, 71 Age 1+, and four adult mortalities.

If indirect mortality does occur, SEWD's fishery biologist (currently FISHBIO) will contact NMFS (currently Monica Gutierrez) and CDFW (currently Chris McKibbin and George Edwards) 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. SEWD's fishery biologist (currently FISHBIO) will coordinate with NMFS on an annual basis to determine appropriate levels of take for ESA-listed species during the permitting process for all planned monitoring activities.

8.3 Estimated Levels of Take of late fall-, spring-, and winter-run Chinook for Covered Activities

A low level of take is prescribed to late fall-, spring-, and winter-run Chinook to account for the unlikely instance that an individual from one of these races is present in the Calaveras River. Therefore, up to one adult and four juveniles could be affected for each race (late fall-, spring, and winter-run Chinook) by each individual activity (OM1-OM7), respectively.

Chapter 9. Adaptive Management Plan

Uncertainty is an inherent component of ecological systems. Adaptive management is a process that will allow management decisions to be adjusted throughout the life of the CHCP incidental take permit to: (1) minimize the uncertainty associated with managing Covered Species where there are gaps in the available scientific information regarding their biological requirements, (2) reflect new information on the life history or ecology of Covered Species generated through continuing research, and (3) ensure that the conservation strategies are being appropriately implemented, and that their biological goals, objectives, and associated targets are being met. According to NMFS' and USFWS' Five-Point Policy for HCPs (65 FR 35242), adaptive management is broadly defined as a method for "…examining alternative strategies for meeting measurable biological goals and objectives, and then, if necessary, adjusting future conservation management actions according to what is learned." The CHCP's Adaptive Management Plan (AMP) provides guidance regarding the manner in which the monitoring information collected by SEWD, as well as information collected by others (e.g., USFWS and CDFW), will be used to continually evaluate and, if necessary, modify the CHCP implementation and long-term management of environmental resources. Collecting and analyzing data through monitoring and research are essential components of the AMP.

Accordingly, the status of the CHCP's Covered Species and conservation strategies will be monitored and analyzed under the CHCP's Compliance and Effectiveness Monitoring Program (Appendix D) to determine whether the CHCP is producing the desired results based on the conservation program's biological goals, objectives, and associated targets (Chapter 7). Conservation strategies are expected to effectively achieve these biological goals, objectives, and associated targets since they were designed based on the best scientific information currently available. However, there are a few data gaps pertaining to salmonid populations within the Calaveras River, which long-term and/or targeted effectiveness monitoring under the AMP will help to address, including:

(1) *O. mykiss* and Chinook salmon carrying capacity;
(2) Proportion of the *O. mykiss* population expressing different life-history patterns (i.e., resident, adfluvial, anadromous) and the factors influencing life-history expression (e.g., water temperature and migration delays);
(3) Susceptibility of individual salmonids to entrainment into individual private water diversions under varying conditions.

If effectiveness monitoring indicates that the desired results of the conservation strategies are not being achieved, or if other information needs to be incorporated into the CHCP, then adjustments in the conservation and mitigation strategies can be made to account for changing conditions and new scientific information.

As described in Chapter 7, certain conservation strategies (i.e., Old Calaveras Headworks Facility) will require an initial evaluation within the first few years of the ITP before a long-term solution can be finalized through the AMP process. Additionally, for some conservation strategies (i.e., Minimum Instream Flow Commitment), it was practicable to identify a default response; adaptive management will be used to afford additional protections to Covered Species above the default protections. As this chapter is largely focused on the general adaptive management process, any more specific provisions in Section 9.5 for critical water storage and flood control measures supersede the more general provisions discussed elsewhere in this chapter.

9.1 Adaptive Management Plan Evaluation Process

Based on the best scientific information currently available, SEWD believes that the CHCP conservation strategies will effectively achieve the CHCP biological goals, objectives, and associated targets. Nonetheless, current habitat conditions and status of covered species will likely change during CHCP implementation and it is possible that additional and different conservation strategies, not identified in the CHCP, would be more effective in achieving CHCP biological goals, objectives, and associated targets than those currently identified. Results of effectiveness monitoring may also indicate that some CHCP conservation strategies are less effective in achieving biological goals, objectives, and associated targets than anticipated, and are unnecessary. To address these possibilities, the CHCP includes implementation of an AMP decision-making process (AMP process) to assess the effectiveness of conservation strategies, propose alternative or modified conservation strategies as the need arises, and address changed and unforeseen circumstances.

The most important element of the AMP is the Compliance and Effectiveness Monitoring Program (Appendix D). Information collected through monitoring will be used to identify whether biological goals, objectives and associated targets are being met by implementation of conservation strategies and identify any modifications that could be made to conservation strategies in order to optimize fishery benefits.

There are three components of the AMP process:

1. Adaptive Management Response Process;
2. Organizational Model; and
3. Coordination, Implementation Timeline, and Reporting.

9.1.1 Adaptive Management Response Process

The adaptive management response process that will be used in the CHCP follows a standard cyclical series of steps, illustrated in the flow chart in Figure 19. Based on the British Columbia Forest Services' adaptive management framework (BCFS 1999), the steps associated with the flowchart are as follows:

Step 1. Assess problem. Define the problem (e.g., passage barrier), synthesize existing knowledge about the system, and explore alternative management actions to determine which actions are most likely to meet biological goals and objectives. Predict outcomes of management actions in order to assess which actions are most likely to meet management objectives. Also, identify key gaps in understanding of the system (i.e., uncertainties that limit the ability to predict outcomes).

Step 2. **Design**. Design an action that will solve the problem (e.g., structural improvement) and enhance the existing effectiveness monitoring program (including the development of new monitoring measures) that will provide reliable feedback about the effectiveness of the chosen action.

Step 3. Implement. Implement the chosen action.

Step 4. Monitor. Implement the monitoring program to determine how effective actions are in meeting biological goals and objectives, and to test the hypothesized relationships that formed the basis for the predicted outcomes. Monitoring details are described further in Chapter 7 and in Appendix D.

Step 5. Evaluate. Compare actual outcomes to predicted outcomes and interpret the reasons underlying any differences.

Step 6. Adjust. Adjustment to actions, objectives, and any models used to make predictions may be necessary based on new understanding obtained through monitoring. New understanding may lead to reassessment of the problem, new questions, and new options to try in a continual cycle of improvement.

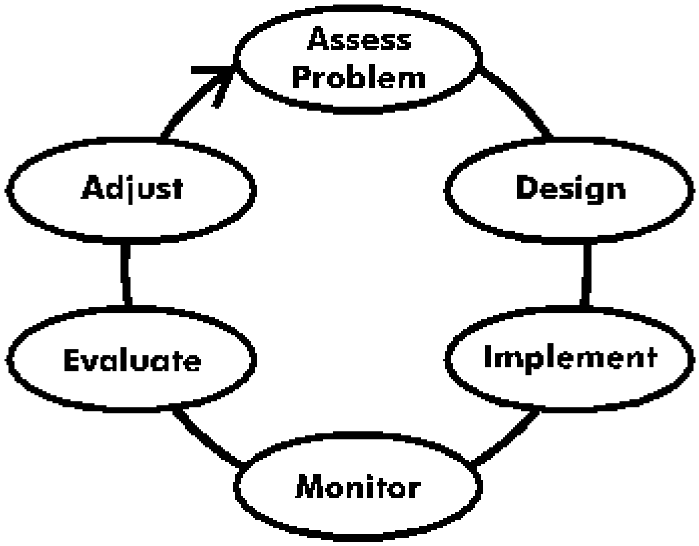


Figure 19. Adaptive Management Flow Chart. Source: BCFS 1999.

9.1.2 Organizational Model

The AMP will be administered by SEWD and NMFS (i.e., Governing Board). However, the District recognizes the importance of public participation and contributions of outside scientists to an AMP; thus, the CHCP's AMP will also provide the opportunity for scientific review of the effectiveness of existing or proposed conservation strategies and monitoring protocols by interested stakeholders. Individual stakeholders may provide suggestions and information related to Steps 1, 2, and 5 during meetings of a Calaveras River Technical Review Group (CRTRG; see description below), as well as through direct submittals to the District; however, the Governing Board will retain final authority to make changes to the CHCP (i.e., Step 6, Adjust). Furthermore, NMFS will continue to have final control over approval or denial of changes in the proposed operations that could affect Covered Species.

9.1.2.1 Governing Board

SEWD and NMFS are responsible for cooperatively implementing the AMP. Responsibilities are divided into those to be implemented by SEWD and those implemented by NMFS, and those to be implemented jointly by the two agencies.

SEWD's responsibilities include:

- gathering monitoring and research data, including relevant information developed by others, and maintaining databases;
- disseminating CHCP generated monitoring and research data (including monitoring reports and research papers) to NMFS and, upon request, to interested stakeholders including members of the CRTRG; and

- contacting the CRTRG, as needed, to solicit input regarding new scientific information relevant to implementation, important data gaps, monitoring and management methods, and data interpretation.

NMFS responsibilities include:

- NMFS will continue to have final control over approval or denial of changes in the proposed activities that could affect NMFS listed species.

NMFS and SEWD[22] shared responsibilities include:

- identifying and/or adjusting specific performance metrics, thresholds, and milestones for individual conservation actions, as needed, that will provide reliable feedback about the effectiveness of the chosen action;
- assessing the effectiveness of conservation strategies;
- based on scientific information, potentially considering on a case-by-case basis specific projects, actions, and monitoring that have not yet been identified or implemented;
- determining the date by which all agreed-upon adaptive management changes must be fully implemented; and
- retaining final authority to revise activities under the CHCP (i.e., Step 6, Adjust).

9.1.2.2 Calaveras River Technical Review Group

The CRTRG will be an open-membership collection of individual organizations that serves as a forum for interested stakeholders to provide recommendations for enhancement actions and fisheries studies in the Calaveras River, as well as provide informal peer review and coordination of these enhancement actions and studies with other programs (e.g., Delta Stewardship Council's Delta Science Program or USFWS's Anadromous Fish Restoration Program [AFRP]).

The District anticipates that the Calaveras River Fish Group (CRFG), which was utilized in a similar capacity by the District prior to the CHCP's development, will continue to function as the CRTRG for the foreseeable future. The CRFG is currently composed of members of interested governmental resource agencies (e.g., USFWS, NMFS, CDFW, USACE, and DWR), non-governmental organizations (e.g., Fishery Foundation of California, and University of the Pacific), and consulting groups (e.g., FISHBIO). The CRFG was not, nor will it ever be, established by, under the control or management of, or funded by NMFS. The CRFG was created to:

> serve as an ad hoc group with scientific and technical expertise on anadromous fish populations, their habitat and fisheries in the Calaveras River that will coordinate studies and evaluate data to enhance anadromous fish populations in the Calaveras River (draft May 21, 2003 CRFG Charter).

[22] The District shall be responsible for the development of the information for its "Covered Activities," and may provide input on matters not under their control, but will not be involved in decision making outside of its Covered Activities.

In its current capacity, the CRFG has no established meeting schedule but meets on an as needed basis to discuss fisheries monitoring and miscellaneous issues as they arise. The CRFG acts as a scientific information dissemination and -exchange forum for fisheries research and monitoring activities within the Calaveras River. Individual members of the CRFG provide recommendations to the District regarding the types of studies that can address data gaps, as well as suggestions for prioritizing research and monitoring activities.

Interested stakeholders, including CRTRG members, may individually (i.e., never sought as group consensus) present ideas about potential fisheries related problems (i.e., Step 1, Assess the Problem), provide information and suggestions regarding enhancement of the effectiveness monitoring program for individual conservation strategies (i.e., Step 2, Design), and may provide science-based peer review and feedback (e.g., recommended changes) to the Governing Board regarding CHCP implementation during annual and five-years reviews based on results of research and monitoring (i.e., Step 5, Evaluate). Interested governmental resource agencies may also make adaptive management recommendations directly to the Governing Board for consideration and inclusion in annual work plans.

9.1.3 Coordination, Implementation Timeline, and Reporting

To effectively implement the AMP, meetings and/or conference calls between SEWD and NMFS will occur at least twice a year, or more frequently as deemed appropriate by NMFS. These discussions will occur prior to annual transitional flow management periods associated with the beginning and end of the irrigation season. The pre-irrigation season meeting will be held annually in March to discuss the expected date for flashboard dam installation and the schedule for small artificial instream structural improvements for the year. The post-irrigation season meeting will be held annually in September to discuss the potential for adaptive management of non-dedicated fall storage (see Section 9.5), flood control (in coordination with USACE), and the preliminary results of monitoring during the previous winter/spring.

Annual and Five-Year Progress Reviews (Progress Review Meetings) will be held with representatives from the Governing Board and the CRTRG to review results of monitoring and provide a forum for discussions regarding the AMP (i.e., Step 5, Evaluate). Progress Review Meetings will be held within 90 days of submittal of either an Annual Monitoring Report or Five-Year Comprehensive Report (reports submitted by March 30 each year). Reports will include summaries of conservation strategies and monitoring activities as described in Appendix D. Additionally, the reports will describe any adaptive management decisions made during the reporting period, the existing information used to guide those decisions, and the rationale for each action. Reports will be provided to NMFS via hardcopy and to any interested parties via an internet website and email reflector list. Presentations will be provided on an as needed basis at watershed group meetings and other forums.

Progress Review Meeting discussions may include, but are not limited to: status of implementing the conservation strategies; results of monitoring efforts; operation strategies, as coordinated with the USACE, for upcoming flood control season; operation plans for the upcoming irrigation season, etc. Additionally, individuals can submit recommendations for program changes to the

Governing Board in advance for discussion at the following Progress Review Meeting. Meeting minutes will be kept and approved by the Governing Board to provide a record of the discussions. Revisions to activities will be made if deemed necessary by the Governing Board (i.e., Step 6, Adjust). The Governing Board may object to recommendations for program changes on the basis that the proposed change 1) is not within the scope of the goals and objectives of the CHCP, 2) is not consistent with permits or authorizations, or 3) is not supported given the current best available science and results of monitoring. The Governing Board will determine the date by which all agreed-upon adaptive management changes must be fully implemented; SEWD will implement all adaptive management changes agreed to by the Governing Board in the timeframe specified, which will vary depending on the action (e.g., modification of a concrete fish passage structure will take more time to implement than removal of a flashboard dam). For yearly adaptive management activities (e.g., the fall non-dedicated flow schedule and the schedule for small artificial instream structural improvements), more specific timelines are identified below and in Sub-Section 9.5 of this Chapter.

Annual HCP AMP Implementation Timeline:

December 31: Annual or Five-Year Comprehensive Reports due to NMFS.

March: Pre-Irrigation and Annual (or Five-Year) Progress Review Meeting will be held within 90 days of report submittal (Governing Board and CRTRG)

September: Pre-flood Season Meeting (Governing Board and CRTRG)

October 10: Governing Board finalizes and approves fall non-dedicated flow schedule (for implementation between October 15- November 30)

Milestones in the HCP Implementation:

Year 5:

- First Five-Year Comprehensive Report Due.
- Finalized schedule for screening prioritized diversion structures (Conservation Strategy 6).

Year 10:

- Five-Year Comprehensive Report Due.
- Bellota Diversion Facility: Construction of a combined crest gate/fishway/fish screen will be completed.
- Old Calaveras River Headworks Facility: Construction of a non-entraining barrier will be completed at the Headworks facility and at the downstream end of the channel near the confluence with the SDC.

Year 15 and every 5 years thereafter, through the HCP Period:

- Five-Year Comprehensive Reports Due.

9.2 Elements of the CHCP Subject to Adaptive Management

All of the CHCP conservation strategies contain an element of uncertainty regarding the expected outcomes of their implementation relative to achieving the CHCP biological goals and objectives. For example, although structural improvements will be constructed according to existing salmonid passage criteria, it is uncertain whether Covered Species will utilize the improved structures as anticipated. If salmonid passage structures are not used by Covered Species in future years, as identified during monitoring, then studies conducted at the structures can help test hypotheses regarding salmonid passage. Based on this information, slight adjustments to the structure may be needed to ensure adequate salmonid passage.

Likewise, other conservation strategies that have uncertainty associated with their outcomes, such as fishery flows and coordination with the USACE, will be adaptively managed based on results of effectiveness monitoring, new information uncovered by others (e.g., USFWS, CDFW), or other factors (e.g., imminent threat of future adverse impacts to fishery resources by invasive, nonnative mud snails).

New or expanded conservation strategies, if adopted in response to adaptive management, must continue to incorporate the impact avoidance and minimization elements of this CHCP to minimize their adverse effects on Covered Species, and, based on the “No Surprises” policy (USFWS and NMFS 1996), must not result in changes to the total amounts of the District’s water right supplies or allocations. Additionally, new or expanded conservation strategies must not result in expenditures greater than the total dollar amount allocated by the District to the program (see Chapter 12).

9.2.1 Circumstances Triggering Adaptive Responses

SEWD will implement adaptive management under the following circumstances:

1. A conservation strategy cannot be implemented as planned; or
2. Effectiveness monitoring or other information indicates that a conservation strategy is not functioning as expected;
3. New scientific information that was not available during the CHCP development supports adjusting conservation management actions of the CHCP;
4. New information supports the reordering of the priority list for fish screens on privately owned diversions; or
5. Flood control and critical storage releases to be coordinated with USACE in order to afford additional protections to Covered Species above the default protections discussed in Chapter 7.

If appropriate, given new information, the Governing Board, potentially with the input of individual members of the CRTRG, may also consider on a case-by-case basis specific projects and actions that have not yet been identified or implemented.

9.3 Costs for Implementing Adaptive Management Actions

It is intended that the AMP will provide the mechanism for budget allocation decisions throughout the term of the CHCP using an allocated budget for activities (see Chapter 12). For example, if it is determined that one component (e.g., monitoring activity or structural improvement) is not a priority in any given year, then funds allocated for that component may be transferred to a higher priority component as long as SEWD and NMFS are in agreement. Also, in the event that SEWD and NMFS conclude (based on monitoring results) that biological objectives and associated targets are not being met, then program activities may be altered to meet those objectives as agreed to by

SEWD and NMFS, provided such alterations do not result in expenditures greater than the total dollar amount allocated by SEWD to the program (see Chapter 12).

9.4 Special Provisions Related to Yearly Adaptive Management Activities

9.4.1 Non-Dedicated Fall Storage

New Hogan Reservoir has a very small storage capacity when compared to other surrounding Central Valley reservoirs and the opportunity for carryover storage is infrequent. This results in few opportunities for managed fish passage flows, as is generally representative of how the river functioned prior to operation of New Hogan Reservoir. Regardless, there are some years (i.e., when reservoir levels are high throughout the summer and are greater than 152,000 AF on October 15) that release volumes are increased above M&I needs between October 15 and December 1 to evacuate the flood storage reserve, which can result in flows downstream of Bellota and corresponding opportunities for managed passage conditions. The second target for the HCP Flow Objective (F2) states that,

F2. Under high, end of irrigation-season storage conditions (i.e., when storage is >152,000 AF on October 15), flood control releases must be undertaken by December 1 to achieve a storage level of 152,000 AF by December 1. Therefore, coordinate, as needed, with the USACE to manage flood control releases during the October 15-November 30 period that will optimize migration opportunities into/out of the 18-mile spawning and rearing reach between Bellota and New Hogan Dam. This water release pattern would take into account the proposed release patterns for the San Joaquin River tributaries and the Mokelumne River to optimize the anadromous fish attraction flow into the San Joaquin River basin. Deviations from the scheduled water release pattern are highly unlikely; however, if substantial precipitation were to occur in October/November, there is a possibility that higher than scheduled releases could become necessary to maintain an adequate flood control reservoir level. These elevated releases would be the result of a naturally occurring weather event, which native fishes would likely be well-adapted to and possibly benefit from.

During years of expected high fall storage conditions (i.e., when storage is expected to reach >152,000 AF on October 15), the potential for utilizing flood control releases to benefit Covered Species will be discussed and examined by the Governing Board at the annual post-irrigation season meeting in September. The Governing Board will develop and approve (no later than October 10) a flow schedule for October 15-November 30 of that year to optimize flows for current fish passage impediments in the lower Calaveras River and time the releases to correlate with when adults are waiting to enter the Calaveras River. Further details on this conservation strategy are presented in Section 7.1.

9.4.2 Small Artificial Instream Structural Improvements

Thirty-seven instream structures have been identified as potential passage impediments to salmon and steelhead trout in the lower Calaveras River downstream of Bellota Weir via both the Mormon Slough/SDC and Old Calaveras River channel routes, DWR 2007a). These structures have been allocated to three priority tiers according to their potential to impair fish passage. Individual structures within or between tiers will be selected each year through the AMP Process, during the pre-irrigation season meeting (March). It is anticipated that construction may occur at up to five individual structures in any given year and priority tiers are provided as guidelines for scheduling implementation. It is expected that improvements to SEWD-owned Tier 1 structures in Mormon Slough/SDC will be completed within the first ten years of the ITP. Improvements to Tier 2 and 3 structures will be completed on schedules determined through the annual AMP process. SEWD is committed to implementing the replacement or retrofitting of all Tier 1 structures in Mormon Slough/SDC owned and operated by Stockton East Water District (n= 5). Additional structures in Mormon Slough/SDC may be improved as agreed upon by the Governing Board. Implementation will occur according to the priority schedule agreed upon by the Governing Board and before the end of the ITP's term.   Further details on this conservation strategy are presented in Section 7.5.

Chapter 10. Analysis of Alternatives to the District's Covered Activities

Covered activities were identified in Chapter 5 of the CHCP; their impacts and associated conservation strategies and monitoring plans were described in subsequent sections. The current level of incidental take is unknown; however, once the conservation strategies are in place the take level will be minimized. The HCP Handbook suggests that alternatives to the proposed activities be explored to assure agencies and the public that all reasonable choices were considered. Several alternatives were considered but dismissed.

10.1 Alternative 1: No Action

In order to be consistent with CEQ's National Environmental Policy Act guidelines regarding ongoing programs (CEQ 1981), the "no action" alternative is considered to be "…'no change' from current management direction or level of management intensity," and includes the District's existing and ongoing activities that are governed by existing operating criteria (Appendix C). Under this alternative, the District would not be in compliance with the ESA, so the "no action" alternative is not a feasible option. However, Alternative 1 represents baseline conditions that provide a benchmark for comparing the "…magnitude of environmental effects of the action alternatives," (CEQ 1981).

There are several key features of this alternative:

1. NMFS would not issue an ITP.
2. The District would not operate under a CHCP.
3. All the covered activities in the proposed CHCP would continue to occur as if there had been no CHCP development process. Requirements of the District's existing permits, such as CVFPB and CDFW 1602 Streambed Alteration permits would remain in effect.
4. The conservation strategies developed in the proposed CHCP would not be performed.

5. The purpose and need of the proposed project to lessen the impact of the District's Calaveras River operations while bringing the District into compliance with the ESA would not be satisfied, and legal uncertainties may persist as to the District's compliance with the ESA.

The "No Action" alternative was dismissed because it does not minimize take of the CHCP species (*O. mykiss* and late fall-, spring-, and winter-run Chinook), and it could expose the District to enforcement actions by federal or state agencies for noncompliance with the ESA.

10.2 Alternative 2: Flashboard Dams installed later than April 15

Under this alternative, all the District's proposed activities would continue with the exception that flashboards would be installed by SEWD later than April 15. In addition, all the conservation strategies identified in the CHCP would be implemented. Installation of flashboards later in the season could allow more opportunities for migrating juveniles to exit the system unobstructed by dam structures.

Benefit of this action would vary between *O. mykiss* and the different runs of Chinook. *O. mykiss* and fall- or spring-run Chinook (if present) juvenile outmigration may possibly occur during this period, but in a very low frequency (See Tables 2 and 3). Spring- and winter-run adult migration (if present) could also overlap this period, also in a very low frequency. There does not appear to be any negative effect as a result of this proposed action on all CHCP species. The exact number of additional fish that could benefit from unobstructed passage is unknown due to the likelihood of annual fluctuations in the flashboard dam installation period (between April 15 and May 15) and the annual fluctuations in the number of salmonids migrating after mid-April as indicated by the estimated number of juveniles migrating downstream before and after April 15 during the past five years. The historic presence of any Chinook is low, but if they were to be present a benefit may occur.

Precipitation patterns in the lower Calaveras River usually do not provide sufficient rainfall for agricultural use after March. Typically, agriculture customers request surface water deliveries by the end of March for both frost protection of permanent crops and essential irrigation of newly planted row crops. Most irrigators rely on SEWD deliveries to fulfill their irrigation needs and few irrigators can afford the expense of operating a dual water supply (i.e., ground and surface sources). To provide sufficient deliveries, SEWD must install flashboard dams to create enough head for irrigators to withdraw surface water through their intake pumps.

Flashboard dam installation may occur between March 15 and April 15 of each year. Historically the flashboards are installed on or near April 15. The District has committed to installing flashboards as late as possible within that window based on water conditions to allow for unobstructed migration opportunities for spring- or winter-run Chinook that may be infrequently present.

10.3 *Alternative 3: Artificial adult* O. mykiss *and Chinook migration flows*

Under this alternative, all the District's activities would continue, and all the conservation strategies identified in the CHCP would be implemented. In addition, artificial pulse flows would be released from New Hogan Dam to attract and assist passage for adult fall-run Chinook salmon and steelhead in the Calaveras River in the fall and winter, respectively. Although there are freshet events and/or flood control releases of sufficient magnitude and duration (i.e., >100 cfs for at least 4 days) for upstream adult migration to occur during normal to above normal precipitation years, adult attraction flows of a higher magnitude (>500 cfs) and longer duration (7 to 10 days) have been proposed as a potential way to increase passage opportunities. The magnitude of pulse flows would initially be set at 730 cfs until passage improvements are made at Caprini Low Flow Crossing, reflecting the flows required for unimpaired passage at this structure (DWR 2007a). Once improvements to Caprini Low Flow Crossing are implemented within the near future, artificial pulse flows of 500 cfs would be provided. Pulse flows of 500 cfs are considered the minimum flow necessary to provide attraction flows that are comparable, after adjustment for basin size differences, to those provided in the nearby Stanislaus River; the Stanislaus River is more than twice the size of the Calaveras River and attraction flows of 1,000-1500 cfs are implemented.

Chinook. A 7- to 10-day adult attraction pulse would be provided sometime between mid-October through November for fall-run Chinook. Assuming artificial pulse flows attract adult Chinook salmon into the river and spawning is successful, then an associated, 7 to 10-day outmigration pulse would be necessary the following spring (in late March/early April) to encourage and assist juvenile Chinook salmon to migrate prior to the irrigation season after which flashboard dams can impede downstream passage and, unlike steelhead, salmon do not typically oversummer. Based on previous data (FISHBIO 2008/09, 2009/10, 2010/11, 2011/12, 2012/13, 2013/14, 2014/15), a majority of progeny during the artificial outmigration pulse period is expected to be fry (mean: 76%; range: 53-99%); therefore, artificial outmigration pulse flows would encourage mostly Chinook fry to migrate out of the river. Since fry contribution to adult escapement is expected to be minor (Sogard 1997, Miller et al. 2010), it is unlikely that providing an artificial pulse flow for Chinook fry will result in enough adult returns to create a self-sustaining population. Within the context of the CHCP, the pulse flows for Chinook would utilize a portion of the limited storage in New Hogan Reservoir that might be better allocated for other uses. The biological goal of the CHCP is to maintain conditions in that reach for Chinook when opportunistic passage (i.e., natural freshets or flood control) occurs, not to intentionally allocate storage to facilitate passage for Chinook. Furthermore, a majority of adult Chinook observed in the river have been hatchery origin strays (i.e., 80% of all in-river Central Valley Chinook carcasses in 2011 were ad-clipped with an unknown additional proportion of hatchery origin non-ad-clipped fish; Palmer-Zwahlen and Kormos 2013). As a result, any adult salmon attracted into the Calaveras River through an artificial pulse flow would likely be hatchery fish straying from other tributaries. Therefore, the need to artificially attract stray hatchery adult salmon whose progeny are unlikely to contribute to a self-sustaining, Calaveras Chinook salmon population is also unwarranted.

Steelhead. A 7- to 10-day adult attraction pulse would be provided sometime between December and March for steelhead. Unlike salmon, which generally migrate to the ocean during their first spring after emergence, *O. mykiss* progeny typically reside within the Calaveras River for at least one summer before migrating downstream, and most Age 1+ migrate downstream during the winter months (i.e., December to February) when unimpeded passage is available. Therefore, assuming that artificial pulse flows attract adult steelhead into the river and spawning is successful, artificial outmigration pulse flows during late March/early April are unnecessary for *O. mykiss*, and potentially detrimental (see Alternative 4). Although artificial pulse flows have the potential to attract an increased number of steelhead adults (above and beyond those that already migrate under existing opportunities), providing artificial attraction flow releases to benefit steelhead would negatively influence water storage in New Hogan Reservoir, which has a more limited storage capacity and reduced inflows (average runoff 157,000 AF) relative to other reservoirs in the San Joaquin basin. Critical water storage periods may occur under certain conditions once reservoir storage has fallen below 99,100 AF (equivalent to conservation storage of 84,100 AF); this has occurred in 14 of 47 years (29.8%) between 1965 and 2011 (Table 19). To assess the potential impacts of artificial pulse flows on the storage of New Hogan Reservoir, actual end of October storage data from 2007 to 2011 were adjusted to reflect the annual release of either 7- or 10-day pulses of 730 cfs or 500 cfs (Table 19) and then adjusted reservoir storage was compared to 99,100 AF (critical storage volume) and 15,000 AF (minimum pool). End of October storage was selected since it represents the end of the irrigation season when the greatest water demands have already been met. Years 2007-2011 were chosen because they represent the most recent period of time following a "resetting" of the reservoir (i.e., storms in 2006 resulted in end of October storage that required evacuation of water to draw the reservoir level down to 152,000 AF by December 1). Each year, the effects of adult migration pulses were assessed, and it was assumed that inflows and outflows would not have changed under alternative scenarios. Table 19 indicates that under all scenarios reservoir storage dropped below 99,100 AF during three consecutive years and pulse flows under the scenario of 730 cfs for 10 days came within 507 AF of draining the reservoir to the minimum pool. Even under a lower migration pulse scenario of 500 cfs for 7 days, reservoir storage still dropped substantially to a low of 38,079 AF, leaving only 23,029 AF of active storage (Table 19).

The analysis of this alternative demonstrates that providing even relatively small volumes of stored water for migration results in negative consequences to storage. Any of these scenarios would increase the risk that storage drops below 99,100 AF in successive years as described in Section 6.2, resulting in negative effects to both water supply deliveries (i.e., reductions in deliveries and reliance on groundwater in critically over-drafted aquifer) and salmonids (i.e., decrease in instream spawning and rearing conditions associated with flow reductions to the minimum 10 cfs associated with critical storage conditions.

Additionally, existing water rights do not allow for the provision of artificial migration flows. The District has a contract with Reclamation for the water appropriated by Reclamation as part of its water right with the SWRCB. This contract is a repayment contract requiring the District (and CCWD) to pay for the entire cost of the conservation storage. In return, the District (and CCWD) is allocated the entire yield of the project for the authorized purposes of use. Conservation storage is defined as that space in New Hogan that is utilized, subject to flood control requirements, for agricultural, municipal, industrial, and domestic water use. Apart from holding the water rights, Reclamation exercises no discretion in the operations of New Hogan Reservoir. The contract gives the District the exclusive right to determine the rate of release of water in accordance with the water rights and contract. The water right allows for the direct diversion and diversion of water to storage in New Hogan for purposes of agricultural, and municipal, industrial and domestic use. The Reclamation contract obligates the yield of the Calaveras River Dam to the District for their beneficial use. Use of the water pursuant to the agreement is limited to agricultural, municipal, industrial and domestic water use by the District. No portion of this yield is allowed for artificial adult migration flow.

Providing artificial adult pulse flow releases for steelhead would remove a substantial quantity of water from beneficial consumptive use (i.e., 6,237-47,520 AF annually) and in most years would reduce the reservoir storage to below 99,100 AF (Table 19); therefore, it would be significantly detrimental to the District (due to reductions in surface water deliveries and associated increase in groundwater usage in a critically overdrafted basin) and would result in decreased spawning and instream rearing conditions for Chinook and *O. mykiss* in successive years (i.e., through reduced flows to the minimum 10 cfs associated with critical storage conditions). New Hogan Reservoir is the sole reliable surface water source for the District's M&I customers and agricultural users on the Calaveras River throughout much of the year. Such an obligation of flow would reduce the average yield from this source, thereby affecting water supply and substantially affecting the ability of the District to address critical groundwater overdraft (i.e., water users would resort to using groundwater instead of surface water, which would exacerbate existing critical groundwater overdraft conditions) within their respective jurisdictions. Given the detrimental impacts on beneficial consumptive use by providing an artificial adult pulse flow for steelhead and the lack of practical benefits of providing an artificial adult pulse flow for Chinook salmon, this alternative was dismissed.

10.4 Alternative 4: Artificial juvenile **O. mykiss** *and Chinook migration pulse flows*

Under this alternative, all the District's activities would continue, and all the conservation strategies identified in the CHCP would be implemented. No artificial adult attraction flows would be provided, and adult migration would be dependent on natural freshets and/or flood control releases; however, a 7- to 10-day pulse flow would be provided just prior to flashboard dam installation (installation occurs between April 15 and May 15) to encourage and assist juvenile salmonids to migrate out of the river before passage is impeded by flashboard dams. Species potentially exposed to pulse flows may include: *O mykiss* and fall-, late fall-, and spring-run Chinook. Winter-run Chinook would not be harmed because juveniles would not be present based on life history periodicity and their overall reliance on the Sacramento River system (see Table 3).

Environmental and biological factors influence the timing, size, and number of juvenile salmonids migrating downstream. Priming factors, environmental factors that condition smolts physiologically to prepare for migration (e.g., photoperiod and temperature), influence the range of dates in which salmonids are prepared to migrate, while variables such as flow, precipitation, and turbidity may function as "releasing factors" that trigger the actual migration (Wagner 1974; Wedemeyer et al. 1980; McCormick et al. 1998; Zydlewski et al. 2005; Sykes et al. 2009). Releasing factors that influence downstream salmonid migration timing have not been well studied in comparison to research on the priming factors. Studies investigating flow as a releasing factor have found varying results. Roper and Scarnecchia (1999) did not find evidence that wild Chinook smolts used changes in flow as an emigration cue. Models developed by Sykes et al. (2009) to examine environmental releasing factors for Chinook salmon smolts indicated a negative influence of flow on the probability of migration, with peak migration occurring just before peaks in flows. However, there is evidence that both juvenile *O. mykiss* and Chinook salmon may be stimulated to migrate by flow pulses attributed to either natural freshets (i.e., short pulses in flow due to rainfall events) or flood control releases (Demko and Cramer 1995, 1996; Demko et al. 2000, 2001). Thomas (1975) found that Chinook fry emigration events from experimental troughs were of short duration, usually during the night following heavy rains even when flows were held constant. Bjornn (1971) concluded: “I found no evidence that food or stream flow induced the movements [of juvenile *O. mykiss* and Chinook salmon] observed in the study streams. Small freshets during the usual migration period occasionally coincided with temporary increases in the number of migrants but such occurrences only modified the basic migration pattern.” In the Calaveras, natural winter and spring freshets sometimes coincide with brief peaks in downstream migration of juvenile *O. mykiss* (FISHBIO 2008/09, 2009/10, 2010/11, 2011/12, 2012/13, 2013/14, 2014/15); however, these events are correlated with increased precipitation and turbidity, which makes it difficult to ascertain which parameters are actually functioning as releasing factors and their relative contribution to migration stimulation and maintenance.

Table 19. Actual and adjusted New Hogan Reservoir annual storage conditions (AF), as measured on October 31 (2007-2011). Cumulative adult attraction pulses are the sum of annual adult steelhead attraction pulses provided beginning in 2007. Adjusted October 31 storage is the actual reservoir storage in year (y) less the cumulative artificial adult attraction pulses contributing to storage for that date.

Year (y)	Adult attraction pulse (y-1)	Cumulative attraction pulses	Actual Oct 31 storage (y)	Adjusted Oct 31 storage (actual storage- cumulative attraction pulses) (y)	Adult attraction pulse (y-1)	Cumulative attraction pulses	Actual Oct 31 storage (y)	Adjusted Oct 31 storage (actual storage- cumulative attraction pulses) (y)
	730 cfs, 7-day pulse				730 cfs, 10-day pulse			
2007	10,118	10,118	123,217	113,099	14,454	14,454	123,217	108,763
2008	10,118	20,236	83,167	62,931	14,454	28,908	83,167	54,259
2009	10,118	30,353	58,869	28,516	14,454	43,362	58,869	15,507*
2010	10,118	40,471	108,938	68,467	14,454	57,816	108,938	51,122
2011	10,118	50,589	189,655	139,066	14,454	72,270	189,655	117,385
	500 cfs, 7-day pulse				500 cfs, 10-day pulse			
2007	6,930	6,930	123,217	116,287	9,900	9,900	123,217	113,317
2008	6,930	13,860	83,167	69,307	9,900	19,800	83,167	63,367
2009	6,930	20,790	58,869	38,079	9,900	29,700	58,869	29,169
2010	6,930	27,720	108,938	81,218	9,900	39,600	108,938	69,338
2011	6,930	34,650	189,655	155,005	9,900	49,500	189,655	140,155

Bold Red indicates reservoir is below conservation storage (less than 99,100 AF) on October 31.

Asterisk indicates reservoir is drained almost to dead pool (i.e., where dead pool is <15,000 AF storage).

Additionally, juvenile salmonid response to both priming and releasing factors is influenced by their developmental state, condition, and size (Wedemeyer et al. 1980). The developmental stage affects their swimming ability (Thomas et al. 1969), which in turn affects their response to flow. Small fish (e.g., YOY *O. mykiss* and Chinook salmon fry) have weak swimming abilities (Thomas et al. 1969; Greenland and Thomas 1972). Thomas et al. (1969) noted a period of reduced swimming ability in Chinook fry occurred shortly before complete yolk sac absorption, which coincided in a peak in emigration, possibly due to the inability of the fish to maintain their location. Thus, fry likely move passively downstream in response to flow pulses due to weak swimming abilities and their distance travelled is dependent on the magnitude and duration of flows. Larger juvenile salmonids (e.g., Age 1+ *O. mykiss* and Chinook salmon smolts), rather than moving passively with the flow, are strong swimmers that can actively swim against significant currents (Peake and McKinley 1998). As such, pulse flows are likely not effective for triggering larger juveniles to migrate all the way out of a river unless additional releasing factors, listed above, are also present, which are dependent on climatological conditions within a given year.

From previous studies, it is unclear whether manipulations of flow (i.e., artificial pulses of flow) independent of other variables would provide a migration cue. For example, in an experimental manipulation of environmental factors, Thomas (1975) found that increasing water temperature and turbidity independently each produced increases in Chinook fry migration while doubling the water flow did not. These confounding factors led Sykes et al. (2009) to caution, “Flow manipulations that change the timing, duration, or magnitude of increases of temperature and flow in spring could have adverse effects for the migration behavior of Chinook salmon.”

Due to typical migration timing and aforementioned releasing/priming factors, artificial flow pulses provided immediately prior to the irrigation season (late March to early April) to stimulate juvenile migration would likely be detrimental to Calaveras River *O. mykiss* and Chinook salmon. Daily estimated abundances for *O. mykiss* at the Shelton Road screw trap (monitoring years 2002-2015) indicate that most Age 1+ have already migrated prior to the irrigation season (mean: 84%; range: 55-100%) beginning approximately April 15th of each year, while most individuals migrating during the irrigation season are YOY (mean: 92%; range: 82-97%) that generally do not show signs of smoltification and readiness to emigrate out of the system (FISHBIO 2008/09, 2009/10, 2010/11, 2011/12, 2012/13, 2013/14, 2014/15). Juvenile Chinook salmon have been absent from the river in 73% of the years studied, indicating that Calaveras River fall-run Chinook salmon is a sink population that is rescued from extinction by immigration from source populations where reproduction is greater than mortality. During years when they have been present, daily estimated abundances for Chinook salmon at the Shelton Road screw trap indicate that the proportion of Chinook salmon that have not yet migrated out prior to the irrigation season can be high (mean: 67%; range: 50-84%).

Since available data indicate that most Age 1+ *O. mykiss* in the Calaveras River migrate prior to the proposed pulse flow, there would be little, if any, benefit to this age class by providing a spring pulse. Although no artificial pulse flows have previously been provided in the Calaveras River for encouraging juvenile migration and natural flow pulses during this period have been too high for sampling, monitoring in the nearby Stanislaus River indicates that Age 1+ *O. mykiss* migration is not substantially influenced by artificial spring flow pulses provided for fall-run Chinook. In general, YOY *O. mykiss* that migrate out of their natal tributaries are expected to have low survival and contribute negligibly to adult escapement (Ward et al. 1989; Bond et al. 2008); therefore, encouraging this age class to migrate out of the river would be detrimental to the population by reducing their potential to achieve adulthood. By remaining in the river, YOY *O. mykiss* likely increase their survival to adulthood and may become either resident adults that would produce resident or steelhead progeny, or they may eventually migrate to the ocean as Age 1+ individuals and become steelhead adults that return to the river to spawn.

Juvenile Chinook salmon have been absent from the river in 73% of the years studied. During years when they have been present[23], daily estimated abundances for Chinook salmon at the Shelton Road screw trap indicate that the proportion of Chinook salmon that have not yet migrated out prior to the irrigation season can be high (mean: 67%; range: 50-84%). Similar to *O. mykiss*, most Chinook salmon passing the Shelton Road rotary screw trap during the proposed spring pulse are fry (mean: 76%; range: 53-99%). There is no evidence that moving fry out of the tributary system and into the Delta more quickly by using an artificial pulse flow will result in successful adult returns, particularly since a majority of adults observed in the system are hatchery origin strays (i.e., 80% of carcasses in 2011 were ad-clipped with an unknown additional proportion of hatchery origin non-ad-clipped fish; Palmer-Zwahlen and Kormos 2013). Therefore, similar to *O. mykiss*, their contribution to adult escapement is expected to be negligible (Sogard 1997; Miller et al. 2010) and there would be few benefits realized by Chinook salmon by providing a spring pulse. Additionally, spring pulse flows provided for Calaveras River fall-run Chinook salmon, which are primarily the progeny of hatchery origin strays, would be at the expense of Calaveras River *O. mykiss*, a self-sustaining, independent population, which may be moved downstream before they are physiologically ready to migrate to the ocean.

Upon consideration, this alternative was dismissed. Biological Goal 2 of the CHCP is to manage for passage of *O. mykiss*, but Chinook passage will occur based on opportunistic events (i.e. freshets or flood control). In addition, juvenile pulse flows provided in this alternative may detrimentally impact steelhead, which is contrary to Biological Goal 1.

10.5 Alternative 5: Moving the SEWD Intake from Bellota to a location closer to the Dr. Joe Waidhofer Water Treatment Plant

Under this alternative, all the District's proposed activities would continue with the exception that the SEWD intake at Bellota is moved to a location closer to the treatment plant. In addition, all the conservation strategies identified in the CHCP would be implemented except for those related to structural improvements at Bellota, which would no longer be needed if the Bellota intake were moved. The relocation of the Bellota intake to a point further downstream would result in flows provided year-round in an extended reach of river, supporting Biological Objective 1.

The Calaveras River reach from New Hogan Dam downstream to Bellota is generally ideal as a drinking water source and as habitat for aquatic species. The reach of the flood control channel downstream of Bellota, known as Mormon Slough, is not ideal for either. SEWD is regulated by

[23] Chinook salmon are only present in years when there are early flow events (i.e., November-December) that provide access into the spawning reach upstream of Bellota. Since monitoring began in 2002, there have only been three such years (2005, 2006, and 2011) and juvenile monitoring from 2012 is not yet complete so estimates are not available.

the California Department of Health Services (CDHS) for the operation of its drinking water treatment facility. Representatives from CDHS have confirmed that relocating the intake from Bellota to a location anywhere downstream of Bellota is not feasible. For this reason, this alternative was dismissed.

Chapter 11. Assurances

This chapter discusses the assurances requested by the District that will accompany the ITP issued by NMFS and outlines the process for changing or amending the CHCP.

11.1 Assurances Requested by the District

Section 10 regulations [50 CFR 17.22 (b)(2)(iii)] require that an HCP specify the procedures that will be used for dealing with any unforeseen circumstances that may arise during the implementation of the HCP. In addition, the Habitat Conservation Plan Assurances ("No Surprises") Rule [50 CFR 17.21(b)(5)-(6) and 17.22(b)(5)-(6); 63 F.R. 8859] defines "unforeseen circumstances" and "changed circumstances" and describes the obligations of the HCP Permittee (i.e., SEWD) and NMFS.

The purpose of the "No Surprises" Rule is to provide assurances to nonfederal landowners participating in an HCP process that, in the event of unforeseen circumstances, no additional land, water, or financial compensation or additional restrictions on the use of land, water, or other natural resources will be requested beyond the level otherwise agreed to in an HCP without the consent of the Permittees. Assurances regarding changed and unforeseen circumstances are described below.

11.1.1 Changed Circumstances

Changed circumstances under the No Surprises Rule are defined as:

> changes in circumstances affecting a species or geographic area covered by the HCP that can reasonably be anticipated by plan developers and NMFS and that can be planned for (e.g., the listing of a new species, or fire or other natural catastrophic events in areas prone to such events).

The No Surprises Rule requires that potential changed circumstances be identified in the CHCP along with measures that would be taken by the Permittee to respond to those changes. If a changed circumstance occurs within the CHCP boundaries, the Permittee will notify NMFS of this changed circumstance within 60 days unless there is a substantial threat of imminent, significant adverse impacts to a Covered Species. NMFS will evaluate the circumstances and may determine that additional conservation strategies are necessary. Pursuant to the No Surprises Rule, if such measures have been addressed in the CHCP, their implementation is required. If such measures are absent from the CHCP, NMFS will not require any additional conservation or mitigation without the consent of the Permittees, as long as the CHCP is found to be properly implemented. "Properly implemented" means that the commitments and provisions of the CHCP and ITP have been, or are being, fully implemented. Changed circumstances that could arise in the permit area have been identified and are described below.

11.1.1.1 Listing of Covered Species

Each Covered Species in the CHCP has been treated as though it were listed under the ESA. The Permittee proposes that all Covered Species be included in the ITP, the ITP be effective for all covered species immediately upon issuance, and a delayed effective date (the date of any future listing) be provided for fall-run Chinook salmon. As a Species of Special Concern, the fall-run Chinook does not currently have any protective regulations against take and no Federal permit is needed to incidentally take them; however, should NMFS list them as threatened or endangered during the permit term, take coverage will become effective for fall-run Chinook at the time of listing. No modifications to the conservation strategies will be required.

11.1.1.2 Listing of Non-Covered Species and Designation of Critical Habitat

During the term of the ITP, Non-Covered species may become listed as threatened or endangered under the ESA or CESA. Similarly, critical habitat may be designated. If the newly listed species could be affected by activities covered in the CHCP, NMFS may consider this to be a changed circumstance. In such case, if requested by the Permittees, the ITP will be reevaluated by NMFS and the CHCP Covered Activities may be modified, within the limitations of the No Surprises Rule, to ensure that CHCP Covered Activities are not likely to jeopardize or result in take of the newly listed species or result in adverse modification of any designated critical habitat. If the Permittee decides to seek incidental take coverage for the newly listed species, a permit will be pursued separately from the listing agency (i.e. USFWS and/or CDFW).

11.1.1.3 De-listing of Species

If a Covered Species in the CHCP is de-listed under the ESA during the term of the ITP, the Permittees and NMFS may consider this to be a changed circumstance. In such case, the ITP will be re-evaluated by the Permittees in consultation with NMFS and the CHCP Covered Activities and conservation strategies may be modified, as necessary, to reduce or eliminate required measures for that species if the activities covered under the CHCP are not likely to lead or contribute to re-listing of the species. The Permittees will continue to implement the HCP in accordance with all applicable provisions until such time as the Permittees have applied for—and NMFS has approved an amendment of—the ITP. All prior commitments for conservation strategies that may remain unmodified will be implemented.

11.1.1.4 Floods

Flooding is a natural event within the Calaveras River. However, extreme floods could destroy fish passage improvement sites and require substantial remediation. There is a 1% chance of a 100-year flood event occurring during any given year, and less than a 1% chance for storms resulting in a greater than 100-year flood event. A flood event resulting in structural damage and/or debris build-up that impedes fish passage under normally passable flow conditions at facilities owned or maintained by the District is considered a changed circumstance. Repairs and maintenance will be performed within a reasonable timeframe according to protocols described in section 7.7.

A flood event resulting in structural damage that prevents fish passage under all flow conditions at facilities owned or maintained by the District is considered an unforeseen circumstance. Structural damage will be evaluated to determine appropriate corrective actions necessary to restore fish passage and the Permittee will implement any measures deemed necessary through the AMP in ways consistent with existing funding and permit obligations.

11.1.1.5 Drought

Drought is a natural part of a Mediterranean climate system to which species and natural communities have adapted. However, a prolonged drought could cause a serious reduction in available habitat for salmonids. Based on drought records for California (DWR 2007b), droughts of two or more years occurred 4.2 times within California and droughts of three or more years occurred 2.3 times during any 50-year period, respectively. Droughts less than or equal to three years will be considered a changed circumstance, and reduced flow releases will be performed according to protocols described in section 7.1.

Changes in climatic weather patterns may increase the frequency of extended drought and persistently drier conditions. Any drought that occurs for more than three successive years will likely create significant impacts to storage and surrounding resources that may require action outside of normal operations as defined within the HCP and section 7.1. In the fourth consecutive year of drought, the Permittee will consult with NMFS. Response action will include a review to determine if base flows should be lowered below 10 cfs (the current minimum flow during critical storage condition) for a determined period of time. Any releases below 10 cfs will be collaboratively agreed upon and a schedule of releases will be determined. Actions outside of reducing base flow (but within the general scope of the HCP) may be discussed during these meetings. These actions will only be implemented if the suggested activity is agreed upon by both the Permittee and NMFS as being both feasible and prudent.

11.1.1.6 Invasive Species

If a plant or animal (e.g., New Zealand Mud Snail) infestation results in substantial adverse effects on a Covered Species or its habitat in the CHCP area, the Permittees will identify appropriate measures and mechanisms to control and eradicate (if possible) the infestation and will respond through the AMP in ways consistent with existing funding and permit obligations. The District may also use existing funding to pursue other external funding mechanisms (e.g. grants, proposition funding, etc.) to expand efforts beyond the existing available funds.

11.1.1.7 Climate Change

According to EPA (1997),

> based on projections given by the Intergovernmental Panel on Climate Change and results from the United Kingdom Hadley Centre's climate model (HadCM2), a model that

> accounts for both greenhouse gases and aerosols, by 2100 temperatures in California could increase by about 5°F (with a range of 2-9°F) in the winter and summer and slightly less in the spring and fall. Appreciable increases in precipitation are projected: 20-30% (with a range of 10-50%) in spring and fall, with somewhat larger increases in winter. Little change is projected for summer. The amount of precipitation on extreme wet days most likely would increase, especially in the winter and fall, and there could be a decrease in the number of long dry spells and an increase in the number of long wet spells.

Most tributaries within the Central Valley are snow-melt driven with cold snow-melt furnishing late spring and early summer runoff that is replaced by warmer precipitation runoff as temperatures and precipitation increase. This is anticipated to truncate the period of time that suitable cold-water conditions exist below existing reservoirs and dams due to the warmer inflow temperatures to the reservoir from rain runoff. Without the necessary cold-water pool developed from melting snow pack filling reservoirs in the spring and early summer, late summer and fall temperatures below reservoirs may rise above thermal tolerances for juvenile and adult salmonids that must hold below the dam over the summer and fall periods (i.e., Sacramento River winter-run Chinook, Central Valley spring-run Chinook, and Central Valley steelhead).

Unlike these other tributaries, the Calaveras River is already a rain-driven system, so increased precipitation may result in benefits to salmonids by creating increased winter and spring migration opportunities, but could also lead to an increased incidence of flooding. In addition, increased ambient temperatures could cause water temperatures to increase to levels that negate the potential benefits of increased flows. At this time, it is unknown how climate change will influence salmonid rearing and migration conditions within the Calaveras River.

If climate change results in substantial adverse effects on a Covered Species or its habitat in the CHCP area, the Permittee will identify appropriate measures to reduce climate change impacts and will respond through the AMP in ways consistent with existing funding and permit obligations. The District may also use existing funding to pursue other external funding mechanisms (e.g. grants, proposition funding, etc.) to expand efforts beyond the existing available funds.

11.1.2 Unforeseen Circumstances

Unforeseen circumstances under the No Surprises Rule are defined as:

> changes in circumstances that affect a species or geographic area covered by the HCP that could not reasonably be anticipated by plan developers and NMFS at the time of the Plan's negotiation and development and that result in a substantial and adverse change in status of the Covered Species.

As described in the "No Surprises Rule," NMFS shall have the burden of demonstrating that Unforeseen Circumstances exist using the best scientific and commercial data available. Any findings of unforeseen circumstances must be clearly documented and based upon reliable technical information regarding the biological status and habitat requirements of the affected species. In determining whether any event constitutes an unforeseen circumstance, NMFS will consider, but not be limited to, the following factors:

- Size of the current range of the affected species.
- Percentage of range adversely affected by the HCP.
- Percentage of range conserved by the HCP.
- Ecological significance of that portion of the range affected by the HCP.
- Level of knowledge about the affected species and the degree of specificity of the species' conservation program under the HCP.
- Whether failure to adopt additional conservation strategies would appreciably reduce the likelihood of survival and recovery of the affected species in the wild.

Except where there is substantial threat of imminent, significant adverse impacts to a Covered Species, NMFS shall provide the Permittees at least sixty (60) calendar days written notice of a proposed finding of Unforeseen Circumstances, during which time NMFS shall meet with the Permittees to discuss the proposed finding, provide the Permittee (i.e., SEWD) with an opportunity to submit information to rebut the proposed finding, and to consider any proposed changes to the conservation strategies for the CHCP Area.

If NMFS determines that the unforeseen circumstance will affect the outcome of the CHCP, additional conservation and mitigation measures may be necessary. Where the CHCP is being properly implemented and an unforeseen circumstance has occurred, the additional measures required of the Permittees must be as close as possible to the terms of the original HCP. Additional conservation and mitigation measures shall not involve the commitment of additional land, water or financial compensation or restrictions on the use of land and water otherwise available for use under the original terms of the CHCP without the consent of the Permittees. Resolution of the situation shall be documented by letters between the NMFS and the Permittees.

In other words, in the event that unforeseen circumstances adversely affect a Covered Species during the term of the permit, the Permittees would not be required to provide additional financial mitigation or additional water, or water use restrictions above those measures specified in the CHCP, provided that the CHCP is being properly implemented. This CHCP expressly incorporates by reference the permit assurances set forth in the "No Surprises" Rule adopted by NMFS and published in the Federal Register on February 23, 1998 (50 CFR Part 17). Except as otherwise required by law or provided for under the CHCP, including those provisions regarding Changed Circumstances, no further mitigation for the effects of the proposed project on Covered Species may be required from the Permittee who is properly implementing the terms of the CHCP and the permit. The CHCP will be properly implemented if the commitments and provisions of the CHCP and the permit have been or are being fully implemented by the Permittees.

11.2 Modifications to the CHCP

Adaptive implementation of the CHCP Conservation Strategies inherently anticipates future changes in the CHCP and how it is implemented. This section describes how the CHCP may be modified, in the context of adaptive management, based on monitoring and research results and new information developed by others. Conditions under which the CHCP Governing Board may request modification to the CHCP include, but are not limited to, changes in funding levels, changed circumstances, etc. There are three mechanisms, depending on the magnitude of future proposed changes, that are available for revising the CHCP:

- administrative changes that are under the sole discretionary authority of SEWD,
- minor modifications to the CHCP, and
- major amendments to the CHCP.

11.2.1 Administrative Changes under Discretionary Authority of SEWD

SEWD maintains the authority to change elements of the CHCP that will result in greater effectiveness or efficiency in achieving biological goals and objectives and that do not change the CHCP geographic scope, biological goals or objectives, intent of the conservation strategies, or effects of CHCP implementation on covered species (e.g., level of take). This level of adaptive flexibility for implementing the CHCP will most likely include, but is not limited to:

- day-to-day implementation decisions, such as modifying reservoir releases or monitoring schedules; and
- modifying CHCP monitoring protocols to align with existing USFWS and CDFW monitoring protocols as they may be modified in the future.

11.2.2 Minor Modifications to the CHCP

SEWD maintains the authority to request minor changes to the CHCP's Covered Activities that do not significantly affect the CHCP's overall conservation program or objectives and the net effect on Covered Species and level of take resulting from the revision is not significantly different than originally analyzed in the CHCP. For minor revisions, SEWD will submit a written request to NMFS proposing changes and will implement proposed changes as long as NMFS concurs. However, if the NMFS representative(s) object to or disagree with the proposed revision, the revision shall thereafter be treated as a major amendment as described below. Minor changes may include, but are not limited to:

- modification of the effectiveness monitoring protocols (other than those modifications done to comply with current USFWS and CDFW approved sampling protocols), including types and timing of monitoring and survey protocols; and
- modification of existing or adoption of additional conservation strategies that improve the likelihood of achieving CHCP species objectives, including any associated with potential Recovery Plans (see below); and
- discontinuing implementation of conservation strategies if they are ineffective.

11.2.3 Major Amendments to the CHCP

Amendments to the CHCP ITP may be required if significant modifications, developed through the adaptive management process, are proposed regarding Covered Activities. Amendments to the CHCP ITP would require an amendment to the CHCP, a Federal Register notice, NEPA compliance, and an internal ESA Section 7 consultation. Future conditions, in the context of adaptive management, that may require an amendment to the CHCP's Section 10(a)(1)(B) permit may include, but are not limited to the following:

- **Requested but unapproved minor modifications to the CHCP:** The CHCP permit may need to be amended if an administrative change or minor modification is requested by SEWD but is not approved by NMFS.
- **Major changes to Conservation Strategies:** Conservation strategies may need to be appreciably changed if technologies to attain them are either unavailable or infeasible to implement.

11.2.4 Recovery Plans

In 2014, NMFS completed a Central Valley salmonid recovery plan that includes recovery objectives for steelhead in the lower Calaveras River. The CHCP includes measures to minimize and mitigate the effects of the District operations consistent with this recovery plan. Additionally, measures such as minimum flows and fish passage improvements are expected to contribute to both conservation and recovery.

Since recovery plans are not intended to establish obligations for permit applicants under Section 10 of the ESA, NMFS's (2014) recovery plan will not affect the CHCP's implementation, except to the extent that the recovery plan may provide informational assistance during the AMP process. However, any alternative conservation strategies identified for implementation under the CHCP will need to meet the following criteria: (1) they must be compatible with, and expected to improve the effectiveness of achieving, the CHCP's biological goals and objectives and (2) they must be feasibly and cost-effectively implementable (i.e., not result in changes to SEWD's water right allocations nor result in expenditures greater than the total dollar amount allocated by SEWD to the program). Any recovery objective actions that are inconsistent with these criteria would need to be addressed through other forums.

Chapter 12. Funding

This chapter describes the funding mechanisms available to implement the CHCP conservation strategies and monitoring identified in previous chapters of the CHCP. SEWD's Special Act, as described in Chapter 1, authorizes the levy- and collection of groundwater water assessments for the production of groundwater supplies within the district and to fix and collect charges for stream-delivered water [Section 5 (f)]. Beginning at Water Code Section 74500 *et seq*., there are a number of statutory authorities to levy and collect fees, charges, and assessments for water, related facilities, and incidental expenses of the District.

SEWD clearly has the statutory authority to, and does in fact, establish rates and charges to fully recover all operating, capital, and debt costs of the District. Additionally, SEWD serves its urban contractors with treated water in accordance with Board approved ordinances and companion long term contracts, which specify the rates, charges, and conditions of service. The ordinance and contracts require that the District's urban contractors pay all operating, capital, and debt costs of the District as it pertains to the services provided pursuant to those contracts.

SEWD warrants that it has, and will expend, such funds as may be necessary to fulfill the conservation strategies and monitoring obligations as outlined in this CHCP. SEWD estimates it will allocate approximately between $200,000 to $400,000 annually for these purposes, depending on the recommendations of the AMP process. SEWD shall dedicate a minimum of twenty-five percent (25%) of its share of the annual allocation to “capital improvements” for the implementation of the fish passage improvements recommended through the AMP process. Table 20 indicates the projected amount of funding for the 50-year duration of the ITP and the amount of funds already expended since 2000 for ESA issues; CHCP development and adaptive management implementation, juvenile and adult fisheries monitoring, interim conservation strategies, and preliminary investigations and implementation of passage and screening improvements at Bellota.

The following is a brief summary of anticipated sources of revenues for each of the conservation strategies and monitoring identified in Chapter 7:

CS1 – New Hogan Reservoir Non-flood Control Operations: Activities will be funded through the general operating budget of SEWD.

CS2 – SEWD Old Calaveras River Headworks Facility Operations: Although SEWD is committed to implementing a non-entraining barrier, the construction timeframe will depend on obtaining matching funds from outside sources such as CALFED, AFRP, NMFS, CDFW, and/or other grant sources. Should funding from these outside sources not materialize, SEWD will work with its urban contractors to develop and implement a funding strategy to complete construction. Since the Calaveras River is identified as a priority stream for salmonids, SEWD anticipates funding will be made available. During the interim period, SEWD will maintain the temporary net barrier utilizing its annual operating budget.

CS3 – SEWD Bellota Diversion Facility Operations: SEWD received a CALFED grant to evaluate and design a long-term solution for entrainment and passage impediments at the Bellota Facility. Although SEWD is committed to implementing the preferred alternative (CH2M Hill 2005; SEWD 2009), the construction timeframe may depend on obtaining matching funds from outside sources such as CALFED, AFRP, NMFS, CDFW, and/or other grant sources. Should funding from these outside sources not materialize, SEWD will work with its urban contractors to develop and implement a funding strategy to complete construction. Since the Calaveras River is identified as a priority stream for salmonids, SEWD anticipates funding will be made available. In the interim, SEWD provided $200,000 for a temporary screen that was installed and became fully operational at Bellota in early 2006. SEWD will provide the necessary funding for the operation and maintenance of the temporary screen through its annual operational budget.

CS4 – Artificial Instream Structures and SEWD Small Instream Dam Operations: Once fish passage improvements are identified and prioritized through the AMP process, funding will be obtained using all available revenue raising devices. Once a flow measuring device(s) are identified through a feasibility investigation, partners and funding will be obtained using all available revenue raising devices. Any alternative sampling programs (e.g., acoustic tagging or radio-tracking) will be funded through SEWD’s annual operating budget.

CS5 – Privately Owned Diversion Facilities Operated within the District's Service Areas: Due to the privately-owned nature of these facilities, no funding commitments are made. For any individual facilities under the District's authority that receive a recommendation for a fish screen, the District's will help the landowner to locate and submit an application for funding opportunities that will allow cost-effective placement of screens at their facility. Screening of any of these diversions will be dependent upon the landowner successfully obtaining outside funding for the individual structures.

CS6 – SEWD Channel Maintenance for Instream Structures: Activities will be funded through the general operating budget of SEWD.

CS7 – Fisheries Monitoring Program: Activities will be funded through the general operating budget of SEWD.

Table 20. Past and projected funding for CHCP related activities. Projected funding is provided in five-year increments to reflect the five-year review period for activities.

Year	ESA / HCP/ AMP	Fisheries Monitoring	Watershed Coordinator	Temporary screens and improve passage at Bellota	Bellota Diversion Facility Improvement	Flashboard Dam Improvements	Old Calaveras Headworks	Private Diversions upstream of Bellota	Private Diversions downstream of Bellota
2000	38,187	-	-	-	-	10,000	-	-	-
2001	32,454	17,889	-	-	-	-	-	-	-
2002	35,506	50,010	-	-	53,664	-	-	-	-
2003	81,658	91,555	-	-	230,237	-	-	-	-
2004	120,531	155,882	22,456	-	260,282	-	-	-	-
2005	71,616	108,888	33,546	-	224,144	-	-	-	-
2006	73,534	272,863	32,488	268,295	-	-	-	-	-
2007	59,118	125,372	12,212	-	-	-	-	-	-
2008	7,402	153,459	-	-	-	-	-	-	-
2009	38,595	134,734	-	-	15,000	202,518	-	-	-
2010	36,865	124,647	-	-	-	36,487	-	-	-
2011	27,614	124,377	-	-	-	1,827	-	-	-
2012	50,661	233,508	-	-	-	139,516	-	-	-
2013	21,936	127,710	-	-	-	10,089	-	-	-
2014	22,170	141,715	-	-	-	271,958	-	-	-
2015	33,488	166,571	-	-	-	-	-	-	-
2016	73,442	245,296	-	-	-	-	-	-	-
2017	61,955	144,852	-	-	-	-	-	-	-
Total 2000-2017	**886,732**	**2,419,328**	**100,702 (plus 106,472 DOC grant)**	**268,295**	**783,327**	**672,395 (plus 462,390 from AFRP/OSPR grant)**	**-**	**-**	**-**
5	280,000	880,000	-	-	-	340,000	-	Estimated costs to screen all 27 diversions =$2.4 milion (CH2M Hill 2005)*	Estimated costs to screen all 202 diversions range from $13.1 million (at minimum of $65,000 per screen) to 34.3 million (at maximum of $170,000 per screen)*
10	125,000	1,233,020	-	-	6,400,000+	141,980	Unknown		
15	125,000	790,000	-	-	-	585,000	-		
20	125,000	750,000	-	-	-	625,000	-		
25	125,000	750,000	-	-	-	625,000	-		
30	125,000	750,000	-	-	-	625,000	-		
35	125,000	750,000	-	-	-	625,000	-		
40	125,000	750,000	-	-	-	625,000	-		
45	125,000	750,000	-	-	-	625,000	-		
50	150,000	900,000	-	-	-	750,000	-		
Total 50 years	2,316,732	10,722,348	100,702	268,295	7,183,327	6,239,375	?	*Screening amounts for private diversions are provided here for informational purposes only; no funding cummitments are made	
Grand Total	26,830,779								

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