Chapter 1

Introduction

1.1 Introduction

This Environmental Impact Statement (EIS) on the Coordinated Long-Term Operation of the Central Valley Project (CVP) and State Water Project (SWP) has been prepared by the U.S. Department of the Interior, Bureau of Reclamation (Reclamation). Reclamation is the Federal lead agency for compliance with the National Environmental Policy Act (NEPA) as ordered by the United States District Court for the Eastern District of California (District Court). In 2008 and 2009, following litigation on previous Biological Opinion (BOs), Reclamation provisionally accepted and began implementing the BOs on continued long-term operation of the CVP, in coordination with the operation of the SWP issued by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS), respectively, pursuant to the Federal Endangered Species Act of 1973 (ESA) as amended (United States Code [U.S.C.] 1531 et. seq.). In 2014, the Ninth Circuit upheld the District Court's ruling that Reclamation's provisional acceptance and implementation of the BOs required Reclamation to comply with NEPA. The District Court remanded Reclamation's decision back to the agency to comply with the court's ruling.

This EIS evaluates potential long-term direct, indirect, and cumulative impacts on the environment that could result from implementation of modifications to the continued long-term operation of the CVP and SWP. This EIS does not evaluate impacts related to implementing project-specific actions, such as impacts during construction and startup periods for actions that are not fully defined at this time and that may be implemented by Reclamation or other agencies as part of the long-term operation of the CVP and SWP.

1.2 Background

This chapter presents an overview of the CVP and SWP, the coordinated operation of the CVP and SWP, and endangered species consultations related to the long-term operation of the CVP and SWP. The long-term operation of the CVP and SWP is described in more detail in Chapter 3, Description of Alternatives; Chapter 5, Surface Water Resources and Water Supplies; and Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations.

1.2.1 Overview of the Central Valley Project

California initiated a comprehensive water plan for the state more than 100 years ago to provide water conservation, flood control, water storage, and water distribution. In 1933, the state legislature, governor, and the electorate approved

construction of the CVP. Because of difficulty in marketing bonds to finance construction, the project could not be constructed by the state, and the Federal government was requested to construct the CVP.

The first Federal authorization of the CVP was by the Rivers and Harbors Act of August 30, 1935. The CVP was reauthorized for construction, operation, and maintenance by the Secretary of the Department of the Interior (Secretary), pursuant to the Reclamation Act of 1902, as amended and supplemented by the Rivers and Harbors Act of August 26, 1937. The 1937 act also provided that the dams and reservoirs of the CVP "… be used, first, for river regulation, improvement of navigation, and flood control; second, for irrigation and domestic uses; and, third, for power."

In 1992, the Central Valley Project Authorization Act of August 26, 1937, was amended by Section 3406(a) of the Central Valley Project Improvement Act (CVPIA), Public Law 102-575. The CVPIA modified the 1937 act and specified that the dams and reservoirs of the CVP be used "first, for river regulation, improvement of navigation, and flood control; second for irrigation and domestic uses and fish and wildlife mitigation, protection and restoration purposes; and third for power and fish and wildlife enhancement."

The CVP is composed of more than 18 reservoirs with a combined storage capacity of more than 11 million acre-feet, more than 10 hydroelectric power plants, and more than 500 miles of major canals and aqueducts (Figure 1.1 at the end of this chapter). The major CVP reservoirs are in the Sacramento-San Joaquin Rivers Delta Estuary (Delta) watershed, including Shasta Lake on the Sacramento River, Folsom Lake on the American River, New Melones Reservoir on the Stanislaus River, and Millerton Lake on the San Joaquin River. The CVP also diverts water from Trinity Lake (on the Trinity River) to the Sacramento River system. CVP pumping plants and canals include the Red Bluff Pumping Plant, which diverts water from the Sacramento River into the CVP Tehama-Colusa Canal; Folsom South Canal, which conveys water from Folsom Lake to southeastern Sacramento County; Contra Costa Canal Pumping Plant, which diverts water from Rock Slough in the Delta into the CVP Contra Costa Canal; and Jones Pumping Plant, which diverts water from the south Delta into the CVP Delta-Mendota Canal (DMC).

These facilities are generally operated as an integrated project, although they are authorized and categorized in more distinct units or divisions. However, not all facilities are operated to meet each of the above-identified project purposes. For example, flood control is not an authorized purpose of the CVP Trinity River Division.

The facilities, operational criteria and constraints, and authorizations of the CVP are described in Chapter 5, Surface Water Resources and Water Supplies.

1.2.2 Overview of the State Water Project

After World War II, California's population almost doubled, and more water was needed. In addition, devastating floods occurred in northern and central

California in the 1950s. To provide more reliable water supplies and reduce the flood risk in the Sacramento Valley, the state legislature appropriated funds to the California Department of Water Resources (DWR) to construct the SWP under the State Central Valley Project Act (Water Code Section 11100 et seq.), Burns-Porter Act (California Water Resources Development Bond Act), State Contract Act (Public Contract Code Section 10100 et seq.), Davis-Dolwig Act (Water Code Sections 11900 through 11925), and other acts of the state legislature. The plans for the SWP included a reservoir on the Feather River near Oroville (Lake Oroville), a Delta cross channel, an electric power transmission system, an aqueduct to convey water from the Delta to Solano and Napa counties (North Bay Aqueduct), an aqueduct to convey water from the Delta to the San Francisco Bay Area (South Bay Aqueduct and a reservoir in Alameda County), an aqueduct (California Aqueduct) with the San Luis Dam to convey water from the Delta to the San Joaquin Valley and southern California, and several reservoirs in southern California.

DWR is required to plan for recreational and fish and wildlife uses of water in connection with the SWP and other state-constructed water projects (Water Code Sections 233, 345, 346, 12582). The Davis-Dolwig Act (Water Code Sections 11900 through 11925) established the policy that preservation of fish and wildlife is part of state costs to be paid by SWP water supply contractors, and recreation and enhancement of fish and wildlife are to be provided by appropriations from the General Fund.

1.2.3 Coordinated Operation of the CVP and SWP

The CVP and SWP are operated in a coordinated manner in accordance with Public Law 99-546 (October 27, 1986), directing the Secretary to execute the Coordinated Operation Agreement (COA). The CVP and SWP are also operated under State Water Resources Control Board (SWRCB) decisions and water right orders related to the CVP's and SWP's water right permits and licenses to appropriate water by diverting to storage, by directly diverting to use, or by re-diverting releases from storage later in the year or in subsequent years.

The CVP and SWP are permitted by SWRCB to store water, divert water and re-divert CVP and SWP water that has been stored in upstream reservoirs. The CVP and SWP have built water storage and water delivery facilities in the Central Valley to deliver water supplies to CVP and SWP contractors, including senior water users. The CVP's and SWP's water rights are conditioned by the SWRCB to protect the beneficial uses of water within the watersheds.

As conditions of the water right permits and licenses, SWRCB requires the CVP and SWP to meet specific water quality objectives within the Delta. Reclamation and DWR coordinate operation of the CVP and SWP, pursuant to the COA, to meet these and other operating requirements. The COA is an agreement between the Federal government and the State of California for the coordinated operation of the CVP and SWP. The agreement suspended a 1960 agreement and superseded annual coordination agreements that had been implemented following construction of the SWP.

The COA established the operating framework for the CVP and SWP based upon conditions in the 1980s, by setting forth: (1) definitions of the CVP and SWP facilities and their water supplies, (2) procedures for coordination of operations, (3) formulas for sharing joint responsibilities for meeting Delta standards and ensuring no injury to other legal uses of water, (4) criteria for sharing unstored flow in the Delta, (5) a framework for exchange of water and services between the SWP and CVP, and (6) provisions for periodic reviews. Coordinated operation by agreed-on criteria can increase the efficiency of both the CVP and the SWP.

Implementation of the COA has evolved continually since 1986 as CVP and SWP facilities, operational criteria, and physical and regulatory environment have changed. For example, adoption of the CVPIA in 1992 changed purposes and operations of the CVP, and ESA responsibilities have affected operation of the CVP and SWP. Since 1986, facilities operations have been modified in response to statutory and regulatory requirements that were not part of the original COA assumptions or requirements. In addition, water quality objectives have been revised by the SWRCB since 1986 in the 1995 and 2006 Water Quality Control Plans and implemented through SWRCB Decision 1641. DWR and Reclamation have operational arrangements to accommodate new facilities, water quality objectives, the CVPIA, other SWRCB criteria, and the ESA, but the COA has not been formally modified to address these newer operating conditions.

1.2.4 Federal Endangered Species Consultation

In addition to the conditions and limitations imposed by the SWRCB on the water rights permits and licenses for the CVP and SWP, Federal agencies have an obligation pursuant to Section (7a)(2) of the ESA to determine that any discretionary action authorized, funded, or carried out by the agency is not likely to jeopardize the continued existence of endangered or threatened species or result in the destruction or adverse modification of their critical habitat [16 U.S.C. 1536 (a)(2)]. A discretionary agency action jeopardizes the continued existence of a listed species if the action is reasonably expected to directly or indirectly appreciably reduce the likelihood of both the survival and recovery of a listed species in the wild by reducing the reproduction, numbers, or distribution of the listed species (50 Code of Federal Regulations [CFR] 402.02).

In carrying out its obligations, Reclamation must consult with the appropriate regulatory agency or agencies (e.g., USFWS and NMFS) when an action may affect listed species. After the formal consultation process, those agencies render written statements (Biological Opinions or BOs) setting forth their opinion as to effects of the agency action on listed species and its designated critical habitat. If these agencies conclude that the action will jeopardize the continued existence of a listed species or result in the destruction or adverse modification of their designated critical habitat, they must suggest a Reasonable and Prudent Alternative (or RPA) to the agency action if one exists. As defined in the ESA, RPAs "refer to alternative actions identified during formal consultation that can be implemented in a manner consistent with the intended purpose of the action, that can be implemented consistent with the scope of the Federal agency's legal authority and jurisdiction, that is economically and technologically feasible, and

that the Director believes would avoid the likelihood of jeopardizing the continued existence of listed species or resulting in the destruction or adverse modification of critical habitat" (40 CFR 402.02).

If the SWP seeks to avail itself of the incidental take exemption provided by the BOs, the coordinated long-term operation of the SWP would be subject to the BOs, including any reasonable and prudent measures, terms and conditions, or RPAs required by the BOs.

1.2.4.1 Threatened and Endangered Species Considered in ESA Consultation for Coordinated Long-Term Operation of the CVP and SWP

The following species, and their associated ESA and critical habitat listing rules, were considered in recent ESA consultations with USFWS and NMFS for the coordinated long-term operation of the CVP and SWP analysis in this document:

- Sacramento River winter-run Chinook Salmon (*Oncorhynchus tshawytscha*) Evolutionarily Significant Unit (ESU) was 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 re-classified as an endangered species on January 4, 1994 (59 FR 440).
- Central Valley spring-run Chinook Salmon (*O. tshawytscha*) ESU was listed as threatened on June 18, 2005 (70 FR 37160).
- Central Valley Steelhead (*O. mykiss*) Distinct Population Segment (DPS) was listed as threatened on January 5, 2006 (71 FR 834).
- Southern Oregon/Northern California Coast Coho Salmon (*O. kisutch*) ESU was reaffirmed as threatened on June 18, 2005 (70 FR 37160).
- Southern DPS of the North American Green Sturgeon (*Acipenser medirostris*) was listed as threatened on June 6, 2006 (71 FR 17757).
- Southern Resident DPS of Killer Whales (*Orcinus orca*) was listed as endangered on November 18, 2005 (70 FR 69903-69912).
- Delta Smelt (*Hypomesus transpacificus*) was listed as threatened on March 5, 1993 (58 FR 12854). The species was recently proposed for re-listing as endangered under the ESA.

Fall and late-fall runs of Chinook Salmon are currently Federal Species of Concern, but have not been formally listed.

Central California Coast Steelhead (*O. mykiss*) DPS was listed as threatened on January 5, 2006 (71 FR 834). The 2009 NMFS BO determined that the long-term operation of the CVP and SWP would not likely adversely affect Central California Coast Steelhead DPS and its critical habitat. Therefore, no further analysis of this DPS was performed for this EIS.

1.2.4.2 Recent ESA Consultation Activities and Court Rulings

Reclamation submitted a biological assessment to USFWS and NMFS for consultation on the long-term operation of the CVP and SWP in June 2004. Because SWP operations are coordinated with CVP operations, SWP operations are included in Reclamation's action. NMFS has responsibility for anadromous fish and marine mammals, and USFWS has jurisdiction over all other ESA listed species.

In July 2004, USFWS issued its BO "Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the Central Valley Project and State Water Project and the Operations Criteria and Plan to Address Potential Critical Habitat Issues." In February 2005, USFWS issued the "Re-Initiation of Formal and Early Section 7 Endangered Species Consultation on the Coordinated Operations of the Central Valley Project and State Water Project and the Operational Criteria and Plan to Address Potential Critical Habitat Issues."

On October 22, 2004, NMFS issued its "Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project."

On April 26, 2006, Reclamation requested that the NMFS consultation be re-initiated based on the new listing of the Southern DPS of the North American Green Sturgeon. On May 19, 2006, Reclamation requested that the USFWS consultation be re-initiated because of the potential for the re-initiation of the NMFS consultation to affect the Delta Smelt and because of recently compiled data related to the pelagic organism decline.

Following the issuance of the 2004 and 2005 BOs, litigation was filed against the Department of the Interior and the Department of Commerce challenging the validity of these BOs. Following a finding that the CVP/SWP operation analyzed in the 2005 BO jeopardized the continued existence of Delta Smelt, on December 14, 2007, the District Court issued an Interim Remedial Order in *Natural Resources Defense Council, et al. v. Kempthorne*, 1:05-cv-1207 OWW GSA (E.D. Cal. 2007), to provide additional protection for Delta Smelt pending completion of a new USFWS BO for the continued long-term operation of the CVP and SWP. The Interim Remedial Order remained in effect until USFWS issued a new BO for the continued long-term operation of the CVP and SWP on December 15, 2008.

On April 16, 2008, the District Court issued a Memorandum Decision and Order on the Cross-Motions for Summary Judgment filed in *Pacific Coast Federation of Fishermen's Associations, et al. v. Gutierrez*, 1:06-cv-245-OWW-GSA (E.D. Cal. 2008). The District Court found that the BO issued by NMFS in 2004 was invalid. An evidentiary hearing followed, resulting in a Remedies Ruling on July 18, 2008. The ruling concluded that the District Court needed further evidence to consider the Plaintiffs' proposed restrictions on the long-term coordinated CVP and SWP operation.

In August 2008, Reclamation submitted a biological assessment to USFWS and NMFS for consultation.

On December 15, 2008, USFWS issued a BO analyzing the effects of the coordinated long-term operation of the CVP and SWP on Delta Smelt and its designated critical habitat. The 2008 USFWS BO concluded that ''the coordinated operation of the CVP and SWP, as proposed, [was] likely to jeopardize the continued existence of the Delta Smelt'' and ''adversely modify Delta Smelt critical habitat.'' The BO included an RPA for long-term operation of the CVP and SWP designed to allow the projects to continue operating without causing jeopardy to Delta Smelt or adverse modification of designated critical habitat.

On December 15, 2008, Reclamation provisionally accepted and began implementing the USFWS RPA.

On June 4, 2009, NMFS issued a BO analyzing the effects of the coordinated long-term operation of the CVP and SWP on listed salmonids, Green Sturgeon, and southern resident Killer Whale and their designated critical habitats. The NMFS BO concluded that the long-term operation of the CVP and SWP, as proposed, was likely to jeopardize the continued existence of Sacramento River winter-run Chinook Salmon, Central Valley spring-run Chinook Salmon, Central Valley Steelhead, Southern DPS of North American Green Sturgeon, and Southern Resident Killer Whales. Further, the BO concluded that the proposed action would destroy or adversely modify critical habitat for Sacramento River winter-run Chinook Salmon, Central Valley spring-run Chinook Salmon, Central Valley Steelhead, and Southern DPS of North American Green Sturgeon.

The 2009 NMFS BO included an RPA designed to allow the CVP and SWP to continue operating without causing jeopardy to the analyzed species or adverse modification of their designated critical habitat. On June 4, 2009, Reclamation provisionally accepted and began implementing the NMFS RPA.

Several lawsuits were filed in the District Court challenging aspects of the 2008 USFWS BO and the 2009 NMFS BO and Reclamation's acceptance and implementation of the associated RPAs. Many of the lawsuits were consolidated into two proceedings focused on each BO. The outcomes of the *Consolidated Delta Smelt Cases* and the *Consolidated Salmonid Cases* are summarized below.

- *Consolidated Delta Smelt Cases*
  - On November 16, 2009, the District Court ruled that Reclamation violated NEPA by failing to conduct a NEPA review of the potential impacts on the human environment before provisionally accepting and implementing the 2008 USFWS BO, including the RPA.
  - On December 14, 2010, the District Court found certain portions of the 2008 USFWS BO to be arbitrary and capricious in several respects and remanded those portions of the BO to USFWS without vacatur for further consideration. The District Court ordered Reclamation to review its decision to provisionally accept and implement the BO and RPA in accordance with NEPA.

  - The decision of the District Court related to the USFWS BO was appealed to the United States Court of Appeals for the Ninth Circuit (Appellate Court). On March 13, 2014, the Appellate Court reversed the District Court and upheld the BO. However, the Appellate Court affirmed the judgment of the District Court with respect to the NEPA claims.
  - The District Court amended the Judgement on September 30, 2014 consistent with the Appellate Court's decision. Petitions for Writ of Certiorari were submitted to the U.S. Supreme Court; however, the U.S. Supreme Court decided to not hear the cases.

- *Consolidated Salmonid Cases*
  - On March 5, 2010, the District Court ruled that Reclamation violated NEPA by failing to undertake a NEPA analysis of potential impacts on the human environment before provisionally accepting and implementing the 2009 NMFS BO and RPA.
  - On September 20, 2011, the District Court found the NMFS BO was arbitrary and capricious in several respects and remanded the 2009 NMFS BO to NMFS without vacatur for further consideration.
  - The decisions of the District Court related to the 2009 NMFS BO were appealed to the Appellate Court. On December 22, 2014, the Appellate Court reversed the District Court and upheld the BO.
  - The District Court issued the Final Order on May 5, 2015 consistent with the Appellate Court's Decision.

1.3 Need to Prepare this Environmental Impact Statement

Compliance with NEPA is a Federal responsibility and involves the participation of Federal, state, tribal, and local agencies, as well as concerned and affected members of the public in the planning process. NEPA requires that Federal agencies analyze and disclose the potential environmental impacts and possible mitigation for Federal actions and a reasonable range of alternatives to the proposed action. NEPA is required when a discretionary Federal action is proposed. The regulations [40 CFR 1508.18(a)] define a Federal action as including new and continuing activities, actions partly or entirely financed by Federal agencies (where some control and responsibility over the action remain with the Federal agency [43 CFR 46.100]), actions conducted by Federal agencies, actions approved by Federal agencies, new or revised agency rules or regulations, and proposals for legislation.

Section 102 of NEPA (42 U.S.C. 4332) indicates that a detailed analysis, such as an EIS, should be completed with proposals for Federal actions that substantially affect the quality of the human environment, including the natural and physical

environment and the relationship of people with that environment (40 CFR 1508.14).

To comply with the District Court's 2010 orders regarding NEPA, Reclamation initiated preparation of this EIS in 2011. This EIS documents Reclamation's analysis of the effects of modifications to the coordinated long-term operation of the CVP and SWP that are likely to avoid jeopardy to listed species and destruction or adverse modification of designated critical habitat.

In accordance with the District Court's order in the *Consolidated Delta Smelt Cases*, the Final EIS and Record of Decision are to be completed on or before December 1, 2015. By order dated October 8, 2015, this date has been extended to January 12, 2016.

As described in Chapter 3, Description of Alternatives, many of the provisions of the RPAs, as set forth in the 2008 USFWS BO and the 2009 NMFS BO, require further study, monitoring, further consultation, implementation of adaptive management programs, and subsequent environmental documentation for future facilities to be constructed or modified. Specific actions related to these provisions are not known at this time. Therefore, this EIS assumes the completion of future actions, including provisions of the RPAs, in a manner that would be consistent with the ESA and does not address impacts during construction and startup phases of these actions.

1.4 Use of the Environmental Impact Statement

This EIS may be used by Reclamation or cooperating agencies that are participating in the preparation of this EIS to inform future decisions related to the ESA consultation and implementation of the RPAs in the 2008 USFWS BO and 2009 NMFS BO. A cooperating agency is defined as any Federal agency, except the NEPA lead agency, that has jurisdiction by law or has special expertise with respect to any environmental issue that should be addressed in the EIS (40 CFR 1501.6). A cooperating agency also can include a governmental entity (state, tribal, or local) that has jurisdiction by law or special expertise with respect to any environmental impact associated with the action being considered. The cooperating agencies for this EIS are listed in Section 1.6.

1.5 Proposed Action and Preferred Alternative

The Notice of Intent identified an "initial Proposed Action" that included the operational actions of the 2008 USFWS BO and 2009 NMFS BO, without structural changes included in the RPA actions that would require future studies and environmental documentation to define recommended actions, including fish passage around the CVP dams. The initial Proposed Action is included in this EIS as Alternative 2.

Based upon the analysis of aquatic resources (see Chapter 9, Fish and Aquatic Resources), by 2030, climate change may result in substantially higher air temperatures than during recent conditions. Higher air temperatures would likely increase water temperatures in both the CVP reservoirs and in the rivers downstream of the CVP dams. Under these conditions, Reclamation may not be able to operate the reservoirs under the initial Proposed Action without fish passage in a manner that would meet water temperature objectives; and it may not be possible to avoid jeopardizing the continued existence of listed species and/or resulting in an adverse modification of critical habitat.

Based upon the results of the impact analyses presented in Chapters 5 through 21 of this EIS, the Preferred Alternative is the No Action Alternative. The No Action Alternative contains all of the RPA actions in the 2008 USFWS BO and 2009 NMFS BO, as amended, including the RPA actions to evaluate fish passage to upstream habitats that exhibit lower water temperatures. Further discussion of the selection of the Preferred Alternative will be included in the Record of Decision.

The Environmentally Preferred Alternative also will be identified and disclosed in the Record of Decision, as required by the Council of Environmental Quality regulations.

1.6 Project Area

The project area boundaries are defined by the locations of most of the CVP facilities and their service areas and all of the SWP facilities and the SWP service areas, as shown on Figure 1.1. The CVP facilities associated with Millerton Lake, including the Madera and Friant-Kern canals and their service areas, and the San Joaquin River Restoration Program are not part of the project area for this EIS because the operations of these facilities were not addressed in the 2008 USFWS BO and 2009 NMFS BO.

1.6.1 CVP Facilities

The CVP facilities evaluated in this EIS include reservoirs on the Trinity, Sacramento, American, and Stanislaus rivers; Mendota Pool on the San Joaquin River; rivers, streams, canals, and aqueducts used to convey CVP water; and the CVP service area that relies upon water from the following reservoirs (as described in Chapter 5, Surface Water Resources and Water Supplies, and Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations).

- A portion of the water from Trinity River is stored and re-regulated in Trinity Lake, Lewiston Lake, and Whiskeytown Reservoir and diverted through tunnels and power plants into the Sacramento River. Water is also stored and re-regulated in Shasta Lake and Folsom Lake. Water from these reservoirs and other reservoirs owned or operated by the CVP flows into the Sacramento River. The Red Bluff Pumping Plant on the Sacramento River lifts water into

the Tehama Colusa Canal for delivery to CVP contractors. Water also is delivered from the Sacramento River, American River, and the Folsom South Canal to CVP contractors, water rights holders, and settlement contractors.

- The Sacramento River conveys water to the Delta for delivery through the Contra Costa Canal and Jones Pumping Plant. The Contra Costa Canal originates at Rock Slough near Oakley and extends to the Martinez Reservoir. Water from the Contra Costa Canal is delivered to the Contra Costa Water District. The Jones Pumping Plant at the southern end of the Delta lifts the water into the DMC. This canal delivers water to CVP contractors, who divert water directly from the DMC, and to San Joaquin River exchange contractors, who divert directly from the San Joaquin River and the Mendota Pool. CVP water is also conveyed to the San Luis Reservoir for deliveries to CVP contractors through the San Luis Canal. Water from the San Luis Reservoir is also conveyed through the Pacheco Tunnel to CVP contractors in Santa Clara and San Benito counties.

- The CVP provides water stored in New Melones Reservoir for water rights holders in the Stanislaus River watershed and CVP contractors in the northern San Joaquin Valley and to meet existing water right permit conditions to support fish and wildlife and water quality beneficial uses.

The project area includes portions of the watersheds upstream of the CVP reservoirs that support anadromous fish species, as addressed in the NMFS BO, and the service areas of CVP water users in the Trinity River Region, Sacramento and San Joaquin valleys in the Central Valley Region, and the San Francisco-Bay Area Region.

1.6.2 SWP Facilities

The SWP facilities evaluated in this EIS include Lake Oroville on the Feather River; rivers, streams, canals, and aqueducts used to convey SWP water; and the SWP service area that relies upon water from these reservoirs including:

- SWP water is stored and re-regulated in Lake Oroville and released into the Feather River, which flows into the Sacramento River. Water also is delivered from the Feather River to SWP contractors, water rights holders, and settlement contractors.

- SWP water flows in the Sacramento River to the Delta and is exported from the Delta at the Banks Pumping Plant. The Banks Pumping Plant pumps the water into the California Aqueduct, which delivers water to the SWP contractors and conveys water to the San Luis Reservoir for continued delivery in the California Aqueduct to the San Joaquin Valley, Central Coast Region, and southern California.

- The SWP provides water from the Delta to Solano and Napa counties through the North Bay Aqueduct and to Alameda and Santa Clara counties through the South Bay Aqueduct (including Lake Del Valle).

- The SWP provides water from the Delta to the Central Coast Region through the Coastal Branch Aqueduct.
- The SWP provides water from the Delta to southern California through the California Aqueduct (including Quail, Pyramid, Castaic, Silverwood, and Perris lakes).
- The SWP delivers water to the Cross-Valley Canal, when the systems have capacity, for CVP contractors.

The project area includes the service areas in the Sacramento and San Joaquin valleys in the Central Valley Region as well as the San Francisco-Bay Area, Central Coast, and Southern California regions.

1.7 Study Period

The coordinated long-term operation of the CVP and SWP, as described in this EIS, is assumed to continue to at least 2030 before CVP and SWP operations would change. These changes could include projects considered as part of the cumulative effects analyses, as described in Chapter 3, Description of Alternatives. Therefore, this EIS analyzes future conditions projected for 2030. It is recognized that many changes between existing conditions and 2030 conditions would occur without changes to CVP and SWP operations, including:

- Land use changes will occur in the Delta watershed as growth occurs as projected in local agency general plans. Much of this growth is expected in the service areas of water users with water rights that may be senior to the CVP and SWP or within the Sacramento Valley, and municipal and industrial CVP contractors will increase water demands for population growth as described in the general plans. These actions could reduce the available water supplies for use by the CVP and SWP. This EIS assumes that this growth will occur by 2030. Therefore, the effects of land use changes by 2030 will be similar in the comparison of all alternatives.
- Climate change could change CVP and SWP water supplies if the amount of snow decreases and the amount of rain either decreases or occurs within a shorter period and limits the amount of water captured in reservoirs. Sea-level rise would increase salinity in the western, central, and southern Delta, which could limit the time when CVP and SWP divert water. These actions could reduce the available water supplies for use by the CVP and SWP. Federal and state agencies have completed numerous studies that project future climate change and sea-level rise scenarios. The specific characteristics of climate change and sea-level rise are not defined at this time because this EIS includes only qualitative analyses. All of the alternatives, including the No Action Alternative, evaluated in this EIS include the same assumptions for climate change and sea-level rise. Therefore, the effects of climate change and sea-level rise will be similar in the comparison of all alternatives.

- Numerous studies are being prepared by Federal, state, and local agencies to evaluate implementation of storage projects in the Delta watershed, Delta conveyance, Delta ecosystem restoration, Delta water quality improvement through construction of treatment facilities for discharges into the Delta, and changes to the SWRCB Water Quality Control Plan. As described in Chapter 3, Description of Alternatives, most of those studies have not been completed. However, many of the facilities recommended by those studies are expected to be constructed and operational by 2030. Therefore, the effects of implementation of those facilities will be similar in the comparison of all alternatives.

As the changing conditions described above and other future changes occur, changes in long-term operation of the CVP and SWP may be required. This may require the re-initiation of consultation on the 2008 USFWS BO and 2009 NMFS BO. Therefore, because the above-described changes in conditions are likely to occur by 2030 and because new BOs would be required, this EIS considers a study period that concludes in 2030.

1.8 Participants in Preparation of the EIS

For this EIS, Reclamation is the Federal lead agency. The Federal cooperating agencies include USFWS, NMFS, U.S. Environmental Protection Agency, U.S. Army Corps of Engineers, and Bureau of Indian Affairs.

Reclamation also provided non-federal agencies with the opportunity to participate in the NEPA process if they qualified under NEPA (as described above) as a cooperating agency. In August 2012, Reclamation invited 747 non-federal entities to be cooperating agencies for this EIS, including:

- DWR
- SWRCB
- California Department of Fish and Wildlife
- Agencies that have contracts with the CVP or SWP for water delivery, water service repayment, exchange or settlement, or use of CVP or SWP facilities for conveyance
- State and Federal Contractors Water Agency
- Cities and counties within the CVP and SWP service areas
- Federally recognized tribes within the CVP and SWP service areas or areas affected by long-term operation of the CVP and SWP

Non-federal entities that meet the specified criteria for cooperating agencies are required to enter into a Memorandum of Understanding (MOU) [43 CFR 46.225(d)] with Reclamation. The MOU provides a framework for cooperating agencies to agree to their respective roles, responsibilities, and limitations, including, as appropriate, target schedules.

Reclamation has signed cooperating agency MOUs with the following entities:

- Anderson-Cottonwood Irrigation District
- California Department of Water Resources
- California Valley Miwok Tribe
- City of Hesperia
- Contra Costa Water District
- East Bay Municipal Utility District
- Friant Water Authority
- Glenn-Colusa Irrigation District
- Metropolitan Water District of Southern California
- Oakdale Irrigation District
- Reclamation District 108
- San Diego County Water Authority
- San Juan Water District
- San Luis & Delta-Mendota Water Authority
- Santa Clara Valley Water District
- Tehama Colusa Canal Authority
- Stockton East Water District
- Sutter Mutual Water District
- Zone 7 Water Agency

Reclamation also received a request from an interested party to include the Federal Emergency Management Agency (FEMA) as a cooperating agency. However, Reclamation concluded that FEMA does not meet the requirements for being a cooperative agency in accordance with Section 1501.6 of NEPA for a "Federal agency which has special expertise related to environmental issues, which should be addressed in the statement" and beyond that which could not be addressed by other cooperating Federal agencies.

1.8.1 Stakeholder and Public Involvement during Preparation of the EIS

The scoping process was initiated on March 28, 2012, with the publication of the Notice of Intent in the Federal Register (FR) and continued through June 28, 2012. Initially, the public scoping process was to be completed on May 29, 2012. During the public scoping process, other agencies and interested persons requested an extension of the public scoping process to allow additional opportunities to provide scoping comments. In response to these requests, Reclamation published a notice on May 25, 2012, extending the public scoping period through June 28, 2012.

Scoping meetings were held to inform the public and interested stakeholders about the project and to solicit comments and input on the EIS. The scoping meetings were held in the following locations and resulted in the following level of public participation:

- Madera on April 25, 2012 (6 participants)

- Diamond Bar on April 26, 2012 (3 participants)
- Sacramento on May 2, 2012 (15 participants)
- Marysville on May 3, 2012 (2 participants)
- Los Banos on May 22, 2012 (230 participants)

Reclamation posted the scoping notices in the FR, on its website, and in newspapers that served areas where the scoping meetings were held. Reclamation also published press releases to news organizations and others that have requested notifications for all press releases.

Scoping comments were used in the development of a reasonable range of alternatives and identification of key issues that would require analysis in the Environmental Consequences sections of this EIS, as described in Chapter 3, Description of Alternatives, and Chapter 23, Consultation, Coordination, and Cooperation.

Reclamation also posted on its website an initial range of alternatives discussed at a stakeholders meeting on October 19, 2012. As described in Chapter 3, Description of Alternatives, comments received during that process were used to refine the description of the alternatives.

Project status meetings were held with cooperating agencies and other stakeholders during preparation of the Draft EIS, including meetings in Sacramento on January 16, May 29, and November 5, 2014; and February 20 and June 24, 2015.

1.8.2 Stakeholder and Public Involvement during Preparation of the Final EIS

The Draft EIS was published for public review in July 2015. The distribution list for the Public Draft EIS is included in Chapter 24. Reclamation posted notification of the availability of the Public Draft EIS and the location and timing of public hearing(s) on its website, in the FR, and through press releases.

Four public meetings were held during the public review period for the Draft EIS in the following locations, with the following level of participation:

- Sacramento on September 9, 2015 (9 participants)
- Red Bluff on September 10, 2015 (9 participants)
- Los Banos on Tuesday, September 15, 2015 (9 participants)
- Irvine on September 17, 2015 (2 participants)

Approximately 860 written and verbal comments were received on the Draft EIS. All of the comments received on the Draft EIS were considered in preparation of the Final EIS. Written responses to all substantive comments received are included in Appendices 1A through 1E of the Final EIS.

1.9 Related Projects and Activities

Because the EIS study area is large, many activities and studies that are currently ongoing or planned for the near future could be affected by the findings of the EIS or are related actions of long-term operation of the CVP and SWP. Preliminary information from these studies and projects has been used to describe the No Action Alternative or to assess cumulative impacts of implementing alternatives evaluated in this EIS. Some of these projects are adjacent to, but not specifically part of the Study Area (e.g., San Joaquin River Restoration Program). However, these projects have been included in the cumulative effects analysis because of indirect effects on the Study Area. The following studies and projects are summarized in Chapter 3, Description of Alternatives, as either part of the No Action Alternative or the cumulative effects analyses:

- Trinity River Restoration Program
- Continued Implementation of the Central Valley Project Improvement Act Provisions
- Clear Creek Mercury Abatement and Fisheries Restoration Project
- Iron Mountain Mine Superfund Site
- Mainstem Sacramento River, American River, and Stanislaus River Gravel Augmentation Program
- Nimbus Fish Hatchery Fish Passage Project
- Folsom Dam Water Control Manual Update
- FERC Relicensing for Middle Fork of the American River Project
- Lower Mokelumne River Spawning Habitat Improvement Project
- Dutch Slough Tidal Marsh Restoration
- Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation
- Tidal Wetland Restoration in the Delta and Suisun Marsh
- San Joaquin River Restoration Program
- Stockton Deep Water Ship Channel Dissolved Oxygen Project
- Grassland Bypass Project
- Central Valley Salinity Alternatives for Long-term Sustainability (CV-Salts)
- Long-term Water Transfers
- Municipal Water Supply Projects that are being implemented (including City of Stockton Delta Water Supply Project, Woodland-Davis Water Supply Project, water recycling programs, San Diego County Water Authority

Carlsbad Seawater Desalination Facility, groundwater bank and wellfield expansions)

- Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan
- Bay-Delta Water Quality Control Plan Update
- California WaterFix (Bay Delta Conservation Plan)
- California EcoRestore
- Shasta Lake Water Resources Investigation
- North of Delta Offstream Storage Investigation
- Federal Energy Regulatory Commission (FERC) License Renewal Projects (including SWP Oroville Project, Yuba-Bear and Drum Spaulding Projects, Turlock Irrigation District and Modesto Irrigation District Don Pedro Project, and Merced Irrigation District Merced River Hydroelectric Project)
- El Dorado Water and Power Authority Supplemental Water Rights Project
- Northeastern San Joaquin County Groundwater Banking Authority
- Semitropic Water Storage District Delta Wetlands
- North Bay Aqueduct Alternative Intake
- Los Vaqueros Reservoir Expansion Phase 2
- Upper San Joaquin River Basin Storage Investigation
- Central Valley Regional Water Quality Control Board Irrigated Lands Regulatory Program
- San Luis Reservoir Low Point Improvement Project
- Future Water Supply Projects (including groundwater storage and recovery projects; major conveyance projects, including Sacramento River Water Reliability Project, water recycling, and desalination projects)
- Contra Loma Reservoir and Recreation Resource Management Plan
- San Luis Reservoir State Recreation Area Resource Management Plan/General Plan
- *Westlands Water District v. United States Settlement*
- Mill Creek Riparian Assessment
- Yolo County Habitat/Natural Community Conservation Plan
- North Delta Flood Control and Ecosystem Restoration Project
- Franks Tract Project
- Future Water Supply Projects (including groundwater storage and recovery, conveyance, water recycling, desalination, and water transfers).

1.10 Organization of the Environmental Impact Statement

The Final EIS was prepared by incorporating changes identified during the public review of the Draft EIS. Chapters 1 through 25 and the Executive Summary have been revised and included in the Final EIS in response to comments received on the Draft EIS. Changes to the Appendices 3A through 19B have been included in the Final EIS as Errata sheets placed in front of each appendix. Appendices 1A through 1E include the comments on the Draft EIS and their corresponding responses. Three additional appendices have been added to the Final EIS to provide more detailed information requested by several commenters (Appendices 5E, 9O, and 9P).

This EIS is organized as follows:

- The **Executive Summary** presents the purpose and intended uses of this EIS and summarizes the project background, need to prepare this EIS, project area and study period, an overview of the alternatives, and major conclusions of the environmental analysis. A table summarizing the environmental consequences, mitigation measures, and significant impacts for the alternatives is included.
- **Chapter 1, Introduction,** summarizes the project background, need to prepare this EIS, use of this EIS, project area and study period, stakeholder and public involvement in the preparation of the EIS, and related projects and activities.
- **Chapter 2, Purpose and Need for the Action,** summarizes the underlying purpose and need to which Reclamation is responding in proposing the alternatives for the action.
- **Chapter 3, Description of Alternatives,** summarizes the methods used for developing the alternatives considered in the EIS, describes the alternatives, and discusses the alternatives considered but eliminated from detailed analysis.
- **Chapter 4, Approach to Environmental Analyses,** describes the approach and terms used in the description of the regulatory setting, affected environment, environmental consequences, cumulative effects, and mitigation measures, if appropriate, for the resource topics identified in Chapters 5 through 21.
- **Chapters 5 through 21** include the regulatory setting, affected environment, and environmental consequences for 17 resource topics and discuss methods of analysis, environmental impacts, and mitigation measures for potential direct and indirect impacts. References for each resource are included within each of these chapters, as follows:
  - Chapter 5 – Surface Water Resources and Water Supplies
  - Chapter 6 – Surface Water Quality

  - Chapter 7 – Groundwater Resources and Groundwater Quality
  - Chapter 8 – Energy
  - Chapter 9 – Fisheries and Aquatic Resources
  - Chapter 10 – Terrestrial Biological Resources
  - Chapter 11 – Geology and Soils
  - Chapter 12 – Agricultural Resources
  - Chapter 13 – Land Use
  - Chapter 14 – Visual Resources
  - Chapter 15 – Recreation Resources
  - Chapter 16 – Air Quality and Greenhouse Gas Emissions
  - Chapter 17 – Cultural Resources
  - Chapter 18 – Public Health
  - Chapter 19 – Socioeconomics
  - Chapter 20 – Indian Trust Assets
  - Chapter 21 – Environmental Justice

- **Chapter 22, Other NEPA Considerations,** summarizes the environmental effects of implementation of the alternatives related to growth-inducing indirect impacts, the relationship between short-term and long-term productivity, irreversible and irretrievable commitments of resources, and impacts on other Federal and non-federal projects and plans.
- **Chapter 23, Consultation, Coordination, and Cooperation,** summarizes public and stakeholder involvement activities under NEPA; Native American consultation; consultation with other Federal, state, regional, and local agencies; consultation with other entities and organizations; and unresolved issues.
- **Chapter 24, Distribution List for Draft EIS and Final EIS,** provides locations where the Draft EIS was available for review and provides an overview of governmental entities, organizations, and interested parties that received a copy of the Draft EIS. The Final EIS was distributed to the same distribution list.
- **Chapter 25, List of Preparers,** provides a list of individuals who participated in the preparation of the EIS.
- **Chapter 26, Index,** provides an index of key topics in Chapters 1 through 23.
- **Appendices** contain background information including modeling methodologies, assumptions, and results; and lists and statuses of species federally listed as threatened and endangered evaluated in this EIS.

Figure 1.1 Study Area

Chapter 2

Purpose and Need for the Action

2.1 Introduction

National Environmental Policy Act (NEPA) regulations require a statement of "the underlying purpose and need to which the agency is responding in proposing the alternatives, including the proposed action" (40 Code of Federal Regulations 1502.13).

2.2 Purpose of the Action

The purpose of the action considered in this Environmental Impact Statement (EIS) is to continue the operation of the Central Valley Project (CVP), in coordination with operation of the State Water Project (SWP), for the authorized purposes, in a manner that:

- Is similar to historical operational parameters with certain modifications
- Is consistent with Federal Reclamation law; other Federal laws and regulations; Federal permits and licenses; and State of California water rights, permits, and licenses
- Enables the Bureau of Reclamation (Reclamation) and the California Department of Water Resources (DWR) to satisfy their contractual obligations to the fullest extent possible

2.3 Need for the Action

Continued operation of the CVP is needed to provide river regulation; improvement of navigation; flood control; water supply for irrigation and domestic uses; fish and wildlife mitigation, protection, and restoration; fish and wildlife enhancement; and power generation. The CVP and the SWP facilities also are operated to provide recreation benefits and in accordance with the water rights and water quality requirements adopted by the State Water Resources Control Board.

As described in Chapter 1, Introduction, the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS) concluded in their 2008 and 2009 Biological Opinions (BOs), respectively, that coordinated long-term operation of the CVP and SWP, as described in the 2008 Reclamation Biological Assessment, jeopardizes the continued existences of listed species and adversely modifies critical habitat. To remedy this, USFWS and NMFS provided Reasonable and Prudent Alternatives (RPAs) in their BOs.

The U.S. Court of Appeals for the Ninth Circuit confirmed the U.S. District Court for the Eastern District of California ruling that Reclamation must conduct a NEPA review to determine whether the RPA actions cause a significant impact on the human environment. Potential modifications to the coordinated operation of the CVP and SWP analyzed in the EIS process should be consistent with the intended purpose of the action, be within the scope of Reclamation's legal authority and jurisdiction, be economically and technologically feasible, and avoid the likelihood of jeopardizing listed species or resulting in the destruction or adverse modification of critical habitat in compliance with the requirements of Section 7(a)(2) of the Endangered Species Act.

Chapter 3

Description of Alternatives

3.1 Introduction

This chapter describes the methodology used for development of all potential alternatives and the basis for selecting the reasonable range of alternatives which are evaluated in detail in this Environmental Impact Statement (EIS).

3.2 Approach to Identify Potential Alternatives

This EIS evaluates a range of alternatives to the No Action Alternative for the coordinated long-term operation of the Central Valley Project (CVP) and the State Water Project (SWP) in the Year 2030. The No-Action Alternative includes full implementation of the 2008 USFWS Biological Opinion (2008 USFWS BO) and the 2009 National Marine Fisheries Service (NMFS) Biological Opinion (2009 NMFS BO) Reasonable and Prudent Alternatives (RPAs), in addition to other ongoing and future programs that are reasonably foreseeable to occur by 2030.

Identification of the No Action Alternative and the range of action alternatives for this EIS were developed in response to the purpose and need for the action as well as comments received during the scoping process and during preparation of the Draft EIS, as summarized below.

3.2.1 Scoping Process

The scoping process was initiated on March 28, 2012, with the publication of the Notice of Intent in the Federal Register (FR) and continued through June 28, 2012. Five scoping meetings were held to inform the public and interested stakeholders about the project, and to solicit comments and input on the EIS. The scoping meetings were held in Madera, Diamond Bar, Sacramento, Marysville, and Los Banos, California, in April and May 2012. Many scoping comments addressed the definition and range of alternatives, as summarized below and in the Scoping Report (included as Appendix 23A of this EIS).

- Alternative South Delta operation criteria, including:
  - Changes to Old and Middle River (OMR) flow criteria from what was described in the 2008 USFWS BO and 2009 NMFS BO
  - Changes to operational criteria of CVP and SWP south Delta intakes relative to the ratio of San Joaquin River inflows to south Delta exports;
  - Changes to measurement methods for OMR flow criteria related to locations of measurements and inclusion of Contra Costa Water District intakes within the calculations of OMR flows.

- Measures to benefit the survival and recovery of listed aquatic species that do not involve modifications of long-term operation of the CVP and SWP, such as improved water quality, reduction of populations of predators of listed aquatic species in the Delta, regulation of small unscreened water diversions, restoration of floodplain habitat, and provisions for levee vegetation approaches.
- Measures to improve primary productivity and food supply for salmonids and smelts Smelt (both Delta Smelt and Longfin Smelt), including through increased spring outflow, reduced Delta diversions, and changes in Delta flow patterns resulting from channel modifications or changes in Delta exports that change Delta residence times for aquatic species.
- Measures to support federal and state fish population doubling mandates and goals.
- Measures to increase opportunities for transfer of water through the Delta.
- Measures to increase water supply availability from the CVP and SWP south Delta intakes.
- Measures to reduce reliance on Delta water supplies by reducing water supply availability from the CVP and SWP south Delta intakes.
- Complete cessation of long-term operation of the CVP and SWP, including benefits related to the operation of the CVP and SWP reservoirs, such as flood management and recreational benefits.
- Measures to prioritize CVP operations of the Trinity, Sacramento, American, and Stanislaus rivers to meet in-watershed water demands, not only in accordance with existing water rights and agreements, but also for CVP water contractors specifically located within the American and Stanislaus river watersheds.
- Measures to prioritize use of Central Valley Project Improvement Act (CVPIA) restoration funds within geographic locations collected from CVP water users in those locations.

3.2.2 Concepts Identified during Preparation of the Draft EIS

As described in Chapter 23, Consultation and Coordination, status meetings were held throughout preparation of the Draft EIS with stakeholders and interested parties between 2012 and 2015. Following the scoping process, the discussions were initially focused on identification of the No Action Alternative, other bases of comparisons, and alternative concepts to the RPAs. Based upon these discussions, the development of alternatives process initially focused on identification of the No Action Alternative, and subsequently, upon development of the range of alternatives to the No Action Alternative.

3.3 Identification of the Bases of Comparison

Council on Environmental Quality (CEQ) regulations require an EIS to include evaluation of a No Action Alternative (40 CFR 1502.14). The No Action Alternative is defined as the projections of current conditions and trends into the future without implementation of alternatives. These projected conditions are defined by CEQ as "'no change' from current management direction or level of management intensity." The No Action Alternative also can be defined as "no project" in cases where a new project is proposed for implementation. However, all of the alternatives evaluated in this EIS are to continue the coordinated long-term operation of the CVP and SWP. Therefore, the definition of the No Action Alternative used for this EIS is continuation of the current management direction and level of intensity.

For this EIS, the No Action Alternative is based upon the continued operation of the CVP and SWP in the same manner as was occurring at the time of the publication of the Notice of Intent in March 2012. Thus, the No Action Alternative consists of the coordinated long-term operation of the CVP and SWP, including full implementation of the RPAs in the 2008 USFWS BO and 2009 NMFS BO, because Reclamation provisionally accepted the BOs in 2008 and 2009, respectively, began implementing the RPAs, and continues to implement the RPAs to date. The No Action Alternative also includes changes not related to the long-term operation of the CVP and SWP or implementation of the RPAs in the 2008 USFWS BO and 2009 NMFS BO, as described in subsequent sections of this chapter.

Numerous scoping comments requested that the No Action Alternative not include the RPAs in the 2008 USFWS BO and 2009 NMFS BO because, at that time, the District Court had remanded the biological opinions (BOs) back to USFWS and NMFS. The comments indicated that the EIS should include a "basis of comparison" for the alternatives that was similar to conditions prior to implementation of the RPAs. Scoping comments also indicated that a "No Action Alternative scenario" without implementation of the RPAs in the 2008 USFWS BO and 2009 NMFS BO could be used to analyze the effects of implementing the RPAs.

Determining an appropriate baseline without the 2008 USFWS BO and 2009 NMFS BO actions and yet continuing to meet all of Reclamation's statutory and regulatory requirements is a difficult task. Simply analyzing a No Action Alternative that is similar to the project description described in either the 2004 Biological Assessment or 2008 Biological Assessment is insufficient, as each was found to jeopardize listed species, the 2004 Biological Assessment by the District Court in 2007, and the 2008 Biological Assessment by USFWS and NMFS. Either of these operations would be inconsistent with Reclamation's existing policy and management direction.

Because the RPAs were provisionally accepted and the No Action Alternative, represents a continuation of existing policy and management direction, the No Action Alternative includes the RPAs. However, in response to scoping

comments and subsequent comments from stakeholders and interest groups; and to provide a basis for comparison of the effects of implementation of the RPAs (per the District Court's mandate), this EIS includes a "Second Basis of Comparison" that represents a condition in 2030 without implementation of the 2008 USFWS BO and 2009 NMFS BO. All of the alternatives are compared to the No Action Alternative and to the Second Basis of Comparison to describe the effects that could occur by 2030 under both bases of comparison.

Several of the 2009 NMFS BO RPA actions had been initiated prior to issuance of the 2009 NMFS BO; and therefore, those actions are included in the Second Basis of Comparison, as described below. Reasonably foreseeable actions included in the No Action Alternative that are not related to the 2008 USFWS BO or 2009 NMFS BO are also included in the Second Basis of Comparison.

3.3.1 Conditions in Year 2030 without Implementation of Alternatives 1 through 5

Changes that would occur over the next 15 years without implementation of the alternatives are not analyzed in this EIS. However, the changes to environmental justice factors that are assumed to occur by 2030 under the No Action Alternative and the Second Basis of Comparison are summarized in this section, including:

- Continued long-term operation of the CVP and SWP in accordance with ongoing management policies, criteria, and regulations, including water right permits and licenses issued by the State Water Resources Control Board (SWRCB); and operational requirements of the 2008 USFWS BO and the 2009 NMFS BO.
- Implementation of existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would occur by 2030 without implementation of the BOs.
- Implementation of existing and future actions not described in the 2009 NMFS BO that would occur by 2030 without implementation of any alternatives considered in this EIS.

3.3.1.1 Continued Long-Term Operation of the CVP and SWP Facilities

The CVP and SWP are operated in a coordinated manner in accordance with Public Law 99-546 (October 27, 1986), directing the Secretary to execute the Coordinated Operation Agreement (COA). The CVP and SWP are also operated under State Water Resources Control Board (SWRCB) decisions and water right orders related to the CVP's and SWP's water right permits and licenses to appropriate water by diverting to storage, by directly diverting to use, or by re-diverting releases from storage later in the year or in subsequent years.

The CVP and SWP are permitted by SWRCB to store water, divert water and re-divert CVP and SWP water that has been stored in upstream reservoirs. The CVP and SWP have built water storage and water delivery facilities in the Central Valley to deliver water supplies to CVP and SWP contractors, including senior

water users. The CVP's and SWP's water rights are conditioned by the SWRCB to protect the beneficial uses of water within the watersheds.

As conditions of the water right permits and licenses, SWRCB requires the CVP and SWP to meet specific water quality objectives within the Delta. Reclamation and DWR coordinate operation of the CVP and SWP, pursuant to the COA, to meet these and other operating requirements. The COA is an agreement between the Federal government and the State of California for the coordinated operation of the CVP and SWP. The agreement suspended a 1960 agreement and superseded annual coordination agreements that had been implemented following construction of the SWP.

The COA established the operating framework for the CVP and SWP based upon conditions in the 1980s, by setting forth: (1) definitions of the CVP and SWP facilities and their water supplies, (2) procedures for coordination of operations, (3) formulas for sharing joint responsibilities for meeting Delta standards and ensuring no injury to other legal uses of water, (4) criteria for sharing unstored flow in the Delta, (5) a framework for exchange of water and services between the SWP and CVP, and (6) provisions for periodic reviews. Coordinated operation by agreed-on criteria can increase the efficiency of both the CVP and the SWP.

Implementation of the COA has evolved continually since 1986 as CVP and SWP facilities, operational criteria, and physical and regulatory environment have changed. For example, adoption of the CVPIA in 1992 changed purposes and operations of the CVP, and ESA responsibilities have affected operation of the CVP and SWP. Since 1986, facilities operations have been modified in response to statutory and regulatory requirements that were not part of the original COA assumptions or requirements. In addition, water quality objectives have been revised by the SWRCB since 1986 in the 1995 and 2006 Water Quality Control Plans and implemented through SWRCB Decision 1641. DWR and Reclamation have operational arrangements to accommodate new facilities, water quality objectives, the CVPIA, other SWRCB criteria, and the ESA, but the COA has not been formally modified to address these newer operating conditions.

The ongoing operational management policies of the CVP and SWP are anticipated to continue under the No Action Alternative and Second Basis of Comparison. These operational assumptions are described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations, and summarized in Chapter 5, Surface Water Resources and Water Supplies.

3.3.1.2 Actions included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Several actions included in the 2008 USFWS BO RPA and 2009 NMFS BO RPA are ongoing and others have been completed, including the following actions.

- 2008 USFWS BO RPA Component 4, Habitat Restoration. In 2014, Reclamation, California Department of Fish and Wildlife (CDFW), and USFWS adopted and initiated implementation of the Suisun Marsh Habitat Management, Preservation, and Restoration Plan (Suisun Marsh Management

Plan). The No Action Alternative assumes that the Suisun Marsh Management Plan will provide up to 7,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh with or without implementation of the 2000 USFWS BO. This would represent up to 87 percent (7,000 of 8,000 acres of this habitat type referenced in the 2008 USFWS BO.

- 2009 NMFS BO RPA Action I.1.3, Clear Creek Spawning Gravel Augmentation. This effort was initiated in 1996 under the CVPIA Section 3406(b)(12), and is assumed to continue under the No Action Alternative and Second Basis of Comparison. The Clear Creek fisheries habitat restoration program is being implemented by USFWS and Reclamation in accordance with CVPIA (Reclamation 2011a). By the year 2020 the overall goal is to provide 347,288 square feet of usable spawning habitat from Whiskeytown Dam downstream to the former McCormick-Saeltzer Dam, which is the amount that existed before construction of Whiskeytown Dam. Between 1996 and 2009, a total of approximately 130,925 tons of spawning gravel was added to the creek. The interim annual spawning gravel addition target is 25,000 tons per year, but due to a lack of funding, only an average of 9,358 tons has been placed annually since 1996 (Reclamation 2013a). In 2010, the first annual evaluation of spawning gravel implementation and monitoring was submitted to NMFS as required by the NMFS BO. In 2012, Reclamation placed 10,000 tons of spawning gravel at four locations: Guardian Rock/Below N.E.E.D. Camp, Placer Bridge, Clear Creek Crossing/Bridge, and Tule Backwater.
- 2009 NMFS BO RPA Action I.1.4, Spring Creek Temperature Control Curtain Replacement. This action was completed when the temperature control curtain was replaced in 2011, as described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations.
- 2009 NMFS BO RPA Action I.2.6, Restore Battle Creek for Winter-Run, Spring-Run, and Central Valley Steelhead. The Battle Creek Salmon and Steelhead Restoration Projects under construction to reestablish approximately 42 miles of salmon and steelhead habitat on Battle Creek and an additional 6 miles of habitat on tributaries. The Project is a collaborative effort between Reclamation, USFWS, NMFS, CDFW, Pacific Gas & Electric Company (PG&E), and other groups. Prior to 2030, elements of the project will be completed including removal of five dams, installation of new fish screens and fish ladders, provisions for increased instream flows in Battle Creek, improved access roads and trails, and decommissioned power plant canals that conveyed water between tributaries. The No Action Alternative assumes implementation of this project with or without implementation of the 2009 NMFS BO.
- 2009 NMFS BO RPA Action I.3.1, Operate Red Bluff Diversion Dam with Gates Out. This action was completed when the new Red Bluff Pumping Plant began operation in 2012, and the gates no longer block the flow of water

in the Sacramento River, as described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations.

- 2009 NMFS BO RPA Action I.5, Funding for CVPIA Anadromous Fish Screen Program. This effort was initiated over 20 years ago under the CVPIA Section 3406(b)(21), and is assumed to continue under the No Action Alternative with or without implementation of the 2009 NMFS BO. The No Action Alternative assumes continued implementation of the program to meet the program objectives by 2030.
- 2009 NMFS BO RPA Action I.6.1, Restoration of Floodplain Habitat; and Action I.6.2, Near-Term Actions at Liberty Island/Lower Cache Slough and Lower Yolo Bypass; Action I.6.3, Lower Putah Creek Enhancements; Action I.6.4, Improvements to Lisbon Weir; and Action I.7, Reduce Migratory Delays and Loss of Salmon, Steelhead, and Sturgeon at Fremont Weir and Other Structures in the Yolo Bypass. These actions are addressed in the ongoing Yolo Bypass Salmonid Habitat Restoration and Fish Passage Implementation Plan (Implementation Plan) that has been initiated by Reclamation and DWR. The No Action Alternative and Second Basis of Comparison assume completion of this Implementation Plan by 2030 with or without implementation of the 2009 NMFS BO. The Implementation Plan includes an operable gate at or near the Fremont Weir and modification of the Sacramento Weir to increase the frequency and extent of floodplain inundation in the Yolo Bypass; restoration of at least 20,000 acres of floodplain rearing habitat (excluding tidally-influenced areas); and habitat enhancements in the Yolo Bypass, including measures to avoid stranding or barriers to migration. The No Action Alternative and Second Basis of Comparison assume that an operable gate would be installed in or near the Fremont Weir that would allow for controlled flows from the Sacramento River into the Yolo Bypass when Sacramento River water elevations exceed approximately 17.5 feet (NAVD88). Other portions of Fremont Weir would continue to block flows into the Yolo Bypass until the Sacramento River water elevations exceed 32.8 feet (NAVD88).
- 2009 NMFS BO RPA Action II.1, Lower American River Flow Management. This effort was initiated in 2006 when Reclamation began operating in accordance with the American River Flow Management Standard (FMS), as described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations. The No Action Alternative and Second Basis of Comparison assume continued operations under the FMS.

3.3.1.3 Future Actions not included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

The No Action Alternative and the Second Basis of Comparison include assumptions unrelated to implementation of the 2008 USFWS BO RPA actions and 2009 NMFS BO RPA actions, including: climate change and sea level rise; continued implementation of ongoing federal, state, and local regulations and

policies; development of lands in accordance with general plans in areas served by CVP and SWP water supplies; and reasonable and foreseeable projects that have been approved and are anticipated to be implemented by 2030. The 2008 USFWS BO and the 2009 NMFS BO included assumptions for climate change and sea level rise; continued implementation of ongoing federal, state, and local regulations and policies; development of lands in accordance with general plans in areas served by CVP and SWP water supplies; and reasonable and foreseeable projects. Subsequent to the publication of the BOs, the assumptions for these items have been updated and are included in the No Action Alternative and the Second Basis of Comparison. The assumptions used in this EIS for these items are discussed below.

3.3.1.3.1 Climate Change and Sea Level Rise

Under Section 9503 of the SECURE Water Act (Public Law 111-11, Subtitle F), Reclamation conducted a comprehensive assessment of current information on potential future climate change impacts and implications for long-term water management in the West, as described in Appendix 5A, Modeling Methodology. Projections of future climate in the Sacramento and San Joaquin River basins are summarized, with regard to temperature, precipitation, snowpack, and runoff. Results indicate that temperatures across both river basins may increase steadily, with the basin-average mean annual temperature projected to increase by roughly 5º to 6º Fahrenheit (F) during the 21st century. Annual precipitation in the basins should remain geographically variable over the next century, with current projections suggesting that annual basin-wide precipitation may initially stay steady to slightly increasing, to an eventual slight decrease over the region. With regard to snowpack, increased warming is expected to diminish snow accumulation during the cool season and reduce the availability of snowmelt to sustain runoff during the warm season. Reductions in annual runoff are predicted to occur by the latter half of the century. Changes in runoff seasonality are generally projected, with warming leading to more rainfall and runoff in the cool season and less runoff during the spring, affecting seasonal water supplies. One difficulty that arises in taking climate change into account in long-term water resources planning is that the natural variability is often greater than the magnitude of change expected over several decades.

Global and regional sea levels have been increasing steadily over the past century and are expected to continue to increase throughout this century (BCDC 2011). The National Research Council recently released a study of sea level rise on the west coast. Key results indicate that global sea level has risen about 7 inches in the 20th century and the rate of sea level rise is accelerating (NRC 2012). Relative to year 2000 levels, global sea level is projected to rise 3 to 9 inches by 2030, 7 to 19 inches by 2050, and 20 to 55 inches by 2100. Sea level rise along the California coast south of Cape Mendocino are projected to show even greater ranges of potential change. As a result, sea level rise associated with climate change will continue to threaten coastal lands and infrastructure, increase flooding at the mouths of rivers, place additional stress on levees and water resources in the Delta.

Additional information related to development of climate change and sea level rise projections by 2030 are presented in Section 5A.A.5 of Appendix 5A, Section A, CalSim II and DSM2 Modeling.

3.3.1.3.2 Continued Implementation of Ongoing Federal, State, and Local Water Resources Policies

The No Action Alternative and Second Basis of Comparison assume continued implementation of ongoing water resources policies and programs that are not addressed in the 2008 USFWS BO and 2009 NMFS BO, including the following programs.

- Federal Clean Water Act, including completion of Total Maximum Daily Load programs, National Pollutant Discharge Elimination System permits, and Waste Discharge Permits, as described in Chapter 6, Surface Water Quality.
- SWRCB water rights and water quality policies and programs, as described in Chapter 5, Surface Water Resources and Water Supplies.
- Federal Safe Drinking Water Act and California Safe Drinking Water Act policies and programs related to drinking water treatment requirements, as described in Chapter 6, Surface Water Quality.
- Federal Clean Air Act and California Clean Air Act, including completion of the compliance programs in accordance with the State Implementation Plans, as described in Chapter 16, Air Quality and Greenhouse Gas Emissions.
- Flood management policies and programs established by the U.S. Army Corps of Engineers (USACE) except for removal of substantial vegetation from levees per recent USACE requirements (USACE 2009, 2010), Federal Emergency Management Agency, DWR, Central Valley Flood Protection Board, and local flood management agencies, as described in Chapter 5, Surface Water Resources and Water Supplies.

3.3.1.3.3 General Plan Development in CVP and SWP Service Areas

Counties and cities throughout California have adopted general plans which identify land use classifications including those for municipal and industrial uses and those for agricultural uses. Preparation of general plans includes an environmental evaluation under the California Environmental Quality Act to identify adverse impacts to the physical environment and to provide mitigation measures to reduce those impacts to a level of less than significance. Most of the counties where CVP and SWP water supplies are delivered have adopted general plans following the environmental review of the plans and appropriate alternatives. Population projections from those general plan evaluations are provided to the State Department of Finance and are used to project future water needs and the potential for conversion of existing undeveloped lands and agricultural lands. Many of the existing general plans for counties with municipal areas recently have been modified to include land use and population projections through 2030. The No Action Alternative and Second Basis of Comparison

assume that land uses, as described in Chapter 13, Land Use, will develop through 2030 in accordance with existing general plans.

3.3.1.3.4 Other Reasonable and Foreseeable Projects and Programs

The No Action Alternative and Second Basis of Comparison assume continued implementation of existing projects and facilities, including water supply and wastewater management facilities, flood management facilities, and recreational facilities.

In addition, the No Action Alternative assumes implementation of the following ongoing projects by 2030. These project descriptions are organized geographically from north to south in the State of California.

Trinity River Restoration Program

The Trinity River Restoration Program is a conducted by eight partners that form the Trinity Management Council, including Reclamation, USFWS, NMFS, U.S. Forest Service, Hoopa Valley Tribe, Yurok Tribe, California Resources Agency, and Trinity County. The Trinity River Flow Evaluation Final Report was adopted in 1999 and the Trinity River Record of Decision (ROD) was signed in 2000 to implement restoration of the physical processes and rehabilitate the Trinity River as foundation for fisheries recovery. The ROD described four restoration methods (flow management through releases from Lewiston Dam, construction of channel rehabilitation sites, augmentation of gravels, and control of fine sediments); infrastructure improvements to accommodate high flow releases from Lewiston Dam; environmental compliance with improvements to riparian vegetation and wetlands, reduced turbidity, and improved water temperatures; and science-based adaptive management. The Trinity River Restoration Program 2011 Annual Report indicated that about half of the projects described in the Flow Evaluation Study had been completed and intensive assessments of the physical responses of the Trinity River and geomorphic assessments of the 40-mile restoration reach had been initiated (TRRP 2012). This project will improve conditions for aquatic species in the Trinity River.

Continued Implementation of the Central Valley Project Improvement Act Provisions

In 1992, the CVPIA (Title 34 of Public Law 102-575) was adopted to include fish and wildlife protection, restoration, enhancement, and mitigation as purposes of the CVP having equal priority with irrigation and domestic water supply uses, and power generation. The purpose of the CVPIA is expressed in six broad statements found in Section 3402 of the Act:

- To protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California;
- To address impacts of the CVP on fish, wildlife, and associated habitats;
- To improve the CVP's operational flexibility;
- To increase water-related benefits provided by the CVP to the state through expanded use of voluntary water transfers and improved water conservation;

- To contribute to the state's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary;
- To achieve a reasonable balance among competing demands for use of CVP water, including the requirements of fish and wildlife, agricultural, municipal and industrial, and power contractors.

The Secretary of the Department of the Interior (DOI) assigned primary responsibility for implementing CVPIA's many provisions to Reclamation and USFWS. Reclamation and USFWS coordinate with other federal agencies, tribes, the State of California, and numerous partners and stakeholders during each fiscal year to plan and implement activities.

The current focus of the CVPIA Program is on fish and wildlife restoration, water management, and conservation activities, authorized in Sections 3406 and 3408 of the Act. These goals fit within four broad resource areas: Fisheries, Water Operations, Refuges and Other Resources (Reclamation 2013c).

The Fisheries Resource Area includes actions to implement the CVPIA "fish-doubling goal" for Chinook Salmon, Rainbow Trout (steelhead), Striped Bass, American Shad, White Sturgeon and Green Sturgeon. The 2001 Final Restoration Plan to implement the CVPIA included 289 actions and evaluations that were determined to be reasonable given numerous technical, legal and implementation considerations. Reclamation and USFWS are implementing these and related actions (Reclamation 2013c). In 2008, the CVPIA Program conducted an independent review of the status of actions to achieve the fish-doubling goal. Following the review, a revised plan was developed to emphasize managing all of the fisheries programs as one program instead of individual actions; utilize a science-based management framework to address problems at a system level; report accomplishments by watershed; and improve transparency by communicating the coordination and decision-making that occurs within the program. The No Action Alternative assumes that the CVPIA Program will continue to be implemented in 2030.

The Water Operations Resource Area includes provisions to supply CVP water to resource locations in flow, quantity, velocity, and timing patterns that would contribute to the biological resources in accordance with Section 3406(b) of CVPIA (Reclamation 2013c). The No Action Alternative assumes that water operations will continue to include measures identified in Section 3406(b).

The Refuges Resources Area includes actions to contribute to the maintenance, restoration and enhancements of wetlands and waterfowl habitat either directly or through contractual agreements with other appropriate parties, firm water supplies of suitable quality to maintain and improve wetland habitat areas on 19 federal, state and private lands. The CVPIA requires Reclamation to provide CVP water to meet "Level 2" water demands and to obtain water supplies to meet "Level 4" water demands (Reclamation 2013c). In 2009, the CVPIA Program conducted an independent review of the refuge water supply program. The report indicated that Level 2 water supplies had become more reliable under CVPIA; however, Level 4 water supplies were not fully obtained. In response, Reclamation entered into an

agreement with USFWS and the National Fish and Wildlife Foundation to explore avenues to improve the effectiveness of the water acquisitions, including those for Incremental Level 4; assessed ways to increase the priority for pumping, conveyance and storage of Incremental Level 4 water supplies in CVP facilities; and continued planning for external storage and conveyance facilities to meet refuge water supply needs. The No Action Alternative assumes that refuge water supplies will continue to be provided in 2030.

The Other Resource Area actions are related to terrestrial habitat and species; and water quality and conservation. One of the programs implemented in this resource area includes the Section 3406(b)(1) "other" Habitat Restoration Program, which focuses on protecting native habitats that have been directly and indirectly affected by the CVP's construction and operation (Reclamation 2013c). This is accomplished through the purchase of fee title or conservation easements on lands where threats are significant and restoring lands to native habitat. Another program is the Land Retirement Program, Section 3408 (h), to purchase and retire land from agricultural production to improve water quality and provide for terrestrial habitat restoration. The No Action Alternative assumes that these actions will continue in a manner similar to ongoing operations.

The DOI is continuing to implement CVPIA using an improved science-based decision making process using a scientific framework that connects restoration actions to environmental and population responses across watersheds (Reclamation 2013c). A system-wide science-based approach with performance indices, monitoring, and scientific review of results is used to provide direction as the CVPIA adapts to changing conditions.

Clear Creek Mercury Abatement and Fisheries Restoration Project

The Lower Clear Creek Aquatic Habitat and Waste Discharge Improvement Project was initiated to remove the long-term impacts of mercury contamination in Lower Clear Creek and to create over 5 acres of new wetlands. The mercury sources are dredge-mined tailings from more than 200 historic gold and gravel mines in the watershed. The tailings are located on the properties adjacent to Clear Creek and in gravels historically used for spawning gravel supplementation. This is being completed in accordance with CVPIA actions (WSRCD 2011). This project will improve conditions for aquatic species in Clear Creek and the upper Sacramento River.

Iron Mountain Mine Superfund Site

The Iron Mountain Mine Superfund Site on Spring Creek had discharged acid mine drainage into several creeks that are tributary to Keswick Reservoir and the Sacramento River since the late 1890s. The interim remedies include source control, acid mine drainage collection and treatment, and water management, including water diversions and coordinated releases of contaminated surface water from Spring Creek Debris Dam with dilution flows released from the Spring Creek power plant and Shasta Lake. In 2008, the U.S. Environmental Protection Agency indicated that the interim remedies were operational and had reduced metal loading discharges by 95 percent as compared to pre-project

conditions. A final restoration plan for natural resources injured by Iron Mountain Mine operation was adopted in 2002 by USFWS, CDFW, National Oceanic and Atmospheric Administration, Bureau of Land Management, and Reclamation and those programs are being implemented (USEPA 2008). This project will improve water quality and conditions for aquatic species in Spring Creek and the upper Sacramento River.

Mainstem Sacramento River, American River, and Stanislaus River Gravel Augmentation Programs

The Mainstem Sacramento Gravel Augmentation Program is an ongoing Reclamation project that helps meet requirements of Section 3406 (b)(13) of the CVPIA to restore and replenish spawning gravel and rearing habitat for salmonid species. Reclamation began placing salmonid spawning gravel in the Sacramento River approximately 0.25 miles downstream of Keswick Dam in 1997 and subsequently in Salt Creek. The project will place approximately 5,000 tons of gravel into the river and implement riffle supplementation/side-channel excavation to help improve spawning habitat for Chinook Salmon and steelhead (Reclamation and USFWS 2012). This project will improve conditions for aquatic species in the upper Sacramento River.

The Lower American River Salmonid Spawning Gravel Augmentation and Side-Channel Habitat Establishment Program to increase and improve salmon and steelhead spawning and rearing habitat by replenishing spawning gravel and establishing additional side-channel habitat at new restoration sites along the lower American River between Nimbus Dam and Upper Sunrise Recreation Area and at Arden Rapids. Gravel augmentation, side channel excavation, and incorporation of woody material into the main channel to improve Chinook Salmon and steelhead spawning and rearing habitat (Reclamation 2008, 2014e).

Gravel restoration also has been implemented on the lower Stanislaus River since 2004 (Reclamation 2011c).

Nimbus Fish Hatchery Fish Passage Project

A fish passageway from the Nimbus Fish Hatchery to the stilling basin downstream of the Nimbus Dam will be constructed and the diversion weir will be removed. This project will create and maintain a reliable system for collecting adult fish to allow Reclamation to mitigate for loss of access to spawning areas following construction of Nimbus Dam and adequately protect Chinook Salmon and Central Valley steelhead. The project is scheduled to start in 2018 if adequate funding is appropriated. This project will improve conditions for aquatic species in the lower American River and lower Sacramento River.

Folsom Dam Water Control Manual Update

The USACE is developing and evaluating alternatives to change flood management operations of Folsom Dam and Folsom Lake to reduce flood risk to the Sacramento area. Currently, the USACE is completing construction of the new auxiliary spillway at Folsom Dam and is completing an in-depth analysis of recent hydrologic data for the American River watershed upstream of Folsom Dam. The study will result in an updated Water Control Manual following

completion of an EIS and an engineering report (USACE et al. 2012). This project could change flow patterns in the American and Sacramento rivers and the Delta.

Federal Energy Regulatory Commission Relicensing for Middle Fork of the American River Project

The Federal Energy Regulatory Commission (FERC) completed a final EIS for the relicensing of the Placer County Water Agency existing 223,753 kilowatt Middle Fork American River Hydroelectric Project. The project is located on the Middle Fork of the American River, Rubicon River, and Duncan and North and South Fork Long Canyon creeks in Placer and El Dorado counties. The re-licensing will provide for continued operation of the project with increased pulse and minimum instream flow releases, defined ramping rates, whitewater boating flow releases, protection of sensitive species, maintenance and enhancement of recreation opportunities, erosion and sedimentation reduction measures, vegetation improvement plans, and recreation management plans (FERC 2012). This project will change flow patterns in the American River and improve conditions for aquatic species in portions of the American River watershed.

Lower Mokelumne River Spawning Habitat Improvement Project

The Mokelumne River is tributary to the Delta and supports five species of anadromous fish. The proposed project will initially include placement of 4,000 to 5,000 cubic yards of suitably sized salmonid spawning gravel annually for a 3-year period at two specific sites, and then provide annual supplementation of 600 to 1,000 cubic yards thereafter. Fall-run Chinook Salmon and steelhead are the primary management focus in the river. Availability of spawning gravel in this section of the Mokelumne River has been determined to be deficient because historic gold and aggregate mining operations removed gravel annually and upstream dams have reduced gravel transport to the area. This area was chosen because it is known to have supported fall-run Chinook Salmon and steelhead spawning in the past and because the substrate is suitable for habitat improvement (USFWS 2009).

This project will improve conditions for aquatic species in the Mokelumne and San Joaquin rivers.

Dutch Slough Tidal Marsh Restoration

The Dutch Slough Tidal Marsh Restoration Project, located near Oakley in Eastern Contra Costa County, will restore wetland and uplands, and provide public access to the 1,200-acre Dutch Slough property. The property is composed of three parcels separated by narrow man-made sloughs. The project is a cooperative partnership between DWR, State Coastal Conservancy, CDFW, City of Oakley, Ironhouse Sanitary District, Reclamation Districts 2137 and 799, Natural Heritage Institute, and landowners. The project will provide ecosystem benefits, including habitat for sensitive species, including winter-run Chinook Salmon Sacramento splittail, and many waterfowl species. It also will be designed and implemented to maximize opportunities to assess the development of those habitats and measure ecosystem responses so that future Delta restoration

projects will be more successful. DWR approved the Final Environmental Impact Report (EIR) for the project in March 2010 (NMFS 2013). This project will improve conditions for aquatic and terrestrial species in the Delta through tidal marsh restoration.

Suisun Marsh Habitat Management, Preservation, and Restoration Plan Implementation

On March 2, 1987, the Suisun Marsh Preservation Agreement (SMPA) was signed by DWR, CDFW, Reclamation, and the Suisun Resource Conservation District. The purpose of the agreement was to establish mitigation for impacts on salinity from the SWP, CVP, and other upstream diversions. The SMPA contains provisions for Reclamation and DWR to mitigate the adverse effects on Suisun Marsh channel water salinity from operation of the CVP and SWP and other upstream diversions. The Suisun Marsh Habitat Management, Preservation and Restoration Plan (SMP) was completed in 2014 under the direction of Reclamation, USFWS, CDFW, NMFS, Suisun Resource Conservation District, and CALFED Bay-Delta Program (the Principal Agencies). This group was assisted by regulatory agencies such as the USACE, Bay Conservation and Development Commission, SWRCB, and the San Francisco Bay Regional Water Quality Control Board. The following actions will be implemented under the plan (Reclamation 2014a).

- Restoration of up to 7,000 acres of tidal marsh and protection and enhancement of up to 46,000 acres of managed wetlands through dredging, erosion protection, and installation of fish screens.
- Increased frequency of currently implemented managed wetlands activities.
- Implementation of the Preservation Agreement Implementation Fund (PAI Fund) to improve managed wetland flood and drain capabilities to accommodate high salinity water while maintaining functions and values of managed wetland habitats.

The plan includes environmental commitments and mitigation measures, an adaptive management program, and reporting through annual reports over the 30-year time frame of the plan. This project will improve conditions for aquatic and terrestrial species in the Delta and Suisun Marsh.

Tidal Wetland Restoration in the Delta and Suisun Marsh

In addition to tidal wetlands restoration that would occur in the Suisun Marsh, several programs are being implemented in the Cache Slough portion of the Delta. The 2008 USFWS BO RPA required a program to create or restore a minimum of 8,000 acres of intertidal and associated subtidal habitat in the Delta and Suisun Marsh. As described above, up to 7,000 acres of tidal marsh restoration would occur under the SMP. Other programs have been initiated to restore or expand tidal wetlands, and could provide an additional 3,000 acres of tidal wetlands in the Delta and Suisun Marsh. This additional 3,000 acres could be completed in accordance with the 2008 USFWS BO requirements. The No Action Alternative includes the following restoration programs.

- Yolo Ranch (initial phase), Northwest Field Network 4, and Flyway Farms – 941 and 405 acres, respectively, of tidal influenced lands (SFWCA 2011, 2013).
- Northern Liberty Island Fish Restoration Project – 737 acres (RD 2093 2011).
- Prospect Island Restoration Project – 1,170 acres (based on maps included in CDFW and DWR 2013).
- Calhoun Cut/Lindsey Slough Tidal Habitat Restoration Project – 87 acres (CDFW 2015).

San Joaquin River Restoration Program

The San Joaquin River Restoration Program is a comprehensive long-term effort to restore flows to the San Joaquin River from Friant Dam to the confluence of Merced River and restore a self-sustaining Chinook Salmon fishery in the river while reducing or avoiding adverse water supply impacts from restoration flows. The restoration program is the product of more than 18 years of litigation, which culminated in a Stipulation of Settlement on the lawsuit known as *NRDC, et al., v. Kirk Rodgers, et al*. The settling parties reached agreement on the terms and conditions of the settlement, which was subsequently approved by the District Court on October 23, 2006. The settling parties include the Natural Resources Defense Council, Friant Water Users Authority, and the U.S. Departments of the Interior and of Commerce. The settlement's two primary goals are to:

- Restore and maintain fish populations in "good condition" in the main stem of the San Joaquin River below Friant Dam to the confluence of the Merced River, including naturally reproducing and self-sustaining populations of salmon and other fish, and
- Reduce or avoid adverse water supply impacts to all of the Friant Division long-term contractors that may result from the Interim Flows and Restoration Flows provided for in the settlement.

The settlement requires specific releases of water from Friant Dam to the confluence of the Merced River, which are designed primarily to meet the various life stage needs for spring- and fall-run Chinook Salmon. The release schedule assumes continuation of the current average Friant Dam release of 116,741 acre-feet, annually, with specific flow requirements depending on the year type. The project was authorized and funded with the passage of San Joaquin River Restoration Settlement Act, part of the Omnibus Public Land Management Act of 2009 (Public Law 111-11). Interim flows began in October, 2009. There are many physical improvements within and near the San Joaquin River that will be undertaken to fully achieve the river restoration goal. The improvements will occur in two separate phases that will focus on a combination of water releases from Friant Dam, as well as structural and channel improvements (Reclamation 2012). This project will improve conditions for aquatic and terrestrial species in the San Joaquin River and the Delta.

This EIS does not address the CVP facilities associated with Millerton Lake, including the Madera and Friant-Kern canals and their service areas, and the San Joaquin River Restoration Program because these facilities are not considered in the consultations related to the 2008 USFWS BO and 2009 NMFS BO.

Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project

The Stockton Deep Water Ship Channel Demonstration Dissolved Oxygen Project is a multiple-year study of the effectiveness of elevating dissolved oxygen (DO) concentrations in the channel. The DO concentrations drop as low as 2 to 3 milligrams per liter (mg/L) during warmer and lower water flow periods in the San Joaquin River. The low DO levels can adversely affect aquatic life including the health and migration behavior of anadromous fish (e.g., salmon). The objective of the study is to maintain DO levels above the minimum recommended levels specified in the 2006 Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River basins, as described in Chapter 6, Surface Water Quality.

The project's full-scale aeration system includes two 200-foot-deep u-tube aeration tubes; two vertical turbine pumps capable of pumping over 11,000 gallons of water each; a liquid-to-gas oxygen supply system; and numerous pieces of ancillary equipment and control systems. The system has been sized to deliver approximately 10,000 pounds of oxygen per day into the Deep Water Ship Channel. The aeration system is anticipated to be operated only when channel DO levels are below the Basin Plan DO water quality objectives (approximately 100 days per year). The project study includes an on-going assessment of DO levels in the channel and vicinity and a study of potential adverse effects of low DO on salmon (DWR 2010a). This project will improve water quality in the central and south Delta as compared to historical conditions.

Grasslands Bypass Project

Reclamation is actively engaged with the Grassland Area Farmers who discharge subsurface agricultural drainage waters through the Grassland Bypass Project, which is a significant source of selenium to the San Joaquin River and to the Delta. Reclamation and the Grassland Area Farmers are continuing to reduce the amount of agricultural drainage water produced in the Grassland Drainage Area, preventing the discharge of this water into local Grassland wetland water supply channels, and improving the quality of water in the San Joaquin River. The Grassland Bypass Project is based upon an agreement between Reclamation and the San Luis and Delta-Mendota Water Authority to use a 28-mile segment of the San Luis Drain to convey agricultural subsurface drainage water from the Grassland Drainage Area to Mud Slough (North), a tributary of the San Joaquin River. An extensive monitoring program by the San Francisco Estuary Institute (2013) continues to document the effectiveness of actions such as source control and other measures being taken by the Grassland Area Farmers. These actions by the Grassland Area Farmers are described in Chapter 2 of SFEI (2013). Briefly, these activities have included the Grassland Bypass Project and the San Joaquin River Improvement Project, formation of a regional drainage entity, newsletters and other communication with the farmers, a monitoring program, using State

Revolving Fund loans for improved irrigation systems, installing and using drainage recycling systems to mix subsurface drainage water with irrigation supplies under strict limits, tiered water pricing and a tradable loads programs.

The purposes and objectives of the Grasslands Bypass Project, 2010–2019, are to: 1) extend the San Luis Drain Use Agreement in order to allow the Grassland Basin Drainers time to acquire funds and develop feasible drainwater treatment technology to meet revised Basin Plan objectives and Waste Discharge Requirements by December 31, 2019; 2) continue the separation of unusable agricultural drainage water discharged from the Grassland Drainage Area from wetland water supply conveyance channels for the period 2010–2019; and 3) facilitate drainage management that maintains the viability of agriculture in the project area and promotes continuous improvement in water quality in the San Joaquin River. All discharges of drainage water from the Grassland Drainage Area into wetlands and refuges have been eliminated. The selenium load discharged from the Grassland Drainage Area has been reduced by 61 percent (from 9,600 pounds to 3,700pounds) and the salt load has been reduced by 39 percent (from 187,300 tons to 113,600 tons). Prior to the project, the monthly mean concentration of selenium in Salt Slough was 16 parts per billion. Since implementation of this project, the concentration has been less than the water quality objective of 2 parts per billion. The drainage water is conveyed to Mud Slough. Grasslands Water District and others are currently evaluating alternative plans to comply with Central Valley Regional Water Quality Control Board water quality objectives for selenium and salinity in the San Joaquin River at the end of this project in 2019. One of the alternatives could be zero discharge with complete recycle of the drainwater to salinity-tolerant crops (Reclamation 2009). This project will improve water quality in the San Joaquin River and the central and south Delta.

Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS)

In 2006, the Central Valley Regional Water Quality Control Board, the SWRCB, and stakeholders began a joint effort to address salinity and nitrate problems in California's Central Valley and adopt long-term solutions that will lead to enhanced water quality and economic sustainability. This effort is referred to as the Central Valley Salinity Alternatives for Long-term Sustainability (CV-SALTS) Initiative. The goal of CV-SALTS is to develop a comprehensive region-wide Salt and Nitrate Management Plan (SNMP) describing a water quality protection strategy that will be implemented through a mix of voluntary and regulatory efforts. The SNMP may include recommendations for numeric water quality objectives, beneficial use designation refinements, and/or other refinements, enhancements, or basin plan revisions.

The SNMP and will serve as the basis for amendments to the three Basin Plans that cover the Central Valley Region (Sacramento River and San Joaquin River Basin Plan, the Tulare Lake Basin Plan and the Sacramento/San Joaquin Rivers Bay-Delta Plan). The basin plan "amendments" will likely establish a comprehensive implementation plan to achieve water quality objectives for salinity (including nitrate) in the Region's surface waters and groundwater. The

SNMP may include recommendations for numeric water quality objectives, beneficial use designation refinements, and/or other refinements, enhancements, or basin plan revisions (CVRWQCB 2015). This project could change water quality and flow patterns in the San Joaquin River.

Municipal Water Supply Projects

Municipal water users in California are required to prepare Urban Water Management Plans (UWMPs) in accordance with the California Urban Water Management Planning Act of 1983. The State Water Conservation Act of 2009 (also known as SBx7-7) required the UWMPs to identify the water demands and water supplies for their service area through the year 2030, and to provide a plan to reduce statewide per capita water use by 20 percent by the year 2020. All of the UWMPs identify conservation measures to reduce water demands by 2020. Many of the UWMPs identify projects that are being planned or implemented to meet water demands in 2030. Water resources projects that have been approved and are being implemented are assumed to be complete by 2030 under the No Action Alternative. There are numerous projects considered in the study area to be included in the No Action Alternative, as described in Appendix 5D, Municipal and Industrial Water Demands and Supplies, including the following major water supply projects.

- Cambria Emergency Water Supply Project desalination project (CCSD 2014).
- Carlsbad Metropolitan Water District water recycling project (Carlsbad MWD 2012)
- Central Basin Municipal Water District Southeast Water Reliability Project (CBMWD 2011).
- City of Los Angeles Department of Water and Power groundwater recharge projects (City of Los Angeles 2011, 2013a).
- City of Oxnard GREAT Program Desalter (City of Oxnard 2013).
- Eastern Municipal Water District water recycling programs (EMWD 2014a, 2014b).
- Fresno Irrigation District groundwater recharge projects (FID 2015).
- Inland Empire Utilities Agency groundwater recharge projects (IEUA 2015).
- Kern County and Antelope Valley-East Kern Water Agency (AVEK 2011).
- Los Angeles County Sanitation Districts expansion of water recycling programs (LACSD 2005).
- San Benito County Water District expansion of water treatment plant to treat CVP water (SBCWD 2014).
- San Diego County Water Authority Carlsbad Seawater Desalination Facility (SDCWA 2014).
- Santa Barbara desalination water treatment plant (KEYT 2015).

- Santa Clara Valley Water District wastewater recycling projects (SCVWD 2012).
- City of Stockton Delta Water Supply Project (City of Stockton 2005).
- Victor Valley Wastewater Reclamation Authority water recycling programs (VVWRA 2015).
- Water Replenishment District Groundwater Reliability Improvement Program and water recycling programs (WRD 2012, 2015).
- West Basin Municipal Water District recycling water programs (WBMWD 2011).
- Western Development and Storage Antelope Valley Water Bank (Reclamation 2010).
- Western Municipal Water District Arlington Desalter Expansion to use saline groundwater (WMD 2015).
- Woodland-Davis Clean Water Agency water treatment plant (WDCWA 2013).

Water Transfer Projects

Water transfer programs have been used historically throughout California, especially among CVP water users to meet both irrigation and municipal water demands either during drought or to replenish stored surface water or groundwater during wet periods (Reclamation 2013b).

Implementation of CVPIA in 1992 facilitated water transfers between CVP water users and between CVP water users and non-CVP water users. The water can be transferred through CVP facilities in a manner that does not harm the operation of the CVP for other users and beneficial uses. CVP facilities also can be used to convey non-CVP water under the Warren Act of 1911. In the first 10 years following adoption of CVPIA, more than 4.3 million acre-feet of water was transferred for agricultural and municipal water uses and more than 396,000 acre-feet was transferred to the DOI for Level 4 Refuge Water Supplies (Reclamation 2004a). Water transfers also occur between the SWP water users and non-SWP water users. SWP facilities can be used to convey the transferred water, including non-SWP water, under DWR conveyance agreements.

Historically, water transfers primarily were in-basin transfers (e.g., Sacramento Valley water seller to Sacramento Valley water user) (Reclamation 2013b; DWR, Reclamation, USFWS and NMFS 2013). However, between 2001 and 2012, water transfers from the Sacramento Valley to the areas located south of the Delta of up to 298,806 acre-feet occurred (not including water transfers under the Environmental Water Account Program in the early 2000s) (DWR, Reclamation, USFWS and NMFS 2013). These transfers occurred in drier years. In 2012 and 2013, the following types of water transfers occurred (DWR and SWRCB 2014).

- Water transfers involving CVP and SWP water:
  - 2012: 47,420 acre-feet of water transfers (43 percent were between agricultural water users, 36 percent were between municipal water users, and 21 percent were between agricultural and municipal water users).
  - 2013: 63,790 acre-feet of water transfers (28 percent were between agricultural water users, and 72 percent were between agricultural and municipal water users).
- Water transfers involving non-CVP and SWP water:
  - 2012: 188,074 acre-feet of water transfers (72 percent were between agricultural water users, 14 percent were from agricultural water users to wildlife refuges, and 14 percent were between agricultural and municipal water users).
  - 2013: 268,370 acre-feet of water transfers (72 percent were between agricultural water users, 1 percent were from agricultural water users to wildlife refuges, and 27 percent were between agricultural and municipal water users).

Until recently, most of the water transfers extended for one or two years. In 2008, one of the first long-term water transfer agreements was approved by the SWRCB for the Lower Yuba River Accord. The plan was designed to protect and enhance fisheries resources in the Lower Yuba River, increase local water supply reliability, provide DWR with increased operational flexibility for protection of Delta fisheries resources, and provide added dry-year water supplies to CVP and SWP water users, as described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations. In 2013, Reclamation approved an overall program for a 25-year period (2014 to 2038) to transfer up to 150,000 acre-feet/year of water from the San Joaquin River Exchange Contractors Water Authority to DOI for refuge water supplies or CVP and SWP water users (Reclamation 2013b). Reclamation is currently evaluating a long-term water transfer program (2015 to 2024) between water sellers in the Sacramento Valley and water users located in the San Francisco Bay Area and south of the Delta (Reclamation 2014b).

Transfer programs generally involve annual crop changes using temporary crop idling or shifting, release of stored water in reservoirs on different patterns for the purchasers' water demands, and/or groundwater substitution (DWR and Reclamation 2014). The transfers must be approved by the CVP and/or SWP if the transfer involves CVP or SWP water or utilizes CVP or SWP facilities. Except for water transfers among CVP water users, water transfers also require approval from the SWRCB. Environmental documentation is required for all water transfers involving CVP and/or SWP water supplies or facilities. Under State law, water transfers cannot result in injury to other legal users of water; unreasonable impacts on fish and wildlife and instream uses; and unreasonable economic or environmental impact on the county in which the transfer water originates.

It is assumed that transfers would continue under the No Action Alternative in a similar manner as have occurred for the past 10 years. It is anticipated that the number of long-term transfer agreements could increase to facilitate annual decisions for water transfers. However, the conditions for each water transfer would be determined on a case-by-case basis.

3.3.2 No Action Alternative

In addition to the common conditions described above, the No Action Alternative also would include existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would not occur by 2030 without implementation of the BOs and implementation of the USACE vegetation management operations along levees for flood management in accordance with policies issued by the USACE in 2009 and 2010.

3.3.2.1 Continued Long-Term Operation of the CVP and SWP Facilities

The actions related to the CVP and SWP operations are described in more detail in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations.

In addition to the operational actions, there are several actions that would not have been implemented by 2030 under the No Action Alternative without implementation of the 2008 USFWS BO and 2009 NMFS BO. These actions have not been fully defined at this time; and therefore, would require future engineering and environmental evaluation prior to implementation. These following actions are assumed to be completed under the No Action Alternative, and the objectives outlined in the 2008 USFWS BO and 2009 NMFS BO are assumed to be achieved by 2030.

- 2009 NMFS BO RPA Action I.2.5, Winter-Run Passage and Re-Introduction Program at Shasta Dam.
- 2009 NMFS BO RPA Action II.3, Structural Improvements for Temperature Management on the American River, including installation of a Folsom Dam temperature control device, methods to transport cold water through Lake Natoma, installation of a temperature control device on the El Dorado Irrigation District intake from Folsom Lake, and development of temperature management decision-support tools.
- 2009 NMFS BO RPA Action II.5, Fish Passage at Nimbus and Folsom Dams.
- 2009 NMFS BO RPA Action II.6, Implement Actions to Reduce Genetic Effects of Nimbus and Trinity River Fish Hatchery Operations.
- 2009 NMFS BO RPA Action III.2.1, Increase and Improve Quality of Spawning Habitat with Addition of 50,000 Cubic Yards of Gravel by 2014 and with a Minimum Addition of 8,000 Cubic Yards per Year for the Duration of the Project Actions on Stanislaus River.

- 2009 NMFS BO RPA Action III.2.2, Conduct Floodplain Restoration and Inundation Flows in Winter or Spring to Inundate Steelhead Juvenile Rearing Habitat on One- to Three-Year Schedule on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.3, Restore Freshwater Migratory Habitat for Juvenile Steelhead by Implementing Projects to Increase Floodplain Connectivity and to Reduce Predation Risk During Migration on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.4, Fish Passage at New Melones, Tulloch, and Goodwin Dams.
- 2009 NMFS BO RPA Action IV.4, Tracy Fish Collection Facility Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 2009 NMFS BO RPA Action IV.4.2 Skinner Fish Collection Facility Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 2009 NMFS BO RPA Action IV.4.3 Tracy Fish Collection Facility and the Skinner Fish Collection Facility Actions to Improve Salvage Monitoring, Reporting and Release Survival Rates.

3.3.2.2 Vegetation Management along Levees

The No Action Alternative also would include vegetation management operations along levees for flood management in accordance with policies issued by the USACE in 2009 and 2010. Historically, the USACE has allowed brush and small trees to be located on the waterside of federal flood management project levees if the vegetation would preserve, protect, and/or enhance natural resources, and/or protect rights of Native Americans, while maintaining the safety, structural integrity, and functionality of the levee (DWR 2011b). After Hurricane Katrina in 2005, the USACE issued a policy and draft policy guidance to remove substantial vegetation from these levees throughout the nation (USACE 2009). This policy requires federally authorized levee systems that have maintenance agreements with the USACE (including Delta levees along the Sacramento and San Joaquin rivers) and other levees that are eligible for the federal Rehabilitation and Inspection Program (Public Law 84-99) to remove vegetation in the following manner.

- Removal of all vegetation from the upper third of the waterside slope of the levee, the top of the levee, landside slope of the levee, or within 15 feet of the toe of the levee on the landside ("toe" is where the levee slope meets the ground surfaces).
- Removal of all vegetation over 2 inches in diameter on the lower two-thirds of the waterside slope of the levee and within 15 feet of the toe of the levee on the waterside along benches above the water surface.

In 2010, the USACE issued a draft policy guidance letter, *Draft Process for Requesting a Variance from Vegetation Standards for Levees and Floodwalls—75 Federal Register 6364-68* (USACE 2010) that included procedures for State and local agencies to request variances on a site-specific basis. DWR has been in

negotiations with USACE to remove vegetation on the upper third of the waterside slope, top, and landside of the levees, and continue to allow vegetation on the lower two-thirds of the waterside slope of the levee and along benches above the water surface (DSC 2011). By 2030, it is anticipated that much of the existing vegetation on the upper third of the waterside slopes, tops, landside slopes, and within 15 feet of the landside toe of the levees would be removed.

3.3.3 Second Basis of Comparison

Numerous comments received during the scoping process and subsequently during preparation of the Draft EIS requested that the No Action Alternative not include the 2008 USFWS BO RPA and 2009 NMFS BO RPA. The comments indicated that the EIS should include a "basis of comparison" for the alternatives that was similar to conditions prior to implementation of the RPAs. Scoping comments also indicated that a "No Action Alternative scenario" without implementation of the RPAs in the 2008 USFWS BO and 2009 NMFS BO could be used to analyze the effects of implementing the RPAs.

Determining an appropriate baseline without the 2008 USFWS BO and 2009 NMFS BO actions and yet continuing to meet all of Reclamation's statutory and regulatory requirements is a difficult task. Simply analyzing a No Action Alternative that is similar to the project description described in either the 2004 Biological Assessment or 2008 Biological Assessment is insufficient, as each was found to jeopardize listed species (the 2004 Biological Assessment by the District Court in 2007, and the 2008 Biological Assessment by USFWS and NMFS). Either of these operations would be inconsistent with Reclamation's existing policy and management direction.

Reclamation has provisionally accepted and implemented the 2008 USFWS BO and 2009 NMFS BO actions; therefore, the No Action Alternative, by definition, must include these actions because they represent a continuation of existing policy and management direction. In response to the comments and to provide a basis for comparison of the effects of implementation of the RPAs (per the District Court's mandate), this EIS includes a "Second Basis of Comparison" that does not include implementation of the RPAs. The Second Basis of Comparison can be used as a basis of comparison for the alternatives that do not include the RPAs. In this way, the action alternatives can be compared against both the No Action Alternative and the Second Basis of Comparison.

3.3.3.1 Continued Long-Term Operation of the CVP and SWP Facilities

The Second Basis of Comparison conditions assume that climate change conditions would have changed between 2015 and 2030. It is anticipated that by 2030, there will be less snowfall over the long-term average conditions and higher mean sea level elevations.

The CVP and SWP operations would be in accordance with water rights permits and licenses issued by the SWRCB and biological opinions issued by the USFWS and NMFS in the early 2000s. The CVP and SWP operations would be closely coordinated through the COA. The ongoing operational management policies of

the CVP and SWP under the Second Basis of Comparison would be similar to the operational assumptions described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations, except for the sections identified as "Implementation of the 2008 USFWS BO [and/or 2009 NMFS BO]" (see Section 3A.4.3.4.8) and New Melones Reservoir operations.

The Second Basis of Comparison includes implementation of existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would occur by 2030 without implementation of the biological opinions (as described in Section 3.3.1.2). The Second Basis of Comparison also includes implementation of future actions not described in the 2009 NMFS BO that would occur by 2030 without implementation of any alternatives considered in this EIS (as described in Section 3.3.1.3).

The Second Basis of Comparison would not include implementation of future actions described in the 2008 USFWS BO and 2009 NMFS BO that would not occur by 2030 without implementation of the biological opinions, as described below, including operations RPA actions and the following actions.

- 2009 NMFS BO RPA Action I.2.5, Winter-Run Passage and Re-Introduction Program at Shasta Dam.
- 2009 NMFS BO RPA Action II.3, Structural Improvements for Temperature Management on the American River, including installation of a Folsom Dam temperature control device, methods to transport cold water through Lake Natoma, installation of a temperature control device on the El Dorado Irrigation District intake from Folsom Lake, and development of temperature management decision-support tools.
- 2009 NMFS BO RPA Action II.5, Fish Passage at Nimbus and Folsom Dams.
- 2009 NMFS BO RPA Action II.6, Implement Actions to Reduce Genetic Effects of Nimbus and Trinity River Fish Hatchery Operations.
- 2009 NMFS BO RPA Action III.2.1, Increase and Improve Quality of Spawning Habitat with Addition of 50,000 Cubic Yards of Gravel by 2014 and with a Minimum Addition of 8,000 Cubic Yards per Year for the Duration of the Project Actions on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.2, Conduct Floodplain Restoration and Inundation Flows in Winter or Spring to Inundate Steelhead Juvenile Rearing Habitat on One- to Three-Year Schedule on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.3, Restore Freshwater Migratory Habitat for Juvenile Steelhead by Implementing Projects to Increase Floodplain Connectivity and to Reduce Predation Risk During Migration on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.4, Fish Passage at New Melones, Tulloch, and Goodwin Dams.

- 2009 NMFS BO RPA Action IV.4, Tracy Fish Collection Facility Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 2009 NMFS BO RPA Action IV.4.2 Skinner Fish Collection Facility Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 2009 NMFS BO RPA Action IV.4.3 Tracy Fish Collection Facility and the Skinner Fish Collection Facility Actions to Improve Salvage Monitoring, Reporting and Release Survival Rates.

3.3.3.2 Vegetation Management Along Levees

The Second Basis of Comparison includes vegetation management operations along levees for flood management in accordance with policies issued by the USACE in 2009 and 2010.

3.3.3.3 New Melones Reservoir Operations

Under the Second Basis of Comparison, operations of New Melones Reservoir would be the same as under the No Action Alternative for flood management, water quality, San Joaquin River base flows and pulse flows at Vernalis, and water supply. Because the Second Basis of Comparison represents regulatory environment without the 2008 USFWS and 2009 NMFS BOs, fishery flows would be consistent with the 1997 New Melones Interim Plan of Operations (IPO) without implementation of the Vernalis Adaptive Management Program (VAMP), as described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations.

3.4 Development of Reasonable Alternatives

The National Environmental Policy Act (NEPA) regulations and DOI NEPA regulations (43 CFR Section 46.415(b)) require an EIS to include a range of reasonable alternatives that meet the purpose and need of the proposed action, and address one or more significant issues related to the proposed action.

The DOI NEPA regulations also state that the lead agencies should include a consensus-based alternatives consistent with the purpose and need of the proposed project that are proposed by participating persons, organizations, or communities who may be interested in or affected by the proposed project when one exists. No alternatives or alternative concepts submitted to Reclamation during preparation of this EIS were identified as consensus-based.

The range of alternatives was developed for this EIS through the identification of screening criteria based upon the purpose of the action; comparison of alternative concepts identified by Reclamation, stakeholders, and agencies to the screening criteria; and review of the identified range of alternatives to determine if the range of alternatives addresses the significant issues.

3.4.1 Application of Screening Criteria to the Range of Alternative Concepts

The screening criteria developed for this EIS is based upon the purpose of the action, as described in Chapter 2, Purpose and Need for the Action. The purpose of the action is:

- To continue the operation of the CVP, in coordination with operation of the SWP, for the authorized purposes, in a manner that:
  - Is similar to historic operational parameters with certain modifications;
  - Is consistent with Federal Reclamation law; other Federal laws; Federal permits and licenses; State of California water rights, permits, and licenses; and
  - Enables Reclamation and DWR to satisfy their contractual obligations to the fullest extent possible.

A number of alternative concepts were identified during the scoping process and through meetings with stakeholders and agencies during preparation of this EIS. These concepts were compared to the purpose of the action, as summarized in Table 3.1. Most of the concepts were incorporated into alternatives to be evaluated in detail in this EIS. Further discussion of concepts not included in the alternatives evaluated in detail in this EIS is presented in Section 3.4.8, Alternatives Considered but Not Evaluated in Detail.

Table 3.1 Application of Screening Criteria to Alternative Concepts Identified for Consideration in the EIS

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 1. CVP and SWP Operations without actions defined in the 2008 USFWS BO RPA and 2009 NMFS BO RPA	Possibly	Yes	Yes, included in Alternatives 1, 3, and 4
Concept 2. Modify actions defined in the 2008 USFWS BO RPA and 2009 NMFS BO RPA in a manner that would increase CVP and SWP deliveries	Possibly	Yes	Yes, included in Alternatives 1, 3, and 4
Concept 3. Modify actions defined in the 2008 USFWS BO RPA and 2009 NMFS BO RPA in a manner that would reduce reverse flows and increase Delta outflow in the spring.	Possibly	Yes	Yes, included in Alternative 5

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 4. Modify actions defined in the 2008 USFWS BO RPA and 2009 NMFS BO RPA in a manner that would increase primary productivity and flood supply for aquatic resources	Possibly	Yes	Yes, included in Alternatives 1, 3, 4, and 5
Concept 5. Modify actions defined in the 2008 USFWS BO RPA and 2009 NMFS BO RPA in a manner that would modify the triggers for OMR criteria to protect Delta Smelt as follows: a) Reduce OMR criteria to a level between -5,000 cfs and -3,500 cfs only when appropriate based on analysis of turbidity levels and normalized salvage data in the south Delta b) Reduce OMR to no more negative than -5,000 cfs when more than 25 percent of the Delta Smelt collected in the spring kodiak or 20 mm trawl are located in the south Delta or the adult cumulative salvage index immediately preceding spawning is high; lift this restriction if Qwest is >12,000 cfs and/or secchi depth in the south Delta is >85 cm Do not implement RPA actions in the 2008 USFWS BO or 2009 NMFS BO	Possibly	Yes	Yes, included in Alternative 3

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 6. Modify actions defined in the 2009 NMFS BO RPA related to the Interim Criteria for the San Joaquin River Inflow:Export ratio as follows for April 1 through May 30: Flows in San Joaquin River at Vernalis (7-day running average shall not be less than 7 percent of the target requirement) shall be based on the New Melones Index (as described in 2009 NMFS BO RPA Action IV.2.1) as follows for January 1 through June 15: a) If the Index is 999 TAF or less - no minimum flow requirement b) If the Index is 1000-1399 TAF - minimum flow is the greater of the SWRCB D-1641 requirement or 1500 cfs c) If the Index is 1400-1999 TAF - minimum flow is the greater of the SWRCB D-1641 requirement or 3000 cfs d) If the Index is 2000-2499 TAF - minimum flow is 4500 cfs e) If the Index is above 2499 TAF - minimum flow is 6000 cfs Do not implement RPA actions in the 2008 USFWS BO or 2009 NMFS BO	Possibly	Yes	No, this criteria is not implementable following the completion of the Vernalis Adaptive Management Program. Other flow criteria for the San Joaquin River at Vernalis are included in the range of alternatives, however this concept is informed the development of other alternative concepts evaluated in this EIS.

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 7. Implement predator control programs for Black Bass, Striped Bass, and Pikeminnow to protect salmonids and Delta Smelt as follows: a) Black Bass catch limit changed to allow catch of 12-inch fish with a bag limit of 10 b) Striped Bass catch limit changed to allow catch of 12-inch fish with a bag limit of 5 c) Establish a Pikeminnow sport-fishing reward program with a 8-inch limit at $2/fish	Yes	Yes	Yes, included in Alternatives 3 and 4
Concept 8. Restore or create at least 10,000 acres of tidally influenced seasonal or perennial wetlands. Do not implement other wetlands restoration RPA actions in the 2008 USFWS BO or 2009 NMFS BO	Yes	Yes	Yes, included in Alternatives 3 and 4

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 9. Establish a trap and haul program for juvenile salmonids entering the Delta from the San Joaquin River in March through June as follows: a) Begin operation of downstream migrant fish traps upstream of the Head of Old River on the San Joaquin River b) "Barge" all captured juvenile salmonids through the Delta, release at Chipps Island. c) Tag subset of fish in order to quantify effectiveness of the program d) Attempt to capture 10 percent to 20 percent of outmigrating juvenile salmonids	Yes	Yes	Yes, included in Alternatives 3 and 4
Concept 10. Work with Pacific Fisheries Management Council, CDFW, and NMFS to minimize harvest mortality of natural origin Central Valley Chinook Salmon, including fall-run Chinook Salmon, by evaluating and modifying ocean harvest for consistency with Viable Salmonid Population Standards; including harvest management plan to show that abundance, productivity, and diversity (age-composition) are not appreciably reduced	Maybe	Yes	Yes, included in Alternative 3

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 11. Work with Pacific Fisheries Management Council, CDFW, and NMFS to impose salmon harvest restrictions to reduce by-catch of winter-run and spring-run Chinook Salmon to less than 10 percent of age-3 cohort in all years	Maybe	Yes	Yes, included in Alternative 4
Concept 12. Limiting floodplain development to protect salmonids and Delta Smelt by implementing the following actions: a) Incorporate guidance into flood hazard mapping to help communities comply with the ESA b) Require communities to demonstrate ESA compliance for all flood plain map revisions c) Prioritize consideration of ESA listed species and critical habitat when selecting flood insurance studies d) Develop and implement floodplain management criteria e) Refine community rating system to provide credits for natural and beneficial functions f) Prohibit new development and substantial improvements to existing development within any designated floodway or within 170 feet of the ordinary high water line of any floodway	Possibly	Yes	Yes, included in Alternative 4

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 13. Do not implement USACE requirements for vegetation on levees, and instead bar removal of vegetation from levees, require planting of trees and shrubs on levees, and armor levees with vegetation, woody material, and root re-enforcement material instead of riprap	Possibly	Yes	Yes, included in Alternative 4
Concept 14. Advance the timing of upgrades at the Sacramento Regional Wastewater Treatment Plant to 2017; and implement advanced treatment technologies at the Fairfield-Suisun Sewer District treatment plant to reduce nutrients in the effluent	Yes	Yes	No, these actions are under construction and will be complete by 2030, per the requirements of the SWRCB and the related Regional Water Quality Control Boards
Concept 15. Expand the current period of time for water transfers addressed in the operations consulted on in the 2008 USFWS BO and 2009 NMFS BO from July through September to year-round	Possibly	Yes	Yes, included in Alternative 4
Concept 16. Include measures to support Federal and state fish-doubling goals, including the goals of CVPIA	Yes	Yes	Yes, included in Alternatives 1, 2, 3, 4, and 5 as part of ongoing implementation of CVPIA
Concept 17. Operate the CVP and SWP to avoid “dead-pool” conditions in Shasta Lake, Folsom Lake, and Lake Oroville	Possibly	Yes	Yes, included in Alternatives 1, 2, 3, 4, and 5 as part of overall CVP and SWP operations

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 18. Change CVP water operations to meet all in-basin water demands for the Trinity, Sacramento, American, and Stanislaus rivers watersheds before meeting other CVP water demands	No	Yes	No, this concept would not be consistent with the purpose for the action
Concept 19. Implement operations of the New Melones Reservoir in accordance with the 2012 Oakdale Irrigation District and South San Joaquin Irrigation District Operations Plan	Possibly	Yes	Yes, included in Alternative 3
Concept 20. Reduce reliance of the CVP and SWP water users on water exported from the Delta through development of regional and local water supplies	Possibly	Yes	Yes, included in Alternatives 1, 2, 3, 4, and 5 as part of overall statewide water operations
Concept 21. Changes to methods used to monitor and predict OMR flow criteria, including exclusion of Contra Costa Water District diversions from the calculations	Possibly	Maybe	No, this EIS analyzes overall operational concepts for the CVP and SWP. Specific methods to monitor and predict operations will be developed under separate efforts by Reclamation
Concept 22. Prioritize use of CVPIA restoration funds within watersheds in accordance with the amount of restoration funds collected in each watershed (e.g., the most funds would be highest in the watershed that generates the highest CVPIA restoration fund based upon water sales)	No	No	No, would not be consistent with CVPIA

Alternative Concept	Consistent with Purpose for the Action	Addresses One or More Significant Issues	Include in One or More of the Alternatives Evaluated in the Draft EIS
Concept 23. Completely cease operations of the CVP and SWP facilities	No	No	No, this concept would not be consistent with the purpose for the action

Note:
Concepts identified as "possibly consistent with the purpose of the action" would require development of additional details and evaluation to determine if the concept is consistent with the stated purpose for the action, as described in Chapter 2, Purpose and Need for the Action. Concepts identified as "possibly consistent with the purpose of the action" were integrated into one or more of the alternatives evaluated in this EIS.

Based upon the comparison of screening criteria to the alternative concepts developed by Reclamation 17 of the 23 alternative concepts would be included in one or more of the alternatives evaluated in this EIS. The next step in the development of the alternatives is to combine the alternative concepts into specific alternatives and determine if the range of alternatives is adequate to address the significant issues in implementing a program that supports the purpose of the action.

3.4.2 Identification of Alternatives

The 17 alternative concepts were compiled into five alternatives. Development of the alternatives was informed by comments received about the alternative concepts. For example, numerous comments were received to evaluate an alternative that included assumptions identical to the Second Basis of Comparison assumptions in which the 2008 USFWS BO and 2009 NMFS BO would not be implemented. One of the scoping comments identified specific alternatives that included several alternative concepts included in Table 3.1; however, some of the specified alternative concepts were not consistent with assumptions for the Year 2030 and were modified to reflect implementable concepts.

Several of the alternative concepts are consistent with the No Action Alternative assumptions related to actions that would have occurred with or without implementation of the 2008 USFWS BO and 2009 NMFS BO. Therefore, the following alternative concepts are included under the No Action Alternative, Second Basis of Comparison, and all other alternatives.

- Alternative Concept 8 to restore or create at least 10,000 acres of tidally-influenced seasonal or perennial wetlands.
- Alternative Concept 16 to support the fish-doubling goals under CVPIA and state ecosystem restoration programs.
- Alternative Concept 17 to operate the CVP and SWP to avoid dead-pool conditions in the CVP and SWP reservoirs, to the extent possible based upon hydrologic conditions.

- Alternative Concept 20 to increase regional and local water supplies that could be used when CVP and SWP water supplies are reduced due to hydrologic and regulatory restrictions.

Using these concepts, the alternative concepts were combined into Alternatives 1 through 5 in a manner to avoid conflicts between concepts within an alternative.

The range of alternatives in the EIS includes the No Action Alternative and Alternatives 1 through 5, as described below.

3.4.3 No Action Alternative

The No Action Alternative, the Preferred Alternative, is described in Section 3.3.2, of this chapter.

3.4.4 Alternative 1

Alternative 1 was created because many comments requested an alternative that reflected conditions without implementation of the 2008 USFWS BO and the 2009 NMFS BO. Since the Second Basis of Comparison is not a true alternative, in accordance with NEPA guidelines, Reclamation could not select Second Basis of Comparison as a preferred alternative. Therefore, Alternative 1 was defined as being identical to the Second Basis of Comparison, as defined in Section 3.3.2.

3.4.5 Alternative 2

Alternative 2 was first included in the Notice of Intent and identified as an initial proposed action that included the operational actions of the 2008 USFWS BO and 2009 NMFS BO. Alternative 2 does not include RPA actions that would require future studies and environmental documentation to define recommended actions (generally, structural actions).

The definition of Alternative 2 is based upon the following assumptions that are briefly described below.

- Continued long-term operation of the CVP and SWP in accordance with ongoing management policies, criteria, and regulations, including water right permits and licenses issued by the SWRCB and implementation of the 2008 USFWS BO and 2009 NMFS BO, as described under the No Action Alternative.
- Implementation of existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would occur by 2030 without implementation of the BOs, as described above for the No Action Alternative in Sections 3.4.1.2 and 3.4.1.3.
- Implementation of future actions not described in the 2009 NMFS BO that would occur by 2030 without implementation of any alternatives considered in this EIS.

Alternative 2 conditions assume that climate change conditions would have changed between 2015 and 2030. It is anticipated that by 2030, there will be less

snowfall over the long-term average conditions and higher mean sea level elevations.

Alternative 2 would not include actions in the 2008 USFWS BO and 2009 NMFS BO that have not been fully defined at this time; and therefore, would require future engineering and environmental evaluation prior to implementation. These following actions are not included in Alternative 2.

- 2009 NMFS BO RPA Action I.2.5, Winter-Run Passage and Re-Introduction Program at Shasta Dam.
- 2009 NMFS BO RPA Action II.3, Structural Improvements for Temperature Management on the American River.
- 2009 NMFS BO RPA Action II.5, Fish Passage at Nimbus and Folsom Dams.
- 2009 NMFS BO RPA Action II.6, Implement Actions to Reduce Genetic Effects of Nimbus and Trinity River Fish Hatchery Operations.
- 2009 NMFS BO RPA Action III.2.1, Increase and Improve Quality of Spawning Habitat with Addition of Gravel.
- 2009 NMFS BO RPA Action III.2.2, Conduct Floodplain Restoration and Inundation Flows in Winter or Spring to Inundate Steelhead Juvenile Rearing Habitat on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.3, Restore Freshwater Migratory Habitat for Juvenile Steelhead on Stanislaus River.
- 2009 NMFS BO RPA Action III.2.4, Fish Passage at New Melones, Tulloch, and Goodwin Dams.
- 2009 NMFS BO RPA Action IV.4, Tracy Fish Collection Facility Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 2009 NMFS BO RPA Action IV.4.2 Skinner Fish Collection Facility Improvements to Reduce Pre-Screen Loss and Improve Screening Efficiency.
- 2009 NMFS BO RPA Action IV.4.3 Tracy Fish Collection Facility and the Skinner Fish Collection Facility Actions to Improve Salvage Monitoring, Reporting and Release Survival Rates.

3.4.5.1 Continued Long-Term Operation of the CVP and SWP Facilities

The CVP and SWP operations and ongoing operational management policies of the CVP and SWP under Alternative 2 would be identical to the operational assumptions described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations.

3.4.5.2 Actions in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Actions included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred with or without the BOs, would be identical under Alternative 2 as under the No Action Alternative and the Second Basis of Comparison.

3.4.5.3 Future Actions not included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Alternative 2 also includes assumptions unrelated to implementation of the 2008 USFWS BO and 2009 NMFS BO, including: climate change and sea level rise; development of lands in accordance with general plans in areas served by CVP and SWP water supplies; and reasonable and foreseeable projects that have been approved and are anticipated to be implemented by 2030. These items included in Alternative 2 are identical as under the No Action Alternative and the Second Basis of Comparison.

3.4.5.4 Vegetation Management Along Levees

Alternative 2 includes vegetation management operations along levees for flood management in accordance with policies issued by the USACE in 2009 and 2010.

3.4.6 Alternative 3

Alternative 3 was developed based upon a scoping comment from the Coalition for a Sustainable Delta which identified "RPA Alternative 1," and a scoping comment received from Oakdale Irrigation District (OID) and South San Joaquin Irrigation District (SSJID) (included in the Scoping Report in Appendix 23A of this EIS). The definition of Alternative 3 is based upon the following assumptions that are briefly described below.

- Continued long-term operation of the CVP and SWP in accordance with ongoing management policies, criteria, and regulations, including water right permits and licenses issued by the SWRCB; without the operational requirements of the 2008 USFWS BO and the 2009 NMFS BO; plus implementation of the 2012 operations plan for New Melones Reservoir proposed by OID and SSJID.
- Implementation of actions described in the Coalition for a Sustainable Delta scoping comment letter related to "RPA Alternative 1."
- Implementation of existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would occur by 2030 without implementation of the BOs, as described above for the No Action Alternative in Sections 3.4.1.2 and 3.4.1.3.
- Implementation of future actions not described in the 2009 NMFS BO that would occur by 2030 without implementation of any alternatives considered in this EIS.

Alternative 3 would not include implementation of actions described in the 2008 USFWS BO and 2009 NMFS BO that would not occur by 2030 without implementation of the BOs.

Alternative 3 conditions assume that climate change conditions would have changed between 2015 and 2030. It is anticipated that by 2030, there will be less snowfall over the long-term average conditions and higher mean sea level elevations.

3.4.6.1 Continued Long-Term Operation of the CVP and SWP Facilities

The CVP and SWP operations and ongoing operational management policies of the CVP and SWP under Alternative 3 would be similar to the operational assumptions under the Second Basis of Comparison with the following changes to water demand assumptions, OMR criteria, and operations of New Melones Reservoir to meet SWRCB D-1641 flow requirements on the San Joaquin River at Vernalis.

Alternative 3 would include additional demands for American River water supplies as compared to the No Action Alternative or Second Basis of Comparison. The additional demands would provide water supplies of up to 17 TAF/year under a Warren Act Contract for El Dorado Irrigation District and 15 TAF/year under a long-term CVP water service contract with El Dorado County Water Agency. During the review of the numerical modeling analyses used in this EIS, it was discovered that the demands for these El Dorado Irrigation District and the El Dorado County Water Agency contracts were not included in the CalSim II modeling analysis for Alternative 3 as presented in Chapters 5 through 21. A sensitivity analysis using the CalSim II model to compare the results of the analysis with and without these demands is presented in Appendix 5B of this EIS for Alternative 3. The results of the sensitivity analysis have been used in conjunction with the results presented in Chapters 5 through 21 to analyze the effects of including the CVP water service contract for El Dorado County Water Agency in Alternative 3.

3.4.6.1.1 Old and Middle River Criteria

The OMR flow criteria under Alternative 3 are based on concepts addressed in the 2008 USFWS BO and 2009 NMFS BO related to adaptive restrictions for temperature, turbidity, salinity, and presence of Delta Smelt. The OMR flow criteria in the Alternative 3 are similar to those of the No Action Alternative, as described in Appendix 3A, No Action Alternative: Central Valley Project and State Water Project Operations, with the exception of the following changes:

- Reduce OMR criteria to a level between -5,000 cfs and -3,500 cfs only when appropriate based on analysis of turbidity levels and normalized salvage data in the south Delta
- Reduce OMR to no more negative than -5,000 cfs when more than 25 percent of the Delta Smelt collected in the spring kodiak or 20 mm trawl are located in the south Delta or the adult cumulative salvage index immediately preceding

spawning is high; lift this restriction if Qwest is >12,000 cfs and/or secchi depth in the south Delta is >85 cm

For the purpose of quantitative analysis in this EIS, the numerical model represented this concept with the following assumptions.

- Action 1 that protects the pre-spawning adult Delta Smelt from entrainment is modified to limit exports such that the average daily OMR flow is no more negative than -3,500 cfs for a total duration of 14 days, with a 5-day running average no more negative than -4,375 cfs (within 25 percent of the monthly criteria).
- Action 2 that protects adult Delta Smelt within the Delta from entrainment is modified to limit exports so that the average daily OMR flow is no more negative than -3,500 or -7,500 cfs depending on the previous month's ending X2 location (-3,500 cfs if X2 is east of Roe Island, or -7,500 cfs if X2 is west of Roe Island), with a 5-day running average within 25 percent of the monthly criteria (no more negative than -4,375 cfs if X2 is east of Roe Island, or -9,375 cfs if X2 is west of Roe Island).
- Action 3 that protects larval and juvenile Delta Smelt from entrainment is modified to limit exports so that the average daily OMR flow is no more negative than -1,250, -3,500, or -7,500 cfs, depending on the previous month's ending X2 location (-1,250 cfs if X2 is east of Chipps Island, -7,500 cfs if X2 is west of Roe Island, or -3,500 cfs if X2 is between Chipps and Roe Island, inclusively), with a 5-day running average within 25 percent of the monthly criteria (no more negative than -1,562 cfs if X2 is east of Chipps Island, -9,375 cfs if X2 is west of Roe Island, or -4,375 cfs if X2 is between Chipps and Roe Island).
- Temporal off-ramp for Action 3 is assumed to occur no later than June 15 (changed from June 30).
- An off-ramp based on QWest (westerly flow on the San Joaquin River past Jersey Point calculated as a combination of San Joaquin River at Blind Point, Three Mile Slough and Dutch Slough) is assumed. If Qwest is greater than 12,000 cfs, then the Action 3 is discontinued. Because Action 2 is defined to occur between Actions 1 and 3, the Qwest off-ramp also results in discontinuation of Action 2 if it happens before Action 3 is triggered. In monthly CalSim II modeling, previous month's QWest value is used for determining the off-ramp, therefore if the off-ramp occurs within the previous month, actions in that previous month are assumed to continue until the end of the month.

3.4.6.1.2 New Melones Operations Criteria

Alternative 3 assumes that the flood control operations for the New Melones Reservoir would be the same as under the No Action Alternative. However, New Melones Reservoir would be operated for different fishery flows, water quality flows, and San Joaquin River base flows and pulse flows at Vernalis.

Fishery

In the Alternative 3 simulation, fishery flows are modeled per the OID and SSJID 2012 operations proposal, as summarized in Tables 3.2 through 3.4. These flows include an outmigration pulse flow from April 1 through May 15. Total annual volume dedicated to fishery flows vary from 174 to 318 TAF depending on the hydrologic conditions defined by the New Melones water supply forecast (the end-of-February New Melones Storage, plus the March - September forecast of inflow to the reservoir).

Table 3.2 Annual Fishery Flow Allocation in New Melones

Melones Water Supply Forecast (TAF)	Fishery Base Flows (TAF)
0 to 1,800	174
1,801 to 2,500	235
>2,500	318

Table 3.3 Monthly "Base" Flows for Fisheries Purposes Based on the Annual Fishery Volume

Annual Fishery Flow Volume (TAF)	Monthly Fishery Base Flows (cfs)											
	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
235	252	300	300	150	173	200	200	200	200	200	200	200
318	300	300	300	300	300	300	1,500	850	200	200	200	200

Table 3.4 April 1 through May 31 "Pulse" Flows for Fisheries Purposes Based on the Annual Fishery Volume

Melones Water Supply Forecast (TAF)	Fishery Pulse Flows (CFS) April 1 –May 31
0 to 1,800	750
1,801 to 2,500	1,500
>2,500	1,500

Water Quality

Alternative 3 assumes that no water is released from New Melones Reservoir to meet the SWRCB D-1641 water quality criteria in the San Joaquin River. Water is released to meet the SWRCB D-1422 DO criteria; however, the compliance point is moved from Ripon to the Orange Blossom Bridge under the Alternative 3.

Bay-Delta Flows

Alternative 3 assumes that no water is released from New Melones Reservoir to meet the SWRCB D-1641 Bay-Delta flow requirements on the San Joaquin River at Vernalis for base flows or pulse flows.

3.4.6.2 Actions Related to Predation Control, Wetlands Restoration, Juvenile Salmonid Trap and Haul Program, and Chinook Salmon Ocean Harvest

Alternative 3 includes the following actions as described in "RPA Alternative 1" in the Coalition for a Sustainable Delta scoping comment.

- Implement predator control programs for Black Bass, Striped Bass, and Pikeminnow to protect salmonids and Delta Smelt as follows:
  - Black Bass catch limit changed to allow catch of 12-inch fish with a bag limit of 10
  - Striped Bass catch limit changed to allow catch of 12-inch fish with a bag limit of 5
  - Establish a Pikeminnow sport-fishing reward program with a 8-inch limit at $2/fish
- Restore or create at least 10,000 acres of tidally influenced seasonal or perennial wetlands. These conditions are the same as under the No Action Alternative and Second Basis of Comparison.
- Establish a trap and haul program for juvenile salmonids entering the Delta from the San Joaquin River in March through June as follows:
  - Begin operation of downstream migrant fish traps upstream of the Head of Old River on the San Joaquin River
  - "Barge" all captured juvenile salmonids through the Delta, release at Chipps Island.
  - Tag subset of fish in order to quantify effectiveness of the program
  - Attempt to capture 10 percent to 20 percent of out-migrating juvenile salmonids
- Work with Pacific Fisheries Management Council, CDFW, and NMFS to minimize harvest mortality of natural origin Central Valley Chinook Salmon, including fall-run Chinook Salmon, by evaluating and modifying ocean harvest for consistency with Viable Salmonid Population Standards; including harvest management plan to show that abundance, productivity, and diversity (age-composition) are not appreciably reduced.

Any changes in harvest limitations would require review and approval from the California Fish and Game Commission; and for some species, the Pacific Fisheries Management Council.

3.4.6.3 Actions in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Actions included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred with or without the BOs, would be identical under Alternative 3 as under the No Action Alternative and the Second Basis of Comparison.

3.4.6.4 Future Actions not included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Alternative 3 also includes assumptions unrelated to implementation of the 2008 USFWS BO and 2009 NMFS BO, including: climate change and sea level rise; development of lands in accordance with general plans in areas served by CVP and SWP water supplies; and reasonable and foreseeable projects that have been approved and are anticipated to be implemented by 2030. These items included in Alternative 3 are identical as under the No Action Alternative and the Second Basis of Comparison.

3.4.6.5 Vegetation Management Along Levees

Alternative 3 includes vegetation management operations along levees for flood management in accordance with policies issued by the USACE in 2009 and 2010.

3.4.7 Alternative 4

Alternative 4 was developed based upon a scoping comment from the Coalition for a Sustainable Delta which identified "RPA Alternative 2" (included in the Scoping Report in Appendix 23A of this EIS). The definition of Alternative 4 is based upon the following assumptions that are briefly described below.

- Continued long-term operation of the CVP and SWP in accordance with ongoing management policies, criteria, and regulations, including water right permits and licenses issued by the SWRCB; without the operational requirements of the 2008 USFWS BO and the 2009 NMFS BO, as described under Second Basis of Comparison.
- Implementation of actions described in the Coalition for a Sustainable Delta scoping comment letter related to "RPA Alternative 2."
- Implementation of existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would occur by 2030 without implementation of the BOs, as described above for the No Action Alternative in Sections 3.4.1.2 and 3.4.1.3.
- Implementation of future actions not described in the 2009 NMFS BO that would occur by 2030 without implementation of any alternatives considered in this EIS.

Alternative 4 would not include implementation of actions described in the 2008 USFWS BO and 2009 NMFS BO that would not occur by 2030 without implementation of the BOs.

The "RPA Alternative 2" also included a provision to "Advance the timing of upgrades at the Sacramento Regional Wastewater Treatment Plant to 2017; and implement advanced treatment technologies at the Fairfield-Suisun Sewer District treatment plant to reduce nutrients in the effluent." However, both of these actions would be complete by 2030, the study period considered in this EIS. The Sacramento Regional Wastewater Treatment Plant must comply with the National Pollutant Discharge Elimination System permit issued on December 9, 2010 by the Central Valley Regional Water Quality Control Board to reduce nutrients in the effluent discharged to the Sacramento River by 2020 (SRCSD 2012). The Fairfield Suisun Sewer District must comply with similar permit conditions issued by the San Francisco Bay Regional Water Quality Control Board in March 2015 (SFRRWQCB 2015). Because the Environmental Consequences analysis in this EIS is conducted as a "snapshot" in time at 2030, inclusion of a provision to require compliance with the discharge requirements prior to 2020 could not be evaluated.

Alternative 4 conditions assume that climate change conditions would have changed between 2015 and 2030. It is anticipated that by 2030, there will be less snowfall over the long-term average conditions and higher mean sea level elevations.

3.4.7.1 Continued Long-Term Operation of the CVP and SWP Facilities

The ongoing operational management policies of the CVP and SWP under Alternative 4 would be identical to operations described under the Second Basis of Comparison.

3.4.7.2 Actions Related to Floodplain Protection, Levee Vegetation, Predation Control, Wetlands Restoration, Juvenile Salmonid Trap and Haul Program, and Chinook Salmon Ocean Harvest

Alternative 4 includes the following actions as described in "RPA Alternative 1" in the Coalition for a Sustainable Delta scoping comment.

- Limiting floodplain development to protect salmonids and Delta Smelt by implementing the following actions:
  - Incorporate guidance into flood hazard mapping to help communities comply with the ESA
  - Require communities to demonstrate ESA compliance for all flood plain map revisions
  - Prioritize consideration of ESA listed species and critical habitat when selecting flood insurance studies
  - Develop and implement floodplain management criteria
  - Refine community rating system to provide credits for natural and beneficial functions

  - Prohibit new development and substantial improvements to existing development within any designated floodway or within 170 feet of the ordinary high water line of any floodway

- Modify the requirements of the USACE related to removal of vegetation on levees. USACE requires removal of vegetation on levees. DWR and USACE have been working to develop a plan that would allow for the continuation of existing vegetation on levees until levee maintenance or repairs requires removal of the vegetation. Under Alternative 4, trees and shrubs would be planted along the levees; and vegetation, woody material, and root re-enforcement material would be installed on the levees instead of riprap for erosion protection.
- Implement predator control programs for Black Bass, Striped Bass, and Pikeminnow to protect salmonids and Delta Smelt as follows:
  - Black Bass catch limit changed to allow catch of 12-inch fish with a bag limit of 10
  - Striped Bass catch limit changed to allow catch of 12-inch fish with a bag limit of 5
  - Establish a Pikeminnow sport-fishing reward program with a 8-inch limit at $2/fish
- Restore or create at least 10,000 acres of tidally influenced seasonal or perennial wetlands. These conditions are the same as under the No Action Alternative and Second Basis of Comparison.
- Establish a trap and haul program for juvenile salmonids entering the Delta from the San Joaquin River in March through June as follows:
  - Begin operation of downstream migrant fish traps upstream of the Head of Old River on the San Joaquin River
  - "Barge" all captured juvenile salmonids through the Delta, release at Chipps Island.
  - Tag subset of fish in order to quantify effectiveness of the program
  - Attempt to capture 10 percent to 20 percent of outmigrating juvenile salmonids
- Work with Pacific Fisheries Management Council, CDFW, and NMFS to impose salmon harvest restrictions to reduce by-catch of winter-run and spring-run Chinook Salmon to less than 10 percent of age-3 cohort in all years.

Any changes in harvest limitations would require review and approval from the California Fish and Game Commission; and for some species, the Pacific Fisheries Management Council.

3.4.7.3 Actions in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Actions included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred with or without the BOs, would be identical under Alternative 4 as under the No Action Alternative and the Second Basis of Comparison.

3.4.7.4 Future Actions not included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Alternative 4 also includes assumptions unrelated to implementation of the 2008 USFWS BO and 2009 NMFS BO, including: climate change and sea level rise; development of lands in accordance with general plans in areas served by CVP and SWP water supplies; and reasonable and foreseeable projects that have been approved and are anticipated to be implemented by 2030. These items included in Alternative 4 are identical as under the No Action Alternative and the Second Basis of Comparison.

3.4.8 Alternative 5

Alternative 5 is similar to the No Action Alternative with positive OMR criteria in April and May which causes increased Delta outflow; and use of the SWRCB D-1641 pulse flow at Vernalis. Alternative 5 was developed considering comments from environmental interest groups during the scoping process. Alternative 5 also provides another method to operate the New Melones Reservoir as compared to the other alternatives.

The definition of Alternative 5 is based upon the following assumptions that are briefly described below.

- Continued long-term operation of the CVP and SWP in accordance with ongoing management policies, criteria, and regulations, including water right permits and licenses issued by the SWRCB; and the operational requirements of the 2008 USFWS BO and the 2009 NMFS BO.
- Implementation of existing and future actions described in the 2008 USFWS BO and 2009 NMFS BO that would occur by 2030 without implementation of the BOs, as described above for the No Action Alternative in Sections 3.4.1.2 and 3.4.1.3.
- Implementation of actions described in the 2008 USFWS BO and 2009 NMFS BO that would not occur by 2030 without implementation of the BOs.
- Implementation of future actions not described in the 2009 NMFS BO that would occur by 2030 without implementation of any alternatives considered in this EIS.

Alternative 5 conditions assume that climate change conditions would have changed between 2015 and 2030. It is anticipated that by 2030, there will be less snowfall over the long-term average conditions and higher mean sea level elevations.

3.4.8.1 Continued Long-Term Operation of the CVP and SWP Facilities

The CVP and SWP operations and ongoing operational management policies of the CVP and SWP under Alternative 5 would be similar to the operational assumptions under the No Action Alternative with the following changes to water demand assumptions, OMR criteria, and operations of New Melones Reservoir to meet SWRCB D-1641 flow requirements on the San Joaquin River at Vernalis.

3.4.8.1.1 Water Demands

Alternative 5 would include additional water demands for users of water from the American River watershed as compared to the No Action Alternative or Second Basis of Comparison. Under Alternative 5, up to 17 TAF/year would be provided to the El Dorado Irrigation District under a Warren Act Contract to allow water to be conveyed through Folsom Lake; and up to 15 TAF/year would be provided to El Dorado County Water Agency under a separate long-term CVP water service contract. During the review of the numerical modeling analyses used in this EIS, it was discovered that the demands for these El Dorado Irrigation District and the El Dorado County Water Agency contracts were not included in the CalSim II modeling analysis for Alternative 3 as presented in Chapters 5 through 21. A sensitivity analysis using the CalSim II model to compare the results of the analysis with and without these demands is presented in Appendix 5B of this EIS for Alternative 3. The results of the sensitivity analysis have been used in conjunction with the results presented in Chapters 5 through 21 to analyze the effects of including the CVP water service contract for El Dorado County Water Agency in Alternative 3.

3.4.8.1.2 Old and Middle River Criteria

The OMR flow criteria under Alternative 5 is similar to the assumptions under the No Action Alternative and based on concepts addressed in the 2008 USFWS BO and 2009 NMFS BO plus a requirement for positive OMR (no reverse flows) in April and May of all water year types.

3.4.8.1.3 New Melones Operations Criteria

Alternative 5 assumptions for New Melones Reservoir operations are similar to assumptions under the No Action Alternative except for SWRCB D-1641 requirements for the San Joaquin River pulse flows at Vernalis, as summarized in Table 3.5.

Table 3.5 Bay-Delta Vernalis Flow Objectives (average monthly cfs)

60-20-20 Index	Pulse Flow Required if X2 is West of Chipps Island	Pulse Flow required if X2 is East of Chipps Island
Wet	8,620	7,330
Above Normal	7,020	5,730
Below Normal	5,480	4,620
Dry	4,880	4,020
Critical	3,540	3,110

3.4.8.2 Actions in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Actions included in the 2008 USFWS BO and 2009 NMFS BO that would have occurred with or without the BOs, would be identical under Alternative 5 as under the No Action Alternative and the Second Basis of Comparison.

3.4.8.3 Actions in the 2009 NMFS BO that Would Not Have Occurred without Implementation of the Biological Opinions

Actions included in the 2008 USFWS BO and 2009 NMFS BO that would not have occurred without the BOs, would be identical under Alternative 5 as under the No Action Alternative.

3.4.8.4 Future Actions not included in the 2008 USFWS BO and 2009 NMFS BO that Would Have Occurred without Implementation of the Biological Opinions

Alternative 5 also includes assumptions unrelated to implementation of the 2008 USFWS BO and 2009 NMFS BO, including: climate change and sea level rise; development of lands in accordance with general plans in areas served by CVP and SWP water supplies; and reasonable and foreseeable projects that have been approved and are anticipated to be implemented by 2030. These items included in Alternative 5 are identical as under the No Action Alternative and the Second Basis of Comparison.

3.4.8.5 Vegetation Management Along Levees

Alternative 5 includes vegetation management operations along levees for flood management in accordance with policies issued by the USACE in 2009 and 2010.

3.4.9 Alternatives Considered but Not Evaluated in Detail

As described above, 6 of the 23 alternative concepts identified for inclusion in the alternatives to be evaluated in this EIS were eliminated for further evaluation for several reasons, as described below.

3.4.9.1 Alternative Concept 6: Modify Flows in San Joaquin River at Vernalis

The 2009 NMFS BO included two phases related to implementation of the San Joaquin River Inflow to Export Ratio. The first phase, to be implemented in 2010 and 2011, assumed CVP and SWP operations under the Vernalis Adaptive Management Plan (VAMP) which provided for Reclamation to purchase water from non-CVP water users in the San Joaquin River watershed. The second phase was designed to be implemented following the completion of VAMP when Reclamation could no longer purchase water to meet flow requirements of the SWRCB D-1641 in the Delta.

Alternative Concept 6 recommended an operations that CVP could not meet without VAMP authorizations. Therefore, Alternative Concept 6 did not meet the provision in the purpose of the action to be "consistent with Federal Reclamation law; other Federal laws; Federal permits and licenses; State of California water

rights, permits, and licenses." Alternative Concept 6 was not retained for analysis in the EIS.

3.4.9.2 Alternative Concept 14: Advance the Timing of Upgrades at Wastewater Treatment Plants

Alternative Concept 14 would advance the timing of upgrades at the Sacramento Regional Wastewater Treatment Plant to 2017; and implement advanced treatment technologies at the Fairfield-Suisun Sewer District treatment plant to reduce nutrients in the effluent." However, both of these actions would be complete by 2030, the study period considered in this EIS. The Sacramento Regional Wastewater Treatment Plant must comply with the National Pollutant Discharge Elimination System permit issued on December 9, 2010 by the Central Valley Regional Water Quality Control Board to reduce nutrients in the effluent discharged to the Sacramento River by 2020 (SRCSD 2012). The Fairfield Suisun Sewer District must comply with similar permit conditions issued by the San Francisco Bay Regional Water Quality Control Board in March 2015 (SFRRWQCB 2015).

Because the Environmental Consequences analysis in this EIS is conducted as a "snapshot" in time at 2030, inclusion of a provision to require compliance with the discharge requirements prior to 2020 would not be evaluated. Therefore, Alternative Concept 14 was not retained for analysis in the EIS.

3.4.9.3 Alternative Concept 18: Change to CVP Operations to Meet In-Basin Water Demands prior to Meeting other CVP Water Demands

Alternative Concept 18 would require operations of the CVP to meet in-basin water demands in the Trinity, Sacramento, American, and Stanislaus rivers watersheds prior to use of the CVP water in other portions of the service area. However, the CVP is operated as integrated system to satisfy statutory, regulatory, and contractual obligations to the fullest extent possible, in accordance with the purpose of the action. Therefore, Alternative Concept 18 was not retained for analysis in the EIS.

3.4.9.4 Alternative Concept 21: Change methods used to monitor and predict OMR criteria

Alternative Concept 21 addresses an item that is related to methods to implement OMR monitoring and projections. The alternatives considered in this EIS address approaches to continued operation of the CVP and SWP. Methods to monitor and predict criteria used in CVP and SWP operations are considered by Reclamation as part of the operations of the CVP. Changes in methods used to monitor and predict OMR values can be applied to any of the alternatives considered in this EIS; and would not result in differentiations between alternatives. Therefore, Alternative Concept 21 was not retained for analysis in the EIS.

3.4.9.5 Alternative 22: Prioritize Use of CVPIA Restoration Funds in the Watersheds that Generated the Funds

As described above, the locations of CVPIA restoration activities are determined based upon scientific framework throughout the CVP service area that connects restoration actions to environmental and population responses across watersheds (Reclamation 2013c). A system-wide science-based approach with performance indices, monitoring, and scientific review of results is used to provide direction as the CVPIA adapts to changing conditions. Changing the approach from the current CVPIA implementation plan could be considered to be inconsistent with Federal law. Therefore, Alternative Concept 22 was not retained for analysis in the EIS.

3.4.9.6 Alternative 23: Completely Cease Operations of the CVP and SWP

Complete cessation of CVP and SWP operations would not be consistent with the requirement of the purpose of the action to operate the CVP and SWP in a manner that is similar to historic operational parameters with certain modifications; and it would not be consistent with Federal Reclamation law; other Federal laws; Federal permits and licenses; State of California water rights, permits, and licenses related to delivery of water by CVP and SWP to water rights holder and related to flood management operations at the CVP and SWP reservoirs. Therefore, Alternative Concept 23 was not retained for analysis in the EIS.

3.5 Assumptions for Cumulative Effects Analysis

The CEQ regulations define cumulative effects as the impact on environmental, human, and community resources that results from the incremental impact of the proposed project when added to other past, present, and reasonably foreseeable future actions regardless of what agency (Federal or non-Federal) or persons undertakes such actions. Cumulative effects can result from individually minor but collectively significant actions taking place over time (40 CFR 1508.7, 1508.25.) Future cumulative impacts should not be speculative but should be based upon known or reasonably foreseeable long-range plans, regulations, operating agreements, or other information that establishes them as reasonably foreseeable.

The reasonably foreseeable future actions included in the cumulative effects analysis are summarized below. The projects and actions are organized into:

- Water Supply and Water Quality Projects and Actions potentially affected by long-term operation of the SWP and CVP (organized geographically from north to south)
- Ecosystem Improvement Projects and Actions potentially affected by long-term operation of the SWP and CVP or potentially affecting resources analyzed in this EIS (organized geographically from north to south)

3.5.1 Water Supply and Water Quality Projects and Actions

There are numerous water supply and water quality projects and actions that could be potentially affected by changes in the coordinated long-term operation of the CVP and SWP, or could affect the CVP and SWP operations. Major future water supply and water quality projects and actions are discussed below.

3.5.1.1 Bay-Delta Water Quality Control Plan Update

In accordance with the federal Clean Water Act and the Porter-Cologne Water Quality Control Act, basin plans must be developed for each hydrologic area. Each basin plan must contain water quality objectives to ensure the reasonable protection of beneficial uses, as well as a program of implementation for achieving those objectives. Federal regulations require each state to adopt water quality standards to protect the public health or welfare, enhance the quality of water, and serve the purposes of the Clean Water Act. In California, the beneficial uses and water quality objectives form the basis of the water quality control standards. In the Sacramento-San Joaquin Bay Delta, water quality and flow objectives to meet water quality criteria are included in the Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary (Bay-Delta WQCP) (SWRCB 2006). The SWRCB and the Central Valley and San Francisco Regional Water Quality Control Boards are in the process of updating the Bay-Delta WQCP. The updates, or amendments, are being prepared in two phases. Initially, the SWRCB and Regional Water Quality Control Boards are evaluating new flow objectives for the Lower San Joaquin River and the tributaries of Stanislaus, Tuolumne, and Merced rivers; and southern Delta salinity objectives. The second phase is evaluating changes to other portions of the Bay-Delta WQCP including Delta outflows, SWP and CVP export restrictions, and other requirements in the Bay-Delta to protect fish and wildlife beneficial uses. A third phase will consider and assign responsibility for implementing measures to achieve the water quality objectives established in the first two phases (SWRCB 2012).

Ongoing programs to adopt and implement total maximum daily loads are described in Chapter 6, Surface Water Quality.

3.5.1.2 Bay Delta Conservation Plan and the California Water Fix

The Bay Delta Conservation Plan (BDCP) and the California WaterFix are being developed by Federal and State agencies and other stakeholders to achieve the dual goals of a reliable water supply for California and a healthy California Bay Delta ecosystem that supports the State's economy. The program would construct a new conveyance facility and modify operation of existing CVP and SWP Delta facilities; and reduce ecological stressors that impair the function or the use of the Delta by aquatic and terrestrial resources.

The Recirculated Draft EIR/Supplemental Draft EIS (RDEIR/SDEIS) was issued by DWR and Reclamation. The RDEIR/SDEIS evaluated new alternatives in addition to the alternatives included in the Public Draft EIR/EIS that combined ecosystem restoration approaches and Delta conveyance approaches. During the last 50 years, several broad conveyance approaches have been studied to address

urban water quality, water supply reliability, and environmental concerns in the Delta: physical barriers, hydraulic barriers, through-Delta facilities, and isolated facilities. Several alternative Delta conveyance facilities are being evaluated as part of the EIR/EIS process. These alternatives included use of an isolated facility that would convey water around or under the Delta for local supply and export through a hydraulically isolated channel or pipeline and with continual use of the existing south Delta intakes (dual conveyance alternatives); and continuation of the use of the through-Delta conveyance with channel modifications.

3.5.1.3 Shasta Lake Water Resources Investigation

The Shasta Lake Water Resources Investigation is currently being conducted by Reclamation to determine the type and extent of federal interest in a multiple purpose plan to modify Shasta Dam and Reservoir to increase the survival of anadromous fish populations in the upper Sacramento River; increase water supplies and water supply reliability for agricultural, municipal, industrial, and environmental purposes (Reclamation 2013d). To the extent possible through meeting these objectives, alternatives evaluated in the EIS included features to benefit other identified water and related resource needs including ecosystem conservation and enhancement, improve hydropower generation capability, flood damage reduction, maintain and increase recreation opportunities, and maintain or improve water quality conditions in the Sacramento River and the Delta consistent with the objectives of the CALFED Bay-Delta Program. Alternatives for expansion of Shasta Lake included, among other features, raising the dam from 6.5 to 18.5 feet above current elevation, which would result in additional storage capacity of 256,000 to 634,000 acre-feet, respectively. The increased capacity would improve water supply reliability and increase the cold water pool, which would provide improved water temperature conditions for anadromous fish in the Sacramento River downstream of the dam. The Final EIS, published in December 2014, identified the preferred alternative to include an 18.5 foot raise of Shasta Dam to provide an additional 634,000 acre-feet of storage with augmentation of spawning gravel programs and restoration of riparian, floodplain, and side channel habitat in the upper Sacramento River (Reclamation 2014g).

3.5.1.4 North of Delta Offstream Storage Investigation

The North-of-the-Delta Offstream Storage Investigation evaluates the feasibility of offstream storage in the northern Sacramento Valley for improved water supply and water supply reliability, improved water quality, and enhanced survival of anadromous fish and other aquatic species (DWR 2013). Specific primary planning objectives are to: 1) increase water supplies to meet existing contract requirements, including improved water supply reliability, and provide greater flexibility in water management for agricultural, environmental, and municipal and industrial users; 2) increase the survival of anadromous fish populations in the Sacramento River, as well as the survivability of other aquatic species; and 3) improve drinking water quality in the Delta. To the extent possible through meeting these objectives, alternatives include ecosystem conservation and enhancement, provide ancillary hydropower generation capability to the statewide power grid, and create incremental flood damage reduction opportunities in

support of major northern California flood-control reservoirs consistent with the objectives of the CALFED Bay Delta Program. All alternatives include construction of a dam and reservoir near Sites, located to the west of Maxwell (California), with various facilities and configurations for conveyance into and out of the reservoir, which would result in additional storage capacity ranging from 1200 to 1900 TAF.

3.5.1.5 Federal Energy Regulatory Commission License Renewals

There are 22 hydroelectric generation FERC permits that will expire prior to 2030 (FERC 2015). Fifteen projects in the Sacramento River watershed include one on the Pit River (upstream of Shasta Lake), six on the Feather River, four on the Yuba River, one on the Bear River, one on the American River, and one each on Cow and Battle creeks. Projects in the San Joaquin River watershed include four on the San Joaquin River, one on the Stanislaus River, two on the Merced River, and one on the Tuolumne River. The FERC must complete analyses under NEPA and ESA to consider the effects of the hydropower operations on the environment, including flow regimes, water quality, fish passage, recreation, aquatic and riparian habitat, and special status species.

3.5.1.5.1 Federal Energy Regulatory Commission License Renewal for SWP Oroville Project

The Oroville Facilities, as part of SWP, are also operated for flood management, power generation, water quality improvement in the Delta, recreation, and fish and wildlife enhancement. The objective of the relicensing process was to continue operation and maintenance of the Oroville Facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license. The initial FERC license for the Oroville Facilities, issued on February 11, 1957, expired on January 31, 2007. The Final EIR/EIS were completed in 2007 (FERC 2007). At this time, the revised BOs and FERC license have not been issued.

3.5.1.5.2 Federal Energy Regulatory Commission Relicensing for Yuba River Watershed Hydroelectric Projects

The Nevada Irrigation District is applying for a new license for the Yuba-Bear Project (FERC Project No. 2266), and PG&E are applying for the Drum-Spaulding Project (FERC Project No. 2310). The Yuba-Bear Project is located on the Middle and South Yuba rivers, Bear River, and Jackson and Canyon creeks (FERC 2013). Concurrently, PG&E is applying for a license renewal for the Drum-Spaulding Project which is located on the Bear and Yuba rivers. Operations of the two projects are coordinated in many factors. The FERC relicensing processes for these two projects in underway.

3.5.1.5.3 FERC Relicense Renewal for Turlock Irrigation District and Modesto Irrigation District Don Pedro Project

The Don Pedro Project is located on the Tuolumne River in Tuolumne County. The initial license was issued for operations between 1971 and 1991 followed by requirements to evaluate fisheries water needs in the Tuolumne River.

In 1987, after the Turlock Irrigation District and Modesto Irrigation District applied to amend their license to add a fourth generating unit, FERC approved an amended fish study plan with possible changes in 1998. In 1996, FERC amended the license to implement amended minimum flow criteria and require fish monitoring studies for completion in 2005. In 2002, NMFS requested that FERC initiate formal consultation on the effects of the Don Pedro Project on Central Valley steelhead. The FERC approved the Summary Report on fisheries in 2008. In 2009, NMFS, USFWS, CDFW, and several environmental interest groups filed requests for rehearing on the license. FERC denied portions of the request but required instream flow studies to be conducted and required NMFS to be included for consultation on any authorized changes to minimum flow release schedules.

The FERC also directed the appointment of an administrative law judge to assist in assessing the need for and feasibility for interim measures prior to relicensing. A final report was completed in 2010. Following the completion of the report and a monitoring plan by the affected districts, FERC approved an order modifying and approving instream flow and monitoring study plans. A final license application, including an Environmental Report, was submitted to FERC in April 2014 (TID and MID 2014). The current license expires in 2016.

The objective of the relicensing process is to continue operation and maintenance of the Don Pedro Project facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license.

3.5.1.5.4 FERC Relicense Renewal for Merced Irrigation District's Merced River Hydroelectric Project

The Merced River Hydroelectric Project is located on the Merced River in Mariposa County and includes both Lake McClure and McSwain Reservoir, two powerhouses (New Exchequer and McSwain), and recreation facilities. The initial FERC license expires on February 28, 2014. The objective of the relicensing process is to continue operation and maintenance of the Merced River Hydroelectric Project facilities for electric power generation, along with implementation of any terms and conditions to be considered for inclusion in a new FERC hydroelectric license (Merced ID 2013).

3.5.1.6 El Dorado Water and Power Authority Supplemental Water Rights Project

The El Dorado Water and Power Authority (EDWPA) proposes to establish permitted water rights allowing diversion of water from the American River basin to meet planned future water demands in the El Dorado Irrigation District and Georgetown Divide Public Utility District service areas and other areas located

within El Dorado County that are outside of these service areas. The EDWPA filed petitions with the SWRCB for partial assignment of State Filed Applications 5644 and 5645, and accompanying applications allowing for the total withdrawal and use of 40,000 acre-feet per year, consistent with the diversion and storage locations allowed under the El Dorado-Sacramento Municipal Utility District Cooperation Agreement (EDWPA 2010).

3.5.1.7 Semitropic Water Storage District Delta Wetlands

In 1987, Delta Wetlands, a California Corporation, proposed a project for water storage and wildlife habitat enhancement on four privately owned islands in the Delta. The four islands were Bacon Island and Bouldin Island in San Joaquin County and Holland Tract and Webb Tract in Contra Costa County, encompassing approximately 23,000 acres. The Delta Wetlands Project would store water on two Reservoir Islands (Bacon Island and Webb Tract) for subsequent release into the Delta, and habitat enhancement to compensate for wetland and wildlife effects of the water storage operations with a Habitat Management Plan on two Habitat Islands (Bouldin Island and Holland Tract).

In 2007, the Delta Wetlands Project partnered with the Semitropic Water Storage District (Semitropic WSD) to: 1) provide water to Semitropic WSD to augment its water supply, and 2) bank water within the Semitropic Groundwater Storage Bank and Antelope Valley Water Bank. The designated places of use for Delta Wetlands Project water would include: Semitropic WSD; Member Agencies of the Metropolitan Water District of Southern California, the Western Municipal Water District of Riverside County, and select service areas of the Golden State Water Company. The project would include improvements of 27 miles of levees and screened diversions to divert water during high-flow periods in the winter months of December through March into Webb Tract (100,000 acre-feet of storage) and Bacon Island (115,000 acre-feet of storage). The water would not be diverted in a manner that would adversely affect senior legal water rights holders, including the SWP and CVP. Stored water would be discharged into False River (from Webb Tract) and Middle River (from Bacon Island) for export when excess SWP or CVP diversion capacity is available, in the summer and fall months of July through November. Any water that could not be exported from the Delta in a given year would be available to increase Delta outflow in the fall months of September through November. Semitropic WSD issued a Draft EIR in 2010 and a Final EIR in 2011 (SWSD 2011).

3.5.1.8 North Bay Aqueduct Alternative Intake

DWR is evaluating the implementation of an alternative intake on the Sacramento River upstream of the Sacramento Regional Wastewater Treatment Plant, and conveyance facility to connect the intake with the existing North Bay Aqueduct. The proposed alternative intake would be operated in conjunction with the existing North Bay Aqueduct intake at Barker Slough. The proposed project would be designed to improve water quality and to provide reliable deliveries of SWP supplies to its contractors, the Solano County Water Agency and the Napa County Flood Control and Water Conservation District (DWR 2011a).

The proposed project would include construction and operation of a 240 cfs capacity intake with state-of-the-art positive barrier fish screens, pumping plant, sediment basins, and ancillary support facilities located on the west side of the Sacramento River near south Sacramento. The conveyance facility would include an approximately 30 mile long, 72 to 84-inch diameter underground steel and/or concrete pipeline to convey the water from the alternate intake to the existing North Bay Aqueduct. Two options are proposed for the location of the alternate intake facility. Alternate intake site 1 is located on the outside edge of Garcia Bend of the Sacramento River (on the west bank), approximately 500 feet south of the boundary of the City of West Sacramento. Alternate intake site 2 is located immediately south of the outside edge of Garcia Bend of the Sacramento River (on the west bank), approximately 2,500 feet south of the boundary of the City of West Sacramento. The intake and pumping plant facility would be constructed on the water side of the Sacramento River levee and the remaining components would be constructed on the land side of the levee. The intake would extend about 100 feet from the top of the levee into the river. The exact amount of this extension would depend on the site option selected. A fish screen would be installed on the face of the intake structure to prevent fish from swimming or being drawn into the intake and it would be designed to meet CDFW, NMFS, and USFWS criteria. The dimensions of the fish screen would be based on an anticipated approach velocity of 0.2 feet per second at the fish screen. Flow-control louvers behind the screen would control flow rates through the screen to assure uniform water velocity across the screen. Normal operation would keep the top of the screen below low water elevation. A reduction in pumping would occur any time the screens are not submerged or the water velocities increased. Above the screen would be concrete panels which extend to the 200 year flood elevation. A log boom would be installed in front of the fish screen to block large debris from blocking or damaging the intake. The intake would be equipped with an automatic fish screen cleaning system.

3.5.1.9 Los Vaqueros Reservoir Expansion Phase 2

Los Vaqueros Reservoir is an off-stream reservoir in the Kellogg Creek watershed to the west of the Delta. The Los Vaqueros Reservoir initial construction was completed in 1997 as a 100 TAF off-stream storage reservoir owned and operated by Contra Costa Water District to improve delivered water quality and emergency storage reliability to their customers. In 2012, the Los Vaqueros Reservoir was expanded to a total storage capacity of 160,000 acre-feet (Phase 1) to provide additional water quality and supply reliability benefits, and to adjust the timing of its Delta water diversions to accommodate the life cycles of Delta aquatic species, thus reducing species impact and providing a net benefit to the Delta environment. As part of the Storage Investigation Program described in the CALFED Bay Delta Program Record of Decision, additional expansion up to 275 TAF (Phase 2) is being evaluated by Contra Costa Water District, DWR, and Reclamation. The alternatives considered in the evaluation also consider methods to convey water from Los Vaqueros Reservoir to the South Bay Aqueduct to provide water to Zone 7 Water Agency, Alameda County Water District, and Santa Clara Valley Water District (Reclamation, CCWD, and Western 2010).

3.5.1.10 Upper San Joaquin River Basin Storage Investigation

The Upper San Joaquin River Basin Storage Investigation is being conducted by Reclamation and DWR to evaluate alternative plans to increase Upper San Joaquin River Storage to enhance the San Joaquin River restoration efforts and improve water supply reliability for agricultural, municipal and industrial, and environmental uses in the Friant Division, the San Joaquin Valley, and other regions of the state. The investigation is evaluating integration of conjunctive management and water transfer concepts into plan formulations. Additional storage is also expected to provide incidental flood damage reduction benefits (Reclamation 2014c).

Reclamation is analyzing alternatives for a new dam and a 1,260 TAF reservoir along the San Joaquin upstream of Millerton Lake in an area known as Temperance Flat. Primary planning objectives are to: 1) increase water supply reliability, and 2) enhance flow and temperature conditions to support the San Joaquin River Restoration Program. Operation variables include reservoir carryover, new or shifting water supply beneficiaries, and alternative conveyance routes.

3.5.1.11 Central Valley RWQCB Irrigated Lands Regulatory Program

The Irrigated Lands Regulatory Program regulates discharges from irrigated agricultural lands. Its purpose is to prevent agricultural discharges from impairing the waters that receive the discharges. The California Water Code authorizes the SWRCB and Regional Water Quality Control Boards to conditionally waive waste discharge requirements if this is in the public interest. On this basis, the Los Angeles, Central Coast, Central Valley, and San Diego regional water quality control boards have issued conditional waivers of waste discharge requirements to growers that contain conditions requiring water quality monitoring of receiving waters. In 2010, the Central Valley Regional Water Quality Control Board proposed to expand the requirements to groundwater especially for regulation of discharges with higher concentrations of nutrients (CVRWQCB 2011). Participation in the waiver program is voluntary; however, non-participant dischargers must file a permit application as an individual discharger, stop discharging, or apply for coverage by joining an established coalition group. The waivers must include corrective actions when impairments are found.

3.5.1.12 San Luis Reservoir Low Point Improvement Project

The San Luis Reservoir Low Point Improvement Project is proposed by Reclamation, the Santa Clara Valley Water District, and the San Luis and Delta Mendota Water Authority. As part of this project, Reclamation is investigating three alternatives to address the water quality problems within the CVP's San Felipe Division (Santa Clara and San Benito counties) that arise when San Luis Reservoir levels drop below 300,000 acre-feet during late summer in dry water years, resulting in large algal blooms. The alternatives being considered are to 1) expand the 6,000 acre-feet Pacheco Reservoir to 80,000 acre-feet or 130,000 acre-feet, 2) lower the San Felipe Intake at San Luis Reservoir, or 3) implement a combination comprehensive plan. The combination

comprehensive plan would involve increasing groundwater recharge and recovery capacity, implementing desalination measures, re-operating Santa Clara Valley Water District's raw- and treated-water systems, and implementing institutional measures. If Pacheco Reservoir were to be enlarged, the reservoir would be filled with Delta water; thus, additional impacts on Delta aquatic species (e.g., juvenile salmonids and Delta Smelt) could result from an increase in Delta exports. The environmental scoping report for the San Luis Reservoir Low Point Improvement Project was released in January 2009 and the plan formulation report was published in January 2011 (Reclamation et al. 2011).

3.5.1.13 Westlands v. United States Settlement

In August 2015, Westlands Water District and the United States agreed upon a settlement involving several litigations, as described below. The settlement is contingent upon Congressional authorization of enabling legislation (Reclamation 2015). The following information provides a summary from the Reclamation news release in October 2015.

In 2000, the court in *Firebaugh Canal Co v. United States*, issued an Order requiring the Secretary of the Interior to provide drainage service to lands served by the San Luis Unit of the Central Valley Project. In 2007 Reclamation signed a Record of Decision selecting a drainage plan and finding that the cost of providing drainage for lands served by the San Luis Unit. Reclamation began implementing the selected drainage plan in a portion of Westlands Water District in 2010 on a court-ordered schedule.

In 2011, individual landowners within Westlands Water District filed a takings claim against the United States alleging that failure to provide drainage service has caused a physical taking of their lands without just compensation in violation of the Fifth Amendment (*Etchegoinberry v. United States*). The Court of Federal Claims denied the government's motion to dismiss the complaint.

In January 2012, Westlands filed a breach of contract case alleging that the government's failure to provide drainage service to the Westlands Water District service area constituted a breach of Westlands Water District 1963 Water Service and 1965 Repayment contracts (including the interim renewal of those contracts). The case is currently pending.

Under the proposed terms of the Settlement, Westlands Water District will:

- Permanently retire not less than 100,000 acres of land from production. Westlands Water District will agree to permanently retire a total of not less than 100,000 acres of lands within its boundaries utilizing those lands only for the following purposes:
  - Management of drain water, including irrigation of reuse areas;
  - Renewable energy projects;
  - Upland habitat restoration projects; or
  - Other uses subject to the consent of the United States.

- Cap contract deliveries at 75 percent of its CVP contact amount (from 1.193 million acre-feet to 895 thousand acre-feet). Any water above this 75 percent cap, that would have been delivered to Westlands Water District, would instead be available to the United States for other public purposes under the CVP.
- Assume all responsibility for drainage in accordance with all legal requirements under state and federal law. Westlands Water District would become legally responsible for the management of drainage water within its boundaries, in accordance with federal and California law.
- Indemnify the United States for any damages and pay compensation for claims arising out of the *Etchegoinberry litigation*. Under the Settlement Westlands Water District will indemnify the United States for any claims (past, present and future) arising out of a failure to provide drainage service with Westlands Water District. Westlands Water District would also intervene in the *Etchigoinberry* case for Settlement purposes and would pay compensation to individual landowners.
- Continue to wheel water to Lemoore Naval Air Station. As part of the overall Settlement, CVP water will be made available to Lemoore Naval Air Station and Westlands Water District would agree to wheel all CVP water made available to Lemoore under the same terms and conditions as Westlands Water District wheels water to other Westlands Water District's contractors.
- Be relieved from potential drainage repayment. If the United States were to expend significant funds to provide a drainage solution, Reclamation would seek repayment from Westlands Water District (over 50 years, with no interest, commencing after completion of each separable element). By taking responsibility for drainage, Westlands Water District would also eliminate responsibility for repayment.

Under the Terms of the Settlement, the United States will:

- Be relieved of all statutory obligations to provide drainage. The Settlement Agreement would relieve the Department of the Interior from all drainage obligations imposed by the San Luis Act, including implementation of the 2007 ROD, which is estimated to cost approximately $3.5 billion ($513 million authorized). Westlands Water District will agree to dismiss with prejudice the *Westlands v. U.S*. breach of contract litigation and will join the U.S. in petitioning for vacatur of the 2000 Order Modifying Partial Judgment in the *Firebaugh* case directing implementation of drainage service and control schedules.
- Receive a waiver of claims for potential damages due to a failure to provide drainage service. Westlands Water District will agree to provide for the release, waiver and abandonment of all past, present and future claims arising from the government's failure to provide drainage service under the San Luis Act, including those by individual landowners within Westlands Water District's service area, and would further agree to indemnify the United States

for any and all claims relating to the provision of drainage service or lack thereof within the Westlands service area.

- Relieve Westlands Water District repayment obligation for CVP construction charges to date (approximately $375 million). Westlands Water District will be relieved of its current, unpaid capitalized construction costs for the CVP, the present value of which is currently estimated to be $375 million. Under the Settlement, Westlands Water District will still be responsible for Operation and Maintenance, the payment of restoration fund charges pursuant to the CVPIA, and for future CVP construction charges.
- Convert Westlands Water District water service contract into a repayment contract. The Secretary will convert Westlands Water District's current 9(e) water service contract to a 9(d) repayment contract consistent with existing key terms and conditions. As a "paid out" contractor, the benefit of this conversion is permanent right to a stated share of CVP water. However, the terms and conditions of the contract—including the so called "shortage clause" – will otherwise be the same as in the current 9(e) contract.
- Retain the right to cease water deliveries if Westlands Water District fails to meet its drainage obligation. Language in the Settlement makes the United States' obligation to provide water to Westlands under the 9(d) Repayment Contract conditional upon Westlands Water District's fulfillment of its obligations to manage drainage water within its service area.
- Issue a water service contract to Lemoore Naval Air Station. As part of the overall Settlement, the United States is authorized to enter into a water service contract with Lemoore Naval Air Station to provide a guaranteed quantity of CVP water to meet the needs of the Naval Air Station associated with air operations and Westlands Water District will agree to wheel all CVP water made available to Lemoore.

3.5.1.14 Contra Loma Reservoir and Recreation Resource Management Plan

The Contra Loma Recreation Resource Management Plan is a long-term plan to guide management of the resources on the federal lands within the 80-acre Contra Loma Reservoir and surrounding 661 acres of recreation areas in Contra Loma Regional Park and Antioch Community Park (Reclamation 2014f). The East Bay Regional Park District manages the federal lands and public recreation facilities under an agreement with Reclamation. The proposed plan is to expand recreational use and facilities to increase recreational demands, including establishment of an additional all-weather sports field, fishermen's shelter, playground structure, a disc golf course, and expanded swim lagoon and trails.

3.5.1.15 San Luis Reservoir State Recreation Area Resource Management Plan/General Plan

The Resource Management Plan addressed recreational plans for the San Luis Reservoir State Recreation Area and adjacent lands in Merced County that are owned by Reclamation and managed by the California Department Parks and

Recreation, DWR, and CDFW (Reclamation and CDPR 2013). The plan would focus on boating management, cultural resources management, vegetation management, enhanced trails management, expanded visitor experiences and education opportunities, and road and utility upgrades.

3.5.1.16 Future Water Supply Projects

Many of the future projects would directly increase regional and local water supplies through groundwater storage and recovery programs, improved conveyance that connects water supplies from different water agencies, recycled water projects, and desalination projects. Water resources projects that have been approved and are being implemented were previously described in this chapter under the No Action Alternative. The following major water supply projects are currently being evaluated and are considered under the Cumulative Effects analysis.

- Future Groundwater Storage and Recovery Projects
  - City of Roseville (City of Roseville 2012)
  - Mokelumne River Water & Power Authority (MORE 2015)
  - Northeastern San Joaquin County Groundwater Banking Authority (NSJCGBA 2011)
  - Stockton East Water District (SEWD 2012)
  - Madera Irrigation District (Reclamation 2011b)
  - Kings River Conservation District (KRCD 2012b)
  - Buena Vista Water Storage District and Rosedale Rio Bravo Water Storage District (BVWSD 2015)
  - City of Los Angeles (City of Los Angeles 2010, 2013b)
  - Los Angeles County (Los Angeles County 2013b)
  - City of San Diego (City of San Diego 2009a, 2009b)
  - Rancho California Water District (RCWD 2011, 2012)
  - Eastern Municipal Water District (EMWD 2014c)
  - Jurupa Community Services District (JCSD et al. 2010)
- Major Conveyance Projects
  - Bay Area Regional Water Supply Reliability (CCWD 2014, EBMUD 2014)
  - Friant-Kern Canal and Madera Canal Capacity Restoration Projects (SJRRP 2011, 2015)
  - Los Banos Creek Water Resources Management Plan (SJRECWA 2012)
  - Sacramento River Water Reliability Project (Reclamation 2004b)

- Major Recycle Water Projects (more than 10,000 acre-feet/year)
  - City of Fresno (City of Fresno 2011)
  - City of Los Angeles (City of Los Angeles 2005)
  - Central Basin Municipal Water District (CBMWD 2010)
  - Foothill Municipal Water District (MWDSC 2010)
  - Upper San Gabriel Valley Municipal Water District (USGVMWD 2013)
  - West Basin Municipal Water District (WBMWD 2011, 2015a)
  - Olivenhain Municipal Water District (OMWD 2015)
  - Eastern Municipal Water District (EMWD 2014c)
  - Inland Empire Utilities Agency (IEUA 2014)
  - Palmdale Water District (PWD 2010)
  - East Valley Water Reclamation Authority (Antelope Valley 2013)
- Major Future Coastal Desalination Water Projects
  - San Francisco Bay Area Regional Desalination Project (BARDP 2015)
  - City of Santa Barbara (City of Santa Barbara 2015)
  - Camrosa Water District (CWD 2015)
  - City of Long Beach (City of Long Beach 2015)
  - City of Huntington Beach (City of Huntington Beach 2010)
  - City of Oceanside (City of Oceanside 2012)
  - City of Carlsbad (City of Carlsbad 2006)
  - West Basin Municipal Water District (WBMWD 2015b)
  - Metropolitan Water District of Orange County (MWDOC 2015)
  - San Diego County Water Authority in the Southern California Region (SDCWA 2009, 2015)
- Long-term and short-term Water Transfers to provide water to municipal, agricultural, and ecosystem water users, including wildlife refuges including programs that transfer water from northern California to the San Joaquin Valley and southern California across the Delta (Reclamation and SLDMWA 2015; BWGWD 2015).

3.5.2 Ecosystem Improvement Projects and Actions

There are numerous ecosystem improvement projects and actions that could be potentially affected by changes in the coordinated long-term operation of the CVP and SWP, or could affect the CVP and SWP operations. Major future water supply and water quality projects and actions are discussed below.

3.5.2.1 Mill Creek Riparian Assessment

The need to restore and maintain riparian habitat in Mill Creek is identified in the Anadromous Fish Restoration Program and CALFED Bay-Delta Ecosystem Restoration Program goals, objectives, and targets. The AFRP is one of five CVPIA programs that have been integrated with the Ecosystem Restoration Plan. Both of these programs prioritize establishment, restoration, and maintenance of anadromous fish habitat on this stream, particularly in the arena of riparian habitat and flow enhancement. In response to this identified need, Reclamation and USFWS is implementing the Mill Creek Riparian Assessment. The project

includes: 1) riparian habitat and condition mapping and vegetation classification of the Mill Creek watershed, 2) identifying and prioritizing areas that should be restored, enhanced, and/or preserved in addition to existing conservation easements, and 3) identifying the types of restoration actions that should occur at the prioritized sites (USFWS 2010).

3.5.2.2 Yolo County Habitat/Natural Community Conservation Plan

The Yolo County Habitat Joint Powers Authority, consisting of five local public agencies, launched the Yolo Natural Heritage Program in March 2007. This effort includes the continuing preparation of a joint Habitat Conservation Plan/ Natural Community Conservation Plan (HCP/NCCP). Member agencies include Yolo County and the cities of Davis, Woodland, West Sacramento, and Winters.

The HCP/NCCP describes the measures that local agencies will implement to conserve biological resources, obtain permits for urban growth and public infrastructure projects, and continue to maintain the agricultural heritage and productivity of Yolo County. The nearly 653,820-acre planning area provides habitat for covered species occurring within five dominant habitats/natural communities. The plan proposes to address 63 covered species, including seven state-listed species: palmate-bracted bird's-beak, Colusa grass, Crampton's tuctoria, giant garter snake, Swainson's hawk, western yellow-billed cuckoo, and bank swallow. Interim conservation activities include acquiring permanent conservation easements for sensitive species habitat in the plan area (YNHP 2015).

3.5.2.3 California EcoRestore

California EcoRestore is an initiative by the California Natural Resources Agency to coordinate and advance habitat restoration for at least 30,000 acres by 2019 (CNRA 2015a, 2015b). This acreage includes 25,000 acres of habitat restoration identified in the 2008 USFWS BO and 2009 NMFS BO, and 5,000 acres of habitat enhancements. Some of these programs would be funded by federal and state water agencies that are required to mitigate impacts of the CVP and SWP. Other programs would be sponsored by a combination of funds from state bonds (Proposition 1 and 1E), Assembly Bill 32 Greenhouse Gas Reduction Fund, federal agencies, local agencies, and private investments. The California Delta Conservancy will lead implementation of identified restoration projects in collaboration with local governments and with a priority on using public lands in the Delta.

Many of the programs to be implemented under California EcoRestore in Suisun Marsh, Yolo Bypass, and Cache Slough are discussed separately under the No Action Alternative and cumulative effects in this EIS.

3.5.2.4 North Delta Flood Control and Ecosystem Restoration Project

The North Delta Flood Control and Ecosystem Restoration Project is proposed near the confluence of the Cosumnes and Mokelumne rivers by the DWR and encompasses approximately 197 square miles. Consistent with objectives contained in the CALFED Record of Decision, the project is intended to improve

flood management and provide ecosystem benefits in the North Delta area through actions such as construction of setback levees and configuration of flood bypass areas to create quality habitat for species of concern. These actions are focused on McCormack-Williamson Tract and Staten Island. The project would implement flood control improvements in a manner that benefits aquatic and terrestrial habitats, species, and ecological processes. Flood control improvements are needed to reduce damage to land uses, infrastructure, and the Bay-Delta ecosystem resulting from overflows caused by insufficient channel capacities and catastrophic levee failures in the 197 square-mile project study area. The proposed project as described in the Final EIR (DWR 2010b) included: portions of the levee system degraded to allow controlled flow across McCormack-Williamson Tract; levee modification to mitigate hydraulic impacts; channel dredging to increase flood conveyance capacity; an off-channel detention basin on Staten Island; ecosystem restoration where floodplain forests and marshes would be developed at McCormack-Williamson Tract and the Grizzly Slough property; setback levee on Staten Island to expand the floodway conveyance; and opening up the southern portion of McCormack-Williamson Tract to boating; improving Delta Meadows property; providing access and interpretive kiosks for wildlife viewing; and providing restroom, circulation, parking, and signage infrastructure to support such uses.

3.5.2.5 Franks Tract Project

Reclamation has conducted studies to evaluate the feasibility of modifying the hydrodynamic conditions near Franks Tract to improve Delta water quality and enhance the aquatic ecosystem. The results of these studies have indicated that modifying the hydrodynamic conditions near Franks Tract may substantially reduce salinity in the Delta and protect fishery resources, including populations of Delta Smelt. Reclamation evaluated installing operable gates to control the flow of water at key locations (Threemile Slough and/or West False River) to reduce sea water intrusion, and to positively influence movement of fish species of concern to areas that provide favorable habitat conditions. The project gates would be operated seasonally and during certain hours of the day, depending on fisheries and tidal conditions. Boat passage facilities would be included to allow for passing of watercraft when the gates are in operation. The Franks Tract Project is consistent with ongoing planning efforts for the Delta to help balance competing uses and create a more sustainable system for the future. By protecting fish resources, this project also could improve operational reliability of the CVP and SWP because curtailments in water exports (pumping restrictions) are likely to be less frequent. Franks Tract was previously evaluated as part of DWR's Flooded Island Pre-Feasibility Study Report (DWR 2007).

3.6 Summary of Environmental Consequences

Conditions in 2030 related to environmental and human resources that would occur with implementation of the No Action Alternative were compared to conditions under the Second Basis of Comparison; and conditions under

Alternatives 1 through 5 were compared to the conditions under the No Action Alternative and the Second Basis of Comparison, as described in Chapter 4, Approach to Environmental Analysis. The results of these analyses by alternative are described in Chapters 5 through 21 of this EIS and summarized in Tables 3.6 and 3.7.

The tables present summarize the results of both quantitative and qualitative impact analyses. The tables include relative quantitative differences for adverse impacts to provide a basis for consideration of mitigation measures. Potential mitigation measures were considered related to the comparison of Alternatives 1 through 5 to the No Action Alternative. Mitigation measures were not included to address adverse impacts of implementation of Alternatives 1 through 5 and the No Action Alternative as compared to the Second Basis of Comparison because this analysis was included in this EIS for information purposes only.

Changes in surface water conditions are provided as a basis for identifying the impacts as described in Aquatic, Terrestrial, and Recreation resources. Therefore, no mitigation measures are presented for Surface Water Resources.

Differences in the quantitative analyses of 5 percent or less are considered to be "similar" because the modeling analyses are based on CalSim II model output which operates with monthly time steps. Therefore, it was determined that changes in the model of 5 percent or less were related to the uncertainties in the model processing.

Table 3.6 Comparison of Alternatives 1 through 5 to No Action Alternative

	Alternative 1 Compared to the No Action Alternative	Alternative 2 Compared to the No Action Alternative	Alternative 3 Compared to the No Action Alternative	Alternative 4 Compared to the No Action Alternative	Alternative 5 Compared to the No Action Alternative
SURFACE WATER					
Trinity Lake	Water surface elevations similar. Storage similar or increased.	No change.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar or increased.
Trinity River at Lewiston Dam	Flows similar or increased.	No change.	Flows similar or increased.	Flows similar or increased.	Water surface elevations similar. Storage similar.
Shasta Lake	Water surface elevations similar. Storage similar or increased.	No change.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage similar.
Sacramento River at Keswick Dam	Flows similar or increased except reduced in September and November (up to 44%).	No change.	Flows similar or increased except reduced in September and November (up to 42%).	Flows similar or increased except reduced in September and November (up to 44%).	Flows similar.
Sacramento River at Freeport	Flows similar or increased except reduced in September and November (up to 47%).	No change.	Flows similar or increased except reduced in September and November (up to 48%).	Flows similar or increased except reduced in September and November (up to 47%).	Flows similar.
Clear Creek near Igo	Flows same except reduced in May (41%).	No change.	Flows same except reduced in May (29%).	Flows same except reduced in May (41%).	No change.
Lake Oroville	Water surface elevations similar. Storage reduced except in June (up to 22%).	No change.	Water surface elevations similar. Storage similar or increased.	Water surface elevations similar. Storage reduced except in June (up to 22%).	Water surface elevations similar. Storage similar.

	Alternative 1 Compared to the No Action Alternative	Alternative 2 Compared to the No Action Alternative	Alternative 3 Compared to the No Action Alternative	Alternative 4 Compared to the No Action Alternative	Alternative 5 Compared to the No Action Alternative
Feather River downstream of Thermalito Complex	Flows similar or increased except reduced in July-September and November-December (up to 65%).	No change.	Flows similar or increased except reduced in July-September and October-January (up to 70%).	Flows similar or increased except reduced in July-September and November-December (up to 65%).	Flows similar or increased except reduced in April-May (up to 27%).
Folsom Lake	Water surface elevations similar Storage similar or increased except reduced in June-August in above normal and below normal years (up to 15%).	No change.	Water surface elevations similar Storage similar or increased except reduced in July-August in above normal and August-September in below normal years (up to 10%).	Water surface elevations similar Storage similar or increased except in reduced June-August in above normal and below normal years (up to 15%).	Water surface elevations similar. Storage similar.
American River at Nimbus Dam	Flows similar or increased except reduced in September-November and June-July (up to 48%).	No change.	Flows similar or increased except reduced in August-November and June (up to 46%).	Flows similar or increased except reduced in September-November and June-July (up to 48%).	Flows similar or increased except reduced in September and April-May (up to 14%).
New Melones Reservoir	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar. Storage reduced in July-September in above normal years (up to 6%); and all months in below normal, dry, and critical dry years (up to 19 percent).
Stanislaus River at Goodwin Dam	Flows similar or increased except reduced in July-August, December, and March (up to 18%).	No change.	Flows similar or increased except reduced in October and February-July (up to 73%).	Flows similar or increased except reduced in July-August, December, and March (up to 18%).	Flows similar or increased except reduced in June-August (up to 18%).

	Alternative 1 Compared to the No Action Alternative	Alternative 2 Compared to the No Action Alternative	Alternative 3 Compared to the No Action Alternative	Alternative 4 Compared to the No Action Alternative	Alternative 5 Compared to the No Action Alternative
San Joaquin River at Vernalis	Flows similar or increased except reduced in October and April (up to 19%).	No change.	Flows similar or increased except reduced in October and May-June (up to 21%).	Flows similar or increased except reduced in October and April (up to 19%).	Flows similar or increased.
San Luis Reservoir	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar Storage similar or increased.	Water surface elevations similar Storage similar or increased except in below normal years in June-July (up to 9%); in dry years in April-September (up to 17%); and in critical dry years in April-January (up to 18%).
Flows into Yolo Bypass	Flows similar or increased except in October in wet years (20%).	No change.	Flows similar or increased except in October in wet years (25%).	Flows similar or increased except in October in wet years (20%).	Flows similar.
Delta Outflow	Reduced flows in many months. Increased flows in some months, including in December, February-March, and June in wet years (up to 1,492 cfs); and similar or increased flows in June and September in dry years (up to 385 cfs).	No change.	Reduced flows in many months. Increased flows in some months, including in December-March, in wet years (up to 3.307cfs); and increased flows in January-February and June-July in dry years (up to 277 cfs).	Reduced flows in many months. Increased flows in some months, including in December, February-March, and June in wet years (up to 1,492 cfs); and similar or increased flows in June and September in dry years (up to 385 cfs).	Flows would be similar or increased.
Reverse Flows in Old and Middle Rivers	Increased negative flows except in July-September.	No change.	Increased negative flows except in July-September.	Increased negative flows except in July-September.	Increased positive flows except in July-August.

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Water Supplies					
Non-CVP and Non-SWP Deliveries	Deliveries similar. No mitigation needed.	No change. No mitigation needed.	Deliveries similar. No mitigation needed.	Deliveries similar. No mitigation needed.	Deliveries similar. No mitigation needed.
CVP Water Deliveries (including CVP agricultural and municipal and industrial water service contracts; Sacramento River Settlement Contracts, San Joaquin River Exchange Contracts, and Eastside Division Contracts)	Deliveries similar or increased. No mitigation needed.	No change. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased in wet to dry years. Reduced deliveries in the Eastside Division Contractors in critical dry years (8%). Potential Mitigation measure: Reclamation would support water transfers from other basin water rights holders.
SWP Water Deliveries (In accordance with Table A contracts without Article 21 water)	Deliveries similar or increased. No mitigation needed.	No change. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased. No mitigation needed.	Deliveries similar or increased. No mitigation needed.

	Alternative 1 Compared to the No Action Alternative	Alternative 2 Compared to the No Action Alternative	Alternative 3 Compared to the No Action Alternative	Alternative 4 Compared to the No Action Alternative	Alternative 5 Compared to the No Action Alternative
Surface Water Quality					
Salinity in Northern Delta (near Emmaton)	Salinity increased in fall and winter months (up to 377%). Reduced in June in wet to dry years (up to 30%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in fall and winter months in wet and above normal years (up to 378%). Reduced in June of above normal years and September of below normal years (up to 8%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in the western Delta in fall and winter months (up to 377%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in January-February in all years (up to 8%). Reduced in April-June in critical dry years (up to 15%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.
Salinity in Western Delta (near Port Chicago)	Salinity increased in Oct-March in below normal, dry, and critical dry years, and September wet and above normal years (up to 96%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in October-January, April-May, June, and September in wet and above normal years (up to 95%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in Oct-March in below normal, dry, and critical dry years, and September wet and above normal years (up to 96%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity similar in most months except reduced in April-May in dry and critical dry years (up to 8%). No mitigation needed.

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Salinity in Western Central Delta (near Antioch)	Salinity increased in fall and winter months (up to 265%). Reduced in June in wet to below normal years (up to 14%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in fall and winter months (up to 262%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in fall and winter months (up to 265%). Reduced in June in wet to below normal years (up to 14%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in February in critical dry years (7%). Reduced in April-May in below normal to critical dry years, and in June in critical dry years (up to 20%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.
Salinity in Western Central Delta (near Contra Costa Water District Intakes)	Salinity increased in October-January and September in wet and above normal years (up to 65%). Reduced in March-June in wet to below normal years (up to 32%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in October-December in all year types, and January in above normal to dry years, and in September in wet and above normal years (up to 76%). Reduced in April-June (up to 34%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in October-January and September in wet and above normal years (up to 65%). Reduced in March-June in wet to below normal years (up to 32%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in April-June in below normal to critical dry years (up to 40%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.

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Salinity in Southern Delta (near CVP and SWP intakes)	Salinity increased in fall and early winter months (up to 65%). Reduced in February-June (up to 22%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	No change. No mitigation needed.	Salinity increased in October-December (up to 29% at Jones Pumping Plant intake and up to 41% at Clifton Court intake). Reduced in June (up to 13% at Jones Pumping Plant intake and up to 19% at Clifton Court intake). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in fall and early winter months (up to 65%). Reduced in February-June (up to 22%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.	Salinity increased in June in dry and critical dry years (up to 12%). Potential Mitigation Measures: Continued coordination of CVP and SWP operations to reduce salinity to the extent possible. Other mitigation measures have not been identified at this time.
Mercury in Delta Fish	Mercury concentrations similar or reduced concentrations. No mitigation needed.	No change. No mitigation needed.	Mercury concentrations similar or reduced concentrations. No mitigation needed.	Mercury concentrations similar or reduced concentrations. No mitigation needed.	Mercury concentrations similar concentrations. No mitigation needed.
Selenium in Delta and Delta Fish	Selenium concentrations similar concentrations. No mitigation needed.	No change. No mitigation needed.	Selenium concentrations similar concentrations. No mitigation needed.	Selenium concentrations similar concentrations. No mitigation needed.	Selenium concentrations similar concentrations. No mitigation needed.
Groundwater Resources					
Trinity River Region	Similar groundwater conditions. No mitigation needed.	No change. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.
Central Valley Region: Sacramento Valley	Similar groundwater conditions. No mitigation needed.	No change. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.	Similar groundwater conditions. No mitigation needed.

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Central Valley Region: San Joaquin Valley	Reduced groundwater pumping (8%); and higher groundwater elevations (2-200 feet). Potentially improved groundwater quality. Reduced subsidence potential. No mitigation needed.	No change. No mitigation needed.	Reduced groundwater pumping (6%); and higher groundwater elevations (2-200 feet). Potentially improved groundwater quality. Reduced subsidence potential. No mitigation needed.	Reduced groundwater pumping (8%); and higher groundwater elevations (2-200 feet). Potentially improved groundwater quality. Reduced subsidence potential. No mitigation needed.	Similar groundwater pumping; and similar to higher groundwater elevations (2-25 feet). Similar groundwater quality. Similar subsidence potential. No mitigation needed.
San Francisco Bay Area, Central Coast, and Southern California Region	Potentially reduced groundwater pumping; and potentially higher groundwater elevations. Potentially improved groundwater quality. Less subsidence potential. No mitigation needed.	No change. No mitigation needed.	Potentially reduced groundwater pumping; and potentially higher groundwater elevations. Potentially improved groundwater quality. Less subsidence potential. No mitigation needed.	Potentially reduced groundwater pumping; and potentially higher groundwater elevations. Potentially improved groundwater quality. Less subsidence potential. No mitigation needed.	Similar groundwater pumping; and groundwater elevations. Potentially similar groundwater quality. Similar subsidence potential. No mitigation needed.
CVP and SWP Energy Resources					
Energy Generated and Used by CVP and SWP Water Users	Similar CVP net generation. Decreased SWP net generation over the long-term (41%). Potentially reduced energy use by CVP and SWP water users. No mitigation needed.	No change. No mitigation needed.	Similar CVP net generation. Decreased SWP net generation over the long-term (27%). Potentially reduced energy use by CVP and SWP water users. No mitigation needed.	Similar CVP net generation. Decreased SWP net generation over the long-term (41%). Potentially reduced energy use by CVP and SWP water users. No mitigation needed.	Similar CVP and SWP net generation. Similar reduced energy use. No mitigation needed.

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Aquatic Resources					
Trinity River: Coho Salmon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Spring-run Chinook Salmon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Steelhead	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Green Sturgeon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity Lake and Lewiston Reservoir: Reservoir Fish	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Pacific Lamprey	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Trinity River: Eulachon	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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Sacramento River System: Winter-run Chinook Salmon	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; reduced pulse flows along lower Clear Creek; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Similar conditions. No mitigation needed.

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Sacramento River System: Spring-run Chinook Salmon	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; reduced pulse flows along lower Clear Creek; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Improved conditions due to predator controls. Potential mitigation measure: Implement fish passage around dams.	Similar conditions. No mitigation needed.
Sacramento River System: Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	Reduced habitat conditions due to reduced pulse flows along lower Clear Creek; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. No mitigation measures have been identified for remaining impacts.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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Sacramento River System: Late Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	Reduced habitat conditions due to lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Sacramento River System: Steelhead	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030. Potential mitigation measure: Implement fish passage around dams.	Similar conditions. No mitigation needed.
Sacramento River System: Green Sturgeon and White Sturgeon	Likely to result in improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Likely to result in improved conditions. No mitigation needed.	Likely to result in improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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Delta: Delta Smelt	Reduced habitat conditions due to increased potential for entrainment during larval and juvenile stages, and increased salinity in the fall in the western Delta. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.	Reduced habitat conditions due to increased potential for entrainment during larval and juvenile stages, and increased salinity in the fall in the western Delta. No mitigation measures have been identified at this time.	Reduced habitat conditions due to increased potential for entrainment during larval and juvenile stages, and increased salinity in the fall in the western Delta. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.
Delta: Longfin Smelt	Reduced habitat conditions due to more negative Old and Middle River flows and other factors (as indicated by lower Longfin Smelt abundance indices). No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.	Reduced habitat conditions due to more negative Old and Middle River flows and other factors (as indicated by lower Longfin Smelt abundance indices). No mitigation measures have been identified at this time.	Reduced habitat conditions due to more negative Old and Middle River flows and other factors (as indicated by lower Longfin Smelt abundance indices). No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.
Delta: Sacramento Splittail	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Sacramento River System: Reservoir Fish	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Sacramento River System: Pacific Lamprey	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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Sacramento River System: Striped Bass, American Shad, and Hardhead	Similar conditions for Hardhead. Reduced habitat conditions for Striped Bass and American Shad due to reduced survival in larval and juvenile stages and increased salinity in the spring in the western Delta. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.	Similar conditions for Hardhead. Reduced habitat conditions for Striped Bass and American Shad due to reduced survival in larval and juvenile stages and increased salinity in the spring in the western Delta. Adverse conditions for Striped Bass due to changes in harvest limitations. No mitigation measures have been identified at this time.	Similar conditions for Hardhead. Reduced habitat conditions for Striped Bass and American Shad due to reduced survival in larval and juvenile stages and increased salinity in the spring in the western Delta. Adverse conditions for Striped Bass due to changes in harvest limitations. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.
Stanislaus River: Fall-run Chinook Salmon	Similar conditions. No mitigation needed.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain. No mitigation needed.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain. No mitigation needed.	Similar conditions. No mitigation needed.

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Stanislaus River: Steelhead	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030; and lack of measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants. Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain. Potential mitigation measure: Implement fish passage around dams to reduce temperature impacts. No mitigation measures have been identified for remaining impacts.	Similar conditions. No mitigation needed.
Stanislaus River: White Sturgeon	Conditions may be similar; however, adverse impacts could occur due to higher water temperatures. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.	Conditions may be similar; however, adverse impacts could occur due to higher water temperatures. No mitigation measures have been identified at this time.	Conditions may be similar; however, adverse impacts could occur due to higher water temperatures. No mitigation measures have been identified at this time.	Similar conditions. No mitigation needed.

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New Melones Reservoir; Reservoir Fish	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Stanislaus River: Other Fish	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions for lampreys and Hardheads. Adverse conditions for Striped Bass due to changes in harvest limitations. No mitigation needed for lamprey and Hardhead. No mitigation measures have been identified at this time for Striped Bass.	Similar conditions for lampreys and Hardheads. Adverse conditions for Striped Bass due to changes in harvest limitations. No mitigation needed for lamprey and Hardhead. No mitigation measures have been identified at this time for Striped Bass.	Similar conditions. No mitigation needed.
Pacific Ocean: Killer Whale	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Terrestrial Resources					
Terrestrial Resources along Shoreline of CVP and SWP Reservoirs	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Terrestrial Resources along Rivers Downstream of CVP and SWP Reservoirs	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along the Stanislaus River.	No change. No mitigation needed.	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along the Stanislaus River.	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along the Stanislaus River.	Similar or improved conditions along Trinity, Sacramento, American, and Feather rivers. Improved conditions along Stanislaus River. No mitigation needed.

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Terrestrial Resources in Yolo Bypass	Similar conditions in Yolo Bypass. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions in Yolo Bypass. No mitigation needed.	Similar conditions in Yolo Bypass. No mitigation needed.	Similar conditions in Yolo Bypass. No mitigation needed.
Terrestrial Resources in Western Delta	Increased extent of salt water in the fall months of wet and above normal years in western Delta which could adversely affect terrestrial resources that use freshwater habitat. No mitigation measures identified at this time.	No change. No mitigation needed.	Increased extent of salt water in the fall months of wet and above normal years in western Delta which could adversely affect terrestrial resources that use freshwater habitat. No mitigation measures identified at this time.	Increased extent of salt water in the fall months of wet and above normal years in western Delta which could adversely affect terrestrial resources that use freshwater habitat. No mitigation measures identified at this time.	Similar habitat in western Delta. No mitigation needed.
Geology and Soils Resources					
Geology and Soils Resources	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Agricultural Resources					
Agricultural Production and Employment	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Land Use					
Municipal and Industrial Land Use	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Visual Resources					
Visual Resources of Land Irrigated with CVP and SWP Water	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Visual Resources at Reservoirs that Store CVP and SWP Water	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.

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Recreation Resources					
Recreation Resources at Reservoirs that Store CVP and SWP Water	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Recreation Resources in Rivers downstream of CVP and SWP Reservoirs	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. Reduced opportunities for Striped Bass and sport ocean salmon fishing. No mitigation measures identified at this time.	Similar or improved conditions. Reduced opportunities for Striped Bass and sport ocean salmon fishing. No mitigation measures identified at this time.	Similar conditions. No mitigation needed.
Air Quality and Greenhouse Gas Emissions					
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Improved air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.	No change. No mitigation needed.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Reduced air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Improved air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Similar air quality conditions in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions. No mitigation needed.

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Increased Greenhouse Gas Emissions (GHG) due to Changes in Energy Resources Related to CVP and SWP Water Use	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could increase in the San Francisco Bay Area, Central Coast, and Southern California regions.
Cultural Resources					
Potential for Disturbance of Cultural Resources	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Public Health					
Water Supply Availability for Wildland Firefighting	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Potential Exposure to Mercury in Fish in Delta	Similar or reduced concentrations. No mitigation needed.	No change. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar concentrations. No mitigation needed.
Socioeconomics					
Agricultural and Municipal and Industrial Employment	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Municipal and Industrial Water Supply Operating Expenses	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.	Similar conditions. No mitigation needed.
Recreational Economics CVP and SWP Reservoirs	Similar or improved conditions. No mitigation needed.	No change. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.	Similar or improved conditions. No mitigation needed.

	Alternative 1 Compared to the No Action Alternative	Alternative 2 Compared to the No Action Alternative	Alternative 3 Compared to the No Action Alternative	Alternative 4 Compared to the No Action Alternative	Alternative 5 Compared to the No Action Alternative
Recreational Economics Related to Striped Bass Fishing in Delta	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Reduced recreational opportunities and associated economics. No mitigation identified at this time.	Reduced recreational opportunities and associated economics. No mitigation identified at this time.	Similar conditions. No mitigation needed.
Commercial and Sport Ocean Salmon Fishing	Similar conditions. No mitigation needed.	No change. No mitigation needed.	Reduced commercial and sport ocean salmon fishing and associated economics. No mitigation identified at this time.	Reduced commercial and sport ocean salmon fishing and associated economics. No mitigation identified at this time.	Similar conditions. No mitigation needed.
Indian Trust Assets					
Potential for Disturbance of Indian Trust Assets	No change. No mitigation needed.	No change. No mitigation needed.	No change. No mitigation needed.	No change. No mitigation needed.	No change. No mitigation needed.
Environmental Justice					
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Improved air quality conditions. No mitigation needed.	No change. No mitigation needed.	Reduced air quality conditions. No mitigation needed.	Improved air quality conditions. No mitigation needed.	Similar air quality conditions. No mitigation needed.
Potential Exposure to Mercury in Fish in Delta	Similar or reduced concentrations. No mitigation needed.	No change. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar or reduced concentrations. No mitigation needed.	Similar concentrations. No mitigation needed.

Table 3.7 Comparison of No Action Alternative and Alternatives 1 through 5 to Second Basis of Comparison

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
SURFACE WATER CONDITIONS						
Trinity Lake	Water surface elevations similar Storage would be similar in most months, except reduced in November-December in above normal years (up to 6%) and all months in critical dry years (up to 10%).	No change.	Water surface elevations similar Storage would be similar in most months, except reduced in November-December in above normal years (up to 6%) and all months in critical dry years (up to 10%).	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage would be similar in most months, except reduced in all months in critical dry years (up to 10%).
Trinity River at Lewiston Dam	Flows similar or increased except reduced in December-February in wet to below normal years (up to 30%).	No change.	Flows similar or increased except reduced in December-February in wet to below normal years (up to 30%).	Flows similar or increased.	No change.	Flows similar or increased except reduced in December-February in wet to below normal years (up to 21%).
Shasta Lake	Water surface elevations similar Storage reduced in September-February in wet to dry years (up to 11%) and in all months in critical dry years (up to 14%).	No change.	Water surface elevations similar Storage reduced in September-February in wet to dry years (up to 11%) and in all months in critical dry years (up to 14%).	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage reduced in September-February in most months of wet to dry years (up to 10%), and in all months in critical dry years (up to 17%).

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Sacramento River at Keswick Dam	Flows reduced (up to 21%) except September and November.	No change.	Flows reduced (up to 21%) except September and November.	Flows similar or increased except reduced in August in below normal years (up to 6%).	No change.	Flows reduced (up to 16%) except September and November.
Sacramento River at Freeport	Flows similar or increased except reduced in May and June (up to 27%).	No change.	Flows similar or increased except reduced in May and June (up to 27%).	Flows similar or increased except reduced in June in below normal years (up to 13%).	No change.	Flows similar or increased except reduced in May and June (up to 28%).
Clear Creek near Igo	Flows similar or increased.	No change.	Flows similar or increased.	No change.	No change.	Flows similar or increased.
Lake Oroville	Water surface elevations similar. Similar in most months May-July in wet to dry years and in all months in critical dry years. Reduced in many months from September-February in all year types (up to 18%).	No change.	Water surface elevations similar. Similar in most months May-July in wet to dry years and in all months in critical dry years. Reduced in many months from September-February in all year types (up to 18%).	Water surface elevations similar Storage similar.	No change.	Water surface elevations similar. Similar in most months May-July in wet to dry years and in all months in critical dry years. Reduced in many months from September-February in all year types (up to 18%).
Feather River downstream of Thermalito Complex	Flows similar or increased except reduced in August-June (up to 52%).	No change.	Flows similar or increased except reduced in August-June (up to 52%).	Flows similar or increased except reduced in August-June (up to 28%).	No change.	Flows similar or increased except reduced in August-June (up to 58%).

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Folsom Lake	Water surface elevations similar Storage similar in many months except reduced flows in September-January (up to 12%) in wet to below normal years and July-September in critical dry years (up to 11%).	No change.	Water surface elevations similar Storage similar in many months except reduced flows in September-January (up to 12%) in wet to below normal years and July-September in critical dry years (up to 11%).	Water surface elevations similar Storage similar.	No change.	Water surface elevations similar Storage similar in many months except reduced flows in August-January (up to 13%) in wet to below normal years and July in critical dry years (8%).
American River at Nimbus Dam	Flows similar or increased except reduced in June-August, December, February, and April (up to 25%).	No change.	Flows similar or increased except reduced in June-August, December, February, and April (up to 25%).	Flows similar or increased except reduced flows in June-August and April (up to 17%).	No change.	Flows similar or increased except reduced in December-February, April, June, and August (up to 25%).
New Melones Reservoir	Water surface elevations similar Storage similar in wet, below normal, and dry years, and in most months in above normal and critical dry years. Storage reduced in October in above normal water years (6%) and in October-January and April-June in critical dry years (up to 7%).	No change.	Water surface elevations similar Storage similar in wet, below normal, and dry years, and in most months in above normal and critical dry years. Storage reduced in October in above normal water years (6%) and in October-January and April-June in critical dry years (up to 7%).	Water surface elevations similar Storage similar or increased.	No change.	Water surface elevations similar Storage reduced in all months in all water year types (up to 23%).

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Stanislaus River at Goodwin Dam	Flows similar or increased except reduced in November-March and May-June (up to 25%).	No change.	Flows similar or increased except reduced in November-March and May-June (up to 25%).	Flows reduced in all months (up to 79%) except April and August.	No change.	Flows reduced in all months (up to 25%) except October, April, and May.
San Joaquin River at Vernalis	Flows similar or increased except reduced in November and May-June (up to 9%).	No change.	Flows similar or increased except reduced in November and May-June (up to 9%).	Flows similar or increased except reduced in May-June (up to 27%).	No change.	Flows similar or increased except reduced in November and June (up to 10%).
San Luis Reservoir	Water surface elevations reduced in all months in wet to below normal water years and in February-September in dry and critical dry years (up to 16%). Storage reduced in October-June in most water years (up to 71%).	No change.	Water surface elevations reduced in all months in wet to below normal water years and in February-September in dry and critical dry years (up to 16%). Storage reduced in October-June in most water years (up to 71%).	Water surface elevations similar except reduced in January-February in above normal years (up to 6%) and February-August in critical dry years (up to 7%). Storage similar or increased in some months except in December-February and June in wet years (up to 16%), October-July in above normal and below normal years (up to 40%), January-September in dry years (up to 19%), and October-August in critical dry years (up to 29%).	No change.	Water surface elevations reduced in all months in all year types (up to 70%). Storage would be reduced in October-August in wet to below normal years (up to 17%), in January-September in dry years (up to 14%), and in all months in critical dry years (up to 14%).

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Flows into Yolo Bypass	Flows similar or increased except reduced in November-December in wet years (up to 15%), January-March in above normal years (14%), December-March in below normal years (up to 25%), and December in dry years (6%).	No change.	Flows similar or increased except reduced in November-December in wet years (up to 15%), January-March in above normal years (14%), December-March in below normal years (up to 25%), and December in dry years (6%).	Flows similar except reduced in October of wet years (6%).	No change.	Flows similar or increased except reduced in November-January in wet years (up to 15%), January-March in above normal years (15%), December-March in below normal years (up to 24%), and December in dry years (7%).
Delta Outflow	Flows similar or increased in many months. Reduced flows in some months, including in December, February-March, and June in wet years (up to 1,590 cfs).	No change.	Flows similar or increased in many months. Reduced flows in some months, including in December, February-March, and June in wet years (up to 1,590 cfs).	Flows would increase in many months. Reduced flows in some months, including October and March-June in wet years (up to 1,127 cfs), and October and May-June in dry years (up to 373 cfs).	No change.	Flows similar or increased in many months. Reduced flows in some months, including in December, February-March, and June in wet years (up to 1,713 cfs), and June in dry years (526 cfs).
Reverse Flows in Old and Middle Rivers	Increased positive flows except in June-August in most years and March in wet years.	No change.	Increased positive flows except in June-August in most years and March in wet years.	Increased negative flows in June-August in most years and March in wet years.	No change.	Increased negative flows in July-August in most years and March and June in wet years.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Water Supplies						
Non-CVP and Non-SWP Deliveries	Deliveries similar.	Deliveries similar.	Deliveries similar.	Deliveries similar.	Deliveries similar.	Deliveries similar.
North of Delta CVP Water Deliveries: Agricultural Water Contractors	Deliveries reduced up to 16% over the long-term to 34% in critical dry years.	No change.	Deliveries reduced up to 16% over the long-term to 34% in critical dry years.	Deliveries similar over the long-term. Reduced up to 9% in dry years to 11% in critical dry years.	No change.	Deliveries reduced up to 16% over the long-term to 31% in critical dry years.
North of Delta CVP Water Deliveries: Municipal and Industrial Water Contractors	Deliveries similar.	No change.	Deliveries similar.	Deliveries similar.	No change.	Deliveries similar.
South of Delta CVP Water Deliveries: Agricultural Water Contractors	Deliveries reduced up to 23% over the long-term to 33% in critical dry years.	No change.	Deliveries reduced up to 23% over the long-term to 33% in critical dry years.	Deliveries similar over the long-term. Reduced up to 8% in dry years to 14% in critical dry years.	No change.	Deliveries reduced up to 24% over the long-term to 33% in critical dry years.
South of Delta CVP Water Deliveries: Municipal and Industrial Water Contractors	Deliveries reduced up to 10% over the long-term to 5% in critical dry years.	No change.	Deliveries reduced up to 10% over the long-term to 5% in critical dry years.	Deliveries similar.	No change.	Deliveries reduced up to 10% over the long-term to 8% in critical dry years.
CVP Water Deliveries: Eastside Division Contractors	Deliveries reduced up to 19% in critical dry years.	No change.	Deliveries reduced up to 19% in critical dry years.	Deliveries similar.	No change.	Deliveries reduced up to 19% in critical dry years.
North of Delta: SWP Water Deliveries under Table A without Article 21 water	Deliveries reduced up to 13% over the long-term to 20% in critical dry years.	No change.	Deliveries reduced up to 13% over the long-term to 20% in critical dry years.	Deliveries similar over the long-term and in dry years. Reduced by 10% in critical dry years.	No change.	Deliveries reduced up to 19% over the long-term to 21% in critical dry years.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
North of Delta: SWP Water Deliveries under Table A without Article 21 water	Deliveries reduced up to 18% over the long-term to 22% in critical dry years.	No change.	Deliveries reduced up to 18% over the long-term to 22% in critical dry years.	Deliveries similar over the long-term and in dry years. Reduced by 11% in critical dry years.	No change.	Deliveries reduced up to 19% over the long-term to 23% in critical dry years.
Surface Water Quality						
Salinity in Northern Delta (near Emmaton)	Salinity increased in June in wet to dry years (up to 21%). Reduced in fall and winter months in wet and above normal years (up to 79%).	No change.	Salinity increased in June in wet to dry years (up to 21%). Reduced in fall and winter months in wet and above normal years (up to 79%).	Salinity increased in June in wet to dry years (up to 35%). Reduced in fall and winter months in wet and above normal years (up to 24%).	No change.	Salinity increased in June in wet to dry years (up to 21%). Reduced in fall and winter months in wet and above normal years (up to 79%).
Salinity in Western Delta (near Port Chicago)	Salinity reduced in September-May (up to 49%).	No change.	Salinity reduced in September-May (up to 49%).	Salinity increased in June in wet to below normal years (up to 9%). Reduced in January-March (up to 25%).	No change.	Salinity reduced in September-May (up to 49%).
Salinity in Western Central Delta (near Antioch)	Salinity increased in June in wet to below normal years (up to 16%). Reduced in fall and winter months (up to 73%).	No change.	Salinity increased in June in wet to below normal years (up to 16%). Reduced in fall and winter months (up to 73%).	Salinity increased in May in wet years and June in wet to dry years (up to 20%). Reduced in January-April (up to 40%).	No change.	Salinity increased in June in wet to below normal years (up to 14%). Reduced in fall and winter months (up to 73%).

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Salinity in Western Central Delta (near Contra Costa Water District Intakes)	Salinity increased in March-June (up to 47%). Reduced in October-January and September (up to 42%).	No change.	Salinity increased in March-June (up to 47%). Reduced in October-January and September (up to 42%).	Salinity increased in March-April in dry and critical dry years (up to 16%). Reduced in December-February in dry and critical dry years (up to 23%).	No change.	Salinity increased in March-June (up to 63%). Reduced in October-January and September (up to 41%).
Salinity in Southern Delta (near CVP and SWP intakes)	Salinity increased in February-June (up to 23%). Reduced in October-January (up to 28%).	No change.	Salinity increased in February-June (up to 23%). Reduced in October-January (up to 28%).	Salinity increased in February-May in dry and critical dry years (up to 23%).	No change.	Salinity increased in February-June (up to 26%). Reduced in October-January (up to 28%).
Mercury in Delta Fish	Mercury concentrations increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	No change.	Mercury concentrations increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	Similar conditions.	No change.	Mercury concentrations increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).
Selenium in Delta and Delta Fish	Selenium concentrations similar concentrations.	No change.	Selenium concentrations similar concentrations.	Selenium concentrations similar concentrations.	No change.	Selenium concentrations similar concentrations.
Groundwater Resources						
Trinity River Region	Similar groundwater conditions.	No change.	Similar groundwater conditions.	Similar groundwater conditions.	No change.	Similar groundwater conditions.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Central Valley Region: Sacramento Valley	Similar groundwater conditions.	No change.	Similar groundwater conditions.	Similar groundwater conditions.	No change.	Similar groundwater conditions.
Central Valley Region: San Joaquin Valley	Increased groundwater pumping (8%); and lower groundwater elevations (2-200 feet). Potentially reduced groundwater quality. Increased subsidence potential.	No change.	Increased groundwater pumping (8%); and lower groundwater elevations (2-200 feet). Potentially reduced groundwater quality. Increased subsidence potential.	Similar groundwater pumping; and similar to lower groundwater elevations (2-25 feet). Similar groundwater quality. Similar subsidence potential.	No change.	Increased groundwater pumping (8%); and lower groundwater elevations (2-200 feet). Potentially reduced groundwater quality. Increased subsidence potential.
San Francisco Bay Area, Central Coast, and Southern California Region	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.	No change.	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.	No change.	Potentially increased groundwater pumping; and potentially lower groundwater elevations. Potentially reduced groundwater quality. Increased subsidence potential.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
CVP and SWP Energy Resources						
Energy Generated and Used by CVP and SWP Water Users	Similar CVP net generation. Increased net generation over the long-term (29%). Potentially increased energy use by CVP and SWP water users.	No change.	Similar CVP net generation. Increased net generation over the long-term (29%). Potentially increased energy use by CVP and SWP water users.	Similar CVP net generation. Increased net generation over the long-term (10%). Potentially increased energy use by CVP and SWP water users.	No change.	Similar CVP net generation. Increased net generation over the long-term (30%). Potentially increased energy use by CVP and SWP water users.
Aquatic Resources						
Trinity River: Coho Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Spring-run Chinook Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Fall-run Chinook Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Steelhead	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Green Sturgeon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity Lake and Lewiston Reservoir: Reservoir Fish	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Pacific Lamprey	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Trinity River: Eulachon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Sacramento River System: Winter-run Chinook Salmon	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.	No change.	Similar conditions.	Improved habitat conditions due to improved escapement potential and predator controls.	Similar conditions.	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.
Sacramento River System: Spring-run Chinook Salmon	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.	No change.	Similar conditions.	Improved habitat conditions due to harvest limitations and predator controls.	Similar conditions.	Improved habitat conditions due to fish passage at dams and other actions to address high water temperatures caused by climate change by 2030.
Sacramento River System: Fall-run Chinook Salmon	Similar conditions.	No change.	Similar conditions.	Similar conditions.	Similar conditions.	Similar conditions.
Sacramento River System: Late Fall-run Chinook Salmon	Improved habitat conditions due to measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.	No change.	Similar conditions.	Similar conditions.	Similar conditions.	Improved habitat conditions due to measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Sacramento River System: Steelhead	Improved habitat conditions due to fish passage programs to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.	No change.	Similar conditions.	Similar conditions.	Similar conditions.	Improved habitat conditions due to fish passage programs to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.
Sacramento River System: Green Sturgeon and White Sturgeon	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030 that are not improved by other actions.	No change.	Similar conditions.	Improved habitat conditions due to lower water temperatures.	No change.	Reduced habitat conditions due to lack of measures to address high water temperatures caused by climate change by 2030 that are not improved by other actions.
Delta: Delta Smelt	Improved habitat conditions due to reduced potential for entrainment during larval and juvenile stages, and reduced salinity in the fall in the western Delta.	No change.	Similar conditions.	Similar conditions.	No change.	Improved habitat conditions due to reduced potential for entrainment during larval and juvenile stages, and reduced salinity in the fall in the western Delta.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Delta: Longfin Smelt	Improved habitat conditions due to more positive Old and Middle River flows and other factors (as indicated by higher Longfin Smelt abundance indices).	No change.	Similar conditions.	Similar conditions.	No change.	Improved habitat conditions due to more positive Old and Middle River flows and other factors (as indicated by higher Longfin Smelt abundance indices).
Delta: Sacramento Splittail	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Reservoir Fish	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Pacific Lamprey	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Sacramento River System: Striped Bass, American Shad, and Hardhead	Similar conditions for Hardhead. Improved habitat conditions for Striped Bass and American Shad due to improved survival in larval and juvenile stages and reduced salinity in the spring in the western Delta.	No change.	Similar conditions.	Similar habitat conditions for Hardhead, Striped Bass, and American Shad. Adverse conditions for Striped Bass due to changes in harvest limitations.	No change in habitat conditions for Hardhead, Striped Bass, and American Shad. Adverse conditions for Striped Bass due to changes in harvest limitations.	Similar conditions for Hardhead. Improved habitat conditions for Striped Bass and American Shad due to improved survival in larval and juvenile stages and reduced salinity in the spring in the western Delta.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Stanislaus River: Fall-run Chinook Salmon	Similar or improved conditions.	No change.	Similar conditions.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain.	Potential improved habitat conditions due to predator controls, trap and haul operations, and harvest restrictions; however, the effectiveness of these measures is uncertain.	Similar or improved conditions.
Stanislaus River: Steelhead	Improved habitat conditions due to measures to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.	No change.	Similar conditions.	Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain.	Potential improved habitat conditions due to predator controls and trap and haul operations; however, the effectiveness of these measures is uncertain.	Improved habitat conditions due to measures to address high water temperatures caused by climate change by 2030; and measures to increase efficiency of fish handling facilities at Banks and Jones pumping plants.
Stanislaus River: White Sturgeon	Conditions may be similar; however, improved conditions could occur due to lower water temperatures.	No change.	Similar conditions.	Similar conditions.	No change.	Conditions may be similar; however, improved conditions could occur due to lower water temperatures.
New Melones Reservoir; Reservoir Fish	Similar conditions.	No change.	Similar conditions.	Improved conditions for black bass nest survival.	No change.	Similar conditions.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Stanislaus River: Other Fish	Similar conditions.	No change.	Similar conditions.	Similar conditions for lamprey and Hardhead. Adverse conditions for Striped Bass due to changes in harvest limitations.	Similar conditions for lamprey and Hardhead. Adverse conditions for Striped Bass due to changes in harvest limitations.	Similar conditions.
Pacific Ocean: Killer Whale	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Terrestrial Resources						
Terrestrial Resources along Shoreline of CVP and SWP Reservoirs	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Terrestrial Resources along Rivers Downstream of CVP and SWP Reservoirs	Similar or improved conditions along Trinity, Sacramento, American, and Stanislaus rivers. Reduced conditions along Feather River. No mitigation measures identified at this time for changes along Feather River.	No change.	Similar or improved conditions along Trinity, Sacramento, American, and Stanislaus rivers. Reduced conditions along Feather River. No mitigation measures identified at this time for changes along Feather River.	Similar or improved conditions along Trinity, Sacramento, Feather, and American rivers. Reduced conditions along Stanislaus River. No mitigation measures identified at this time for changes along Stanislaus River.	No change.	Similar or improved conditions along Trinity, American, and Stanislaus rivers. Reduced conditions along Feather and Sacramento rivers. No mitigation measures identified at this time for changes along Feather and Sacramento rivers.
Terrestrial Resources in Yolo Bypass	Similar conditions in Yolo Bypass.	No change.	Similar conditions in Yolo Bypass.	Similar conditions in Yolo Bypass.	No change.	Similar or reduced conditions in Yolo Bypass.
Terrestrial Resources in Western Delta	Increased extent of freshwater habitat in western Delta.	No change.	Increased extent of freshwater habitat in western Delta.	Similar conditions.	No change.	Increased extent of freshwater habitat in western Delta.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Geology and Soils Resources						
Geology and Soils Resources	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Agricultural Resources						
Agricultural Production and Employment	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Land Use						
Municipal and Industrial Land Use	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Visual Resources						
Visual Resources of Land Irrigated with CVP and SWP Water	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Visual Resources at Reservoirs that Store CVP and SWP Water	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir. Similar conditions at San Luis Reservoir in above normal to dry years. Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%). Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir. Similar conditions at San Luis Reservoir in above normal to dry years. Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%). Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).	Similar conditions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir. Similar conditions at San Luis Reservoir in above normal to dry years. Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 9%). Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Recreation Resources						
Recreation Resources at Reservoirs that Store CVP and SWP Water	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir. Similar conditions at San Luis Reservoir in above normal to dry years. Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%). Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir. Similar conditions at San Luis Reservoir in above normal to dry years. Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 6%). Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).	Similar conditions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, and New Melones Reservoir. Similar conditions at San Luis Reservoir in above normal to dry years. Reduced conditions at San Luis Reservoir in wet and critical dry years (up to 9%). Potentially reduced conditions in the San Francisco Bay Area, Central Coast, and Southern California regions (up to 18%).
Recreation Resources in Rivers downstream of CVP and SWP Reservoirs	Similar or improved conditions; except reduced conditions in June and August along the Feather and American rivers, and in May along the Feather River and Sacramento River near Freeport.	No change.	Similar or improved conditions; except reduced conditions in June and August along the Feather and American rivers, and in May along the Feather River and Sacramento River near Freeport.	Similar or improved conditions along rivers. Reduced opportunities for Striped Bass and sport ocean salmon fishing.	No change along rivers. Reduced opportunities for Striped Bass and sport ocean salmon fishing.	Similar or improved conditions; except reduced conditions in May and June and August along the Sacramento and Feather rivers, in August along the American River; and in June-August along Stanislaus River.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Air Quality and Greenhouse Gas Emissions						
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Potential increase in emissions (up to 18%) in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Potential increase in emissions (up to 18%) in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions.	Similar conditions.	No change.	Similar air quality conditions in the Trinity River Region and Sacramento Valley. Potential increase in emissions (up to 18%) in the San Joaquin Valley and the San Francisco Bay Area, Central Coast, and Southern California regions.
Increased Greenhouse Gas Emissions due to Changes in Energy Resources Related to CVP and SWP Water Use	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Overall changes are not known at this time due to complexity of energy demands associated with alternative water supplies. However, GHG emissions could be reduced in the San Francisco Bay Area, Central Coast, and Southern California regions.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Cultural Resources						
Potential for Disturbance of Cultural Resources	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Public Health						
Water Supply Availability for Wildland Firefighting	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir (6%).	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir (6%).	Similar conditions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir (9%).
Potential Exposure to Mercury in Fish in Delta	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	Similar conditions.	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).
Socioeconomics						
Agricultural and Municipal and Industrial Employment	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.
Municipal and Industrial Water Supply Operating Expenses	Similar conditions.	No change.	Similar conditions.	Similar conditions.	No change.	Similar conditions.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Recreational Economics CVP and SWP Reservoirs	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir and reservoirs that store CVP and SWP water in San Francisco Bay Area, Central Coast, and Southern California regions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir and reservoirs that store CVP and SWP water in San Francisco Bay Area, Central Coast, and Southern California regions.	Similar conditions.	No change.	Similar conditions at Trinity Lake, Shasta Lake, Lake Oroville, Folsom Lake, and New Melones Reservoir. Reduced potential at San Luis Reservoir and reservoirs that store CVP and SWP water in San Francisco Bay Area, Central Coast, and Southern California regions.
Recreational Economics Related to Striped Bass Fishing in Delta	Similar conditions.	No change.	Similar conditions.	Reduced recreational opportunities and associated economics.	Reduced recreational opportunities and associated economics.	Similar conditions.
Commercial and Sport Ocean Salmon Fishing	Similar conditions.	No change.	Similar conditions.	Reduced commercial and sport ocean salmon fishing and associated economics.	Reduced commercial and sport ocean salmon fishing and associated economics.	Similar conditions.
Indian Trust Assets						
Potential for Disturbance of Indian Trust Assets	No change.	No change.	No change.	No change.	No change.	No change.

	No Action Alternative Compared to Second Basis of Comparison	Alternative 1 Compared to the Second Basis of Comparison	Alternative 2 Compared to the Second Basis of Comparison	Alternative 3 Compared to the Second Basis of Comparison	Alternative 4 Compared to the Second Basis of Comparison	Alternative 5 Compared to the Second Basis of Comparison
Environmental Justice						
Emissions of Criteria Air Pollutants and Precursors and/or Exposure of Sensitive Receptors to Substantial Concentrations of Air Contaminants from Diesel Engines at Groundwater Wells	Potential increase in emissions (up to 18%).	No change.	Potential increase in emissions (up to 18%).	Similar conditions.	No change.	Potential increase in emissions (up to 18%).
Potential Exposure to Mercury in Fish in Delta	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).	Similar conditions.	No change.	Increased near Rock Slough, San Joaquin River at Antioch, and Montezuma Slough (up to 7%).

3.7 References

Antelope Valley. 2013. *Antelope Valley Integrated Regional Water Management Plan, Final, 2013 Update*.

AVEK (Antelope Valley-East Kern Water Agency). 2011b. *Water Supply Stabilization Project No. 2 Implementation Grant Proposal*. AVRWC (Apple Valley Ranchos Water Company). 2011. *2010 Urban Water Management Plan*. June 23.

BARDP (Bay Area Regional Desalination Project). 2015. *About the Project, Schedule*. Site accessed January 12, 2015. http://www.regionaldesal.com/schedule.html

BCDC (Bay Conservation and Development Commission). 2011. *Draft Staff Report, Living with a Rising Bay: Vulnerability and Adaptation in San Francisco Bay and on its Shoreline, As Revised Through September 23, 2011*. September 23.

BWGWD (Biggs-West Gridley Water District). 2015. *Gray Lodge Water Supply Project*. Site accessed November 1, 2015. http://www.bwgwater.com/news-information/gray-lodge-water-supply-project

Carlsbad MWD (Carlsbad Metropolitan Water District). 2012. *Approval of a Mitigated Negative Declaration for Carlsbad Municipal Water District Phase III Recycled Water Project, Draft Initial Study/Mitigated Negative Declaration*. November 27.

CBMWD (Central Basin Municipal Water District). 2011. *Draft, 2010 Urban Water Management Plan*. March.

CBMWD (Central Basin Municipal Water District). 2011. *Initial Study, Central Basin Groundwater Storage Plan: A Blueprint for Future Reliability*. February.

CCSD (Cambria Community Services District). 2014. *Cambria Emergency Water Supply Project*. June.

CCWD (Contra Costa Water District). 2014. *Bay Area Regional Water Supply Reliability Presentation*. November 18.

CDFW (California Department of Fish and Wildlife Service). 2015. *CDFW Completes Drought Related Restoration Project at Lindsey Slough, Solano County*. Site accessed June 1, 2015. https://cdfgnews.wordpress.com/2014/12/19/cdfw-completes-drought-related-restoration-project-at-lindsey-slough-solano-county/

CDFW and DWR (California Department of Fish and Wildlife Service and California Department of Water Resources). 2013. *DRERIP Evaluation*

for Prospect Island Restoration Design Alternatives, Summary of a two-day workshop held at UC Davis, October 24-25, 2012. February.

City of Carlsbad. 2006. *California Environmental Quality Act (CEQA) Addendum City of Carlsbad, California Precise Development Plan and Desalination Plant Project, Final Environmental Impact Report*. June 13.

City of Fresno. 2011. *City of Fresno Recycled Water Master Plan, Final Environmental Impact Report*. June.

City of Huntington Beach. 2010. *Draft Subsequent Environmental Impact Report, Seawater Desalination Project at Huntington Beach*. May.

City of Long Beach. 2015. *Capital Projects, Seawater Desalination*. Site accessed January 12, 2015. http://www.lbwater.org/overview-long-beach-seawater-desalination-project

City of Los Angeles (Los Angeles Department of Water and Power). 2005. *Integrated Resources Plan, Draft Environmental Impact Report*. November.

City of Los Angeles (Los Angeles Department of Water and Power). 2011. *Urban Water Management Plan, 2010*. May 3.

City of Los Angeles. 2013a. *Tujunga Spreading Grounds Enhancement Project, Final Environmental Impact Report*. April.

City of Los Angeles (Los Angeles Department of Water and Power). 2013b. *Initial Study, Los Angeles Groundwater Replenishment Project*. September.

City of Oxnard. 2013. *GREAT Program Update, City Council Report, December 10, 2013, Draft*. November 22.

City of Roseville. 2012. *Aquifer Storage and Recovery Program Final Environmental Impact Report*. March.

City of San Diego. 2009a. *Mission Valley Basin*. September 11.

City of San Diego. 2009a. *San Pasqual Basin*. September 11.

City of Santa Barbara. 2015. *Desalination*. Site accessed February 19, 2015. http://www.santabarbaraca.gov/gov/depts/pw/resources/system/sources/desalination.asp

City of Stockton. 2005. *Draft – Volume I, Stockton Delta Water Supply Project, Program Environmental Impact Report*. April.

CNRA (California Natural Resources Agency). 2015a. *California EcoRestore, A Stronger Delta Ecosystem*. Site accessed November 1, 2015. http://resources.ca.gov/ecorestore.

CNRA (California Natural Resources Agency). 2015b. *Restoring the Sacramento-San Joaquin Delta Ecosystem*. April.

CVRWQCB (Central Valley Regional Water Quality Control Board). 2011. *Irrigated Lands Regulatory Program, Program Environmental Impact Report*. March.

CVRWQCB (Central Valley Regional Water Quality Control Board). 2015. *CV-SALTS, Central Valley Salinity Alternatives for Long-Term Sustainability*. Site accessed April 29, 2015. http://www.waterboards.ca.gov/centralvalley/water_issues/salinity/

CWD (Camarosa Water District). 2015. *Local Water Desalination*. Site accessed January 25, 2015. http://www.camrosa.com/self_reliance_lwd.html

DSC (Delta Stewardship Council). 2011. *Draft Delta Plan Program Environmental Impact Report*. November.

DWR (California Department of Water Resources). 2007. *Value Engineering Study, Franks Tract Pilot Project, Final Report*. June.

DWR (California Department of Water Resources). 2010a. *Final Report, Stockton Deep Water Ship Channel, Demonstration Dissolved Oxygen Aeration Facility Project*. December.

DWR (California Department of Water Resources). 2010b. *Final Environmental Impact Report, North Delta Flood Control and Ecosystem Restoration Project*. October.

DWR (California Department of Water Resources). 2011a. *Scoping Report, North Bay Aqueduct Alternative Intake Project*. February.

DWR (Department of Water Resources). 2011b. Effects of U.S. Army Corps of Engineers' Policy on Levee Vegetation in California. Accessed September 26, 2011. water.ca.gov/floodsafe/leveeveg/.

DWR (California Department of Water Resources). 2013. *North-of-the-Delta Offstream Storage Preliminary Administrative Draft Environmental Impact Report*. December.

DWR and Reclamation (California Department of Water Resources and Bureau of Reclamation). 2014. *Draft Technical Information for Preparing Water Transfer Proposals (Water Transfer White Paper), Information for Parties Preparing Proposals for Water Transfers Requiring Department of Water Resources or Bureau of Reclamation Approval*. November.

DWR and SWRCB (California Department of Water Resources and State Water Resources Control Board). 2014. *2012/2013 Transfer Activity*. January 28.

DWR, Reclamation, USFWS and NMFS (California Department of Water Resources, Bureau of Reclamation, U.S. Fish and Wildlife Service, and National Marine Fisheries Service). 2013. *Draft Environmental Impact Report/Environmental Impact Statement for the Bay Delta Conservation Plan*. November.

EBMUD (East Bay Municipal Utility District). 2014. *Memo to the Board of Directors, Bay Area Regional Reliability Principles*. May 8.

EDWPA (El Dorado Water and Power Authority). 2010. *Supplemental Water Rights Project, Acquisition of 40,000 Acre-Feet Per Year of New Consumptive Water Draft Environmental Impact Report*. July 15.

EMWD (Eastern Municipal Water District). 2014a. *Administrative Draft, Mitigated Negative Declaration, Temecula Valley Regional Water Reclamation Facility, 23 MGD Expansion*. January.

EMWD (Eastern Municipal Water District). 2014b. *San Jacinto Regional Water Reclamation Facility*. March.

EMWD (Eastern Municipal Water District). 2014c. *Indirect Potable Reuse Program*. January 8.

EMWD (Eastern Municipal Water District). 2014c. *Hemet/San Jacinto Groundwater Management Area, 2013 Annual Report, Prepared for Hemet-San Jacinto Watermaster*. April.

FERC (Federal Energy Regulatory Commission). 2007. *Final Environmental Impact Statement for Hydropower License, Oroville Facilities, FERC Project No. 2100-052*, California.

FERC (Federal Energy Regulatory Commission). 2012. *Draft Environmental Impact Statement for Hydropower License, Middle Fork American River Hydroelectric Project – FERC Project No. 2079-069.* July.

FERC (Federal Energy Regulatory Commission). 2013. *Draft Environmental Impact Statement for for the Drum-Spaulding Hydroelectric Project (Project No. 2310-193) and Yuba-Bear Hydroelectric Project (Project No. 2266-102)*. May.

FERC (Federal Energy Regulatory Commission). 2015. *FERC: Hydropower-General Information – Licensing*. Site accessed April 29, 2015. http://www.ferc.gov/industries/hydropower/gen-info/licensing.asp

FID (Fresno Irrigation District). 2015. *FID Pond Measurement – State of California DWR LGA Grant*. Site accessed February 13, 2015. http://www.fresnoirrigation.com/index.php?c=36

IEUA (Inland Empire Utilities Agency). 2014. *Inland Empire Utilities Agency, 2013/14 Recycled Water Annual Report*.

IEUA (Inland Empire Utilities Agency). 2015. *Draft Fiscal Year 2015/16 Ten-Year Capital Improvement Plan*. January

JCSD et al. (Jurupa Community Services District, City of Ontario, Western Municipal Water District). 2010. *Chino Desalter Phase 3*. December.

KEYT (KEYT News). 2015. *Santa Barbara Desalination Plant Permit Approved*. Site accessed February 19, 2015.

http://www.keyt.com/news/santa-barbara-desal-plant-permit-approved/31055434

KRCD (Kings River Conservation District). 2012. *Sustainable Groundwater Management through an Integrated Regional Water Management Plan (IRWMP)*.

LACSD (Los Angeles County Sanitation District). 2005. *Final Palmdale Water Reclamation Plant 2025 Plan and Environmental Impact Report*. September.

Los Angeles County (County of Los Angeles). 2013. *Press Release, LA County Flood Control District Tapped to Receive $28 Million State Flood Protection, Water Supply Grant*. October 3.

Merced ID (Merced Irrigation District). 2015. *The Public Website for Relicensing of Merced Irrigation District's Merced River Hydroelectric Project, FERC Project No. 2179*. Site accessed January 13, 2015. http://www.eurekasw.com/mid/default.aspx?Paged=Next&p_StartTimeUTC=20131129T1

MID/TID (Modesto Irrigation District and Turlock Irrigation District). 2015. *Don Pedro Project Relicensing*. Site accessed January 13, 2015. http://www.donpedro-relicensing.com/default.aspx

MORE (Mokelumne River Water & Power Authority). 2015. *Status and Timeline*. Site accessed January 14, 2015. http://www.morewater.org/about_project/status_timeline.html

MWDOC (Metropolitan Water District of Orange County). *Doheny Desalination Project*. Site accessed January 12, 2015. http://www.mwdoc.com/services/dohenydesalhome

MWDSC (Metropolitan Water District of Southern California). 2010. *Integrated Water Resources Plan, 2010 Update*. October.

NMFS (National Marine Fisheries Service). 2013. *Biological Opinion, Dutch Slough Tidal Marsh Restoration Project*. February 7.

NRC (National Research Council of the National Academies). 2012. *Sustainable Water and Environmental Management in the California Bay-Delta*. Washington D.C.

NSJCGBA (Northeastern San Joaquin County Groundwater Banking Authority). 2011. *Eastern San Joaquin Basin Integrated Conjunctive Use Program Programmatic Environmental Impact Report*. February.

OMWD (Olivenhain Municipal Water District). 2015. North County Recycled Water Project on Track to Receive Millions More in State Grant Funds. Site accessed February 16, 2015. http://www.olivenhain.com/component/content/article/3-news/236-north-county-recycled-water-project-on-track-to-receive-millions-more-state-grant-funds.

PWD (Palmdale Water District). 2010. *Strategic Water Resources Plan, Final Report*. March.

RCWD (Rancho California Water District). 2011. *2010 Urban Water Management Plan Update*. June 30.

RCWD (Rancho California Water District). 2012. *Agricultural Water Management Plan*. December 13.

RD 2093 (Reclamation District 2093). 2011. *Northern Liberty Island Fish Conservation Bank, Final Initial Study/Mitigated Negative Declaration, SCH#2010122078*. February 2011.

Reclamation (Bureau of Reclamation). 2004a. *Implementation of the Central Valley Project Improvement Act, 10 Years of Progress, Fiscal Years 1993-2002*. May.

Reclamation (Bureau of Reclamation). 2004b. *Sacramento River Water Reliability Study*. March 16.

Reclamation (Bureau of Reclamation). 2009. *Record of Decision, Grasslands Bypass Project, 2010-2019*. December.

Reclamation (Bureau of Reclamation). 2010. *Draft Environmental Assessment, Antelope Valley Water Bank Initial Recharge and Recovery Facilities Improvement Project*. January.

Reclamation (Bureau of Reclamation). 2011a. *Draft CVPIA Fiscal Year 2012 Annual Work Plan, Clear Creek Restoration – CVPIA Section 3406(b)(12)*. December 9.

Reclamation (Bureau of Reclamation). 2011b. *Record of Decision Madera Irrigation District Water Supply Enhancement Project*. July.

Reclamation (Bureau of Reclamation). 2011c. *Finding of No New Significant Impact, 2011 CVPIA Gravel Replenishment Program, Stanislaus River at River Mile 58*. August.

Reclamation (Bureau of Reclamation). 2012. *Record of Decision San Joaquin River Restoration Program*. September 28.

Reclamation (Bureau of Reclamation). 2013a. *Clear Creek Restoration Program, Public Meeting*.

Reclamation (Bureau of Reclamation). 2013b. *Record of Decision, Water Transfer Program for the San Joaquin River Exchange Contractors Water Authority, 2014-2038*. July 30.

Reclamation (Bureau of Reclamation). 2013c. *2013 CVPIA Draft Annual Work Plans – Introduction*.

Reclamation (Bureau of Reclamation). 2013d. *Shasta Lake Water Resources Investigation Draft Environmental Impact Statement*. June.

Reclamation (Bureau of Reclamation). 2014a. *Record of Decision, Suisun Marsh Habitat Restoration, Preservation, and Management Plan*. April 21.

Reclamation (Bureau of Reclamation). 2014b. *Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report, Public Draft*. September.

Reclamation (Bureau of Reclamation). 2014c. *Upper San Joaquin River Basin Storage Investigation, Draft Environmental Impact Statement*. August.

Reclamation (Bureau of Reclamation). 2014d. *Santa Clara Valley Water District California Aqueduct Reverse Flow Project*. October.

Reclamation (Bureau of Reclamation). 2014e. *Lower American River Salmonid Spawning Gravel Augmentation and Side-Channel Habitat Establishment Program – 2014 Nimbus Project, Finding of No Significant Impact*. August.

Reclamation (Bureau of Reclamation). 2014f. *Contra Loma Reservoir and Recreation Area Final Resource Management Plan and Final Environmental Impact Statement.*

Reclamation (Bureau of Reclamation). 2014g. *Shasta Lake Water Resources Investigation Final Environmental Impact Statement*. December.

Reclamation (Bureau of Reclamation). 2015. *Westlands v. United States Settlement*. October.

Reclamation et al. (Bureau of Reclamation, Santa Clara Valley Water District, San Luis and Delta-Mendota Water Authority). 2011. *San Luis Low Point Improvement Project, Plan Formulation Report*. January.

Reclamation and CDPR (Bureau of Reclamation and California Department of Parks and Recreation). 2013. *San Luis Reservoir State Recreation Area Final Resource Management Plan/General Plan, Final Environmental Impact Statement/Environmental Impact Report.* June.

Reclamation and SLDMWA (Bureau of Reclamation and San Luis & Delta-Mendota Water Authority). 2015. *Long-term Water Transfers Environmental Impact Statement/Environmental Impact Report, Final*. March.

Reclamation and USFWS (Bureau of Reclamation and U.S. Fish and Wildlife Service). 2012. *Spawning and Rearing Habitat Restoration (gravel), CVPIA 3406b(13)*.

Reclamation, CCWD, and Western (Bureau of Reclamation, Contra Costa Water District, and Western Area Power Administration). 2010. *Los Vaqueros Expansion Project, Environmental Impact Statement/Environmental Impact Report*. March.

SBCWD (San Benito County Water District). 2014. *West Hills Water Treatment Plant Project, Draft Environmental Impact Report*. January.

SCVWD (Santa Clara Valley Water District). 2012. *2012 Water Supply and Infrastructure Master Plan*. October.

SDCWA (San Diego County Water Authority). 2009. *Camp Pendleton Seawater Desalination Project Feasibility Study*. December.

SDCWA (San Diego County Water Authority). 2014. *Fact Sheet, The Carlsbad Desalination Project*.

SDCWA (San Diego County Water Authority). 2015. *Seawater Desalination*. Site accessed January 12, 2015. http://www.sdcwa.org/seawater-desalination

SEWD (Stockton East Water District). 2012. *Farmington Groundwater Recharge Program*. Site accessed November 30, 2012. http://www.farmingtonprogram.org/index.html

SFCWA (State and Federal Contractors Water Agency). 2011. Two Years Old: Walking and Talking – Poised to Run? Urban Water Institute: August 25, 2011. August 25, 2011.

SFCWA (State and Federal Contractors Water Agency). 2013. *Lower Yolo Restoration Project, Draft Environmental Impact Report*. April 2013.

SFEI (San Francisco Estuary Institute). 2013. *Grasslands Bypass Project, Prepared by San Francisco Estuary Institute, U.S. Bureau of Reclamation, U.S. Environmental Protection Agency, U.S. Fish and Wildlife, U.S. Geological Survey, Central Valley Regional Water Quality Control Board, California Department of Fish and Game, San Luis & Delta-Mendota Water Authority, Annual Report 2010-2011*. November.

SFRRWQCB (San Francisco Bay Region Regional Water Quality Control Board). 2015. *Staff Summary Report, Fairfield-Suisun Sewer District, Fairfield-Suisun Wastewater Treatment Plant and Wastewater Collection System, Fairfield, Solano County – Reissuance of NPDES Permit*. March 11.

SJRECWA (San Joaquin River Exchange Contractors Water Authority). 2012. *Los Banos Creek Water Restoration Management Plan, Attachment 4 – Project Description*.

SJRRP (San Joaquin River Restoration Program). 2011. *Friant-Kern Canal Capacity Restoration, Draft*. June.

SJRRP (San Joaquin River Restoration Program). 2015. *Madera Canal Capacity Restoration Project*. Site accessed February 21, 2015. http://restoresjr.net/activities/site_specific/madera-canal/index.html

SRCSD (Sacramento Regional County Sanitation District). 2012. *Notice of Preparation*. May 7.

SWRCB (State Water Resources Control Board). 2006. *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary*. December 13.

SWRCB (State Water Resources Control Board). 2012. *Public Draft, Substitute Environmental Document in Support of Potential Changes to the Water*

Quality Control Plan for the San Francisco Bay-Sacramento/San Joaquin Delta Estuary: San Joaquin River Flows and Southern Delta Water Quality. December.

SWSD (Semitropic Water Storage District). 2011. *Delta Wetlands Project Place of Use, Final Environmental Impact Report*. August.

TID and MID (Turlock Irrigation District and Modesto Irrigation District). 2014. *Don Pedro Hydroelectric Project, FERC No. 2299, Final License Application, Exhibit E – Environmental Report*. April.

TRRP (Trinity River Restoration Program, including Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Forest Service, Hoopa Valley Tribe, Yurok Tribe, California Department of Water Resources, California Department of Fish and Wildlife, and Trinity County). 2012. *Trinity River Restoration Program 2011 Annual Report*. May.

TRRP (Trinity River Restoration Program, including Bureau of Reclamation, U.S. Fish and Wildlife Service, National Marine Fisheries Service, U.S. Forest Service, Hoopa Valley Tribe, Yurok Tribe, California Department of Water Resources, California Department of Fish and Wildlife, and Trinity County). 2014. *Typical Releases*. Site accessed September 4, 2014 http://www.trrp.net/restore/flows/typical/.

USACE (U.S. Army Corps of Engineers). 2009. *ETL 1110-2-571 Guidelines For Landscape Planting and Vegetation Management at Levees, Floodwalls, Embankment Dams, and Appurtenant Structures*. April 10.

USACE (U.S. Army Corps of Engineers). 2010. *Draft Process for Requesting a Variance from Vegetation Standards for Levees and Floodwalls--75 Fed. Reg. 6364-68*. February 9.

USACE et al. (U.S. Army Corps of Engineers, Bureau of Reclamation, Sacramento Area Flood Control Agency, and California Central Valley Flood Protection Board). 2012. Folsom Dam Modification Project Approach Channel, *Final Supplemental Environmental Impact Statement/ Environmental Impact Report*. December.

USEPA (U.S. Environmental Protection Agency). 2008. *Five-Year Review Report, Fourth Five-Year Review Report for Iron Mountain Mine Superfund Site, Redding, California*. July.

USGVMWD (Upper San Gabriel Valley Municipal Water District). 2013. *Integrated Resources Plan*. January.

USFWS (U.S. Fish and Wildlife Service). 2009. *Finding of No Significant Impact for the Lower Mokelumne River Spawning Habitat Improvement Project*. September 3.

USFWS (U.S. Fish and Wildlife Service). 2010. *Notice of Availability of Federal Assistance 2010 Request for Proposals, Mill Creek.*

VVWRA (Victor Valley Wastewater Reclamation Authority). 2015. *Apple Valley Subregional Water Recycling Plant*. Site accessed January 25, 2015. http://vvwra.com/index.aspx?page=122

WBMWD (Western Basin Municipal Water District). 2011. *Edward C. Little Water Recycling Facility Phase V Expansion, Initial Study/Mitigated Negative Declaration*. March.

WBMWD (West Basin Municipal Water District). 2015a. *Water Recycling Satellite Facilities*. Site accessed January 12, 2015. http://www.westbasin.org/water-reliability-2020/recycled-water/satellite-facilities

WBMWD (West Basin Municipal Water District). 2015b. *Ocean Water Desalination*. Site accessed January 12, 2015. http://www.westbasin.org/water-reliability-2020/ocean-water-desalination/overview

WDCWA (Woodland-Davis Clean Water Agency). 2013. *The Project*. Site accessed February 5, 2013. http://www.wdcwa.com/the_project

WMWD (Western Municipal Water District). 2015. *Arlington Desalter*. Site accessed January 19, 2015. http://wmwd.com/index.aspx?nid=301&PREVIEW=YES

WRD (Water Replenishment District). 2012. *Notice of Intent to Adopt a Negative Declaration for Leo J. Vanders Lans Water Treatment Facility Expansion Project, Revised March 9, 2012*. March 9.

WRD (Water Replenishment District). 2015. *Recirculated Draft Environmental Impact Report, Groundwater Reliability Improvement Program (GRIP), Recycled Water Project*. April.

WSRCD (Western Shasta Resource Conservation District). 2011. *Lower Clear Creek Aquatic Habitat and Waste Discharge Improvement Project*.

YNHP (Yolo County Natural Heritage Program). 2015. *Yolo Natural Heritage Plan*. Site accessed June 3, 2015. http://www.yoloconservationplan.org/

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Chapter 4

Approach to Environmental Analysis

This chapter describes the organization of the remaining chapters in the Environmental Impact Statement (EIS). It also defines the scope, extent, and framework of the environmental analysis, including a description of resources areas evaluated and not evaluated.

The resource chapters in this EIS (Chapters 5 through 21) describe the affected environment and the impact analysis for each resource associated with implementation of the No Action Alternative, Second Basis of Comparison, and Alternatives 1 through 5. Potential mitigation measures (if necessary and available) to avoid, reduce, or otherwise minimize potential adverse impacts to the environment due to implementation of Alternatives 1 through 5 as compared to conditions under the No Action Alternative are discussed within each resource section. Potential cumulative effects that would occur with implementation of the alternatives are described in each resource chapter.

4.1 Basis of the Environmental Analysis

The impact analysis is focused on the coordinated long-term operation of the Central Valley Project (CVP) and the State Water Project (SWP). This EIS addresses conditions that would result from the long-term operation of Alternatives 1 through 5 as compared to the long-term conditions that would occur under the No Action Alternative and the Second Basis of Comparison in the Year 2030. This EIS does not address interim changes that would occur between now and 2030.

This EIS does not address the impacts that could occur between now and 2030 due to the construction of projects that are assumed to be implemented under the No Action Alternative, Second Basis of Comparison, and Alternatives 1 through 5. As described in Chapter 3, Description of Alternatives, there are several ongoing projects that are assumed to be implemented in 2030, including facilities that require construction. The 2030 conditions assume the projected long-term conditions for each ongoing project as described in their respective environmental documents. This EIS does not address the construction activities of each ongoing project because those impacts are addressed in separate environmental documents for each project.

Implementation of the No Action Alternative and Alternatives 1, 3, 4, and 5 also could result in construction of facilities (e.g., fish passage facilities around dams or across the Delta under these alternatives). Because, at this time, it is not known if construction will be required to implement these provisions or the nature of future facilities, this EIS does not address the construction activities of the future facilities. Impacts of future facilities will be addressed in separate environmental

documents for each project. It is assumed that the provisions in the alternatives, including construction activities, would be implemented in 2030.

4.2 Resources Considered for Environmental Analysis

The resources and issues included in Chapters 5 through 22 were identified through a review of scoping comments and subsequent comments received from agencies and the public during preparation of this EIS, as described in Chapter 3, Description of Alternatives. The resources and issues are described and analyzed in the following chapters of this EIS.

- Chapter 5 – Surface Water Resources and Water Supplies
- Chapter 6 – Surface Water Quality
- Chapter 7 – Groundwater Resources and Groundwater Quality
- Chapter 8 – Energy
- Chapter 9 – Fish and Aquatic Resources
- Chapter 10 – Terrestrial Biological Resources
- Chapter 11 – Geology and Soils Resources
- Chapter 12 – Agricultural Resources
- Chapter 13 – Land Use
- Chapter 14 – Visual Resources
- Chapter 15 – Recreation Resources
- Chapter 16 – Air Quality and Greenhouse Gas Emissions
- Chapter 17 – Cultural Resources
- Chapter 18 – Public Health
- Chapter 19 – Socioeconomics
- Chapter 20 – Indian Trust Assets
- Chapter 21 – Environmental Justice
- Chapter 22 – Other National Environmental Policy Act (NEPA) Considerations
- Chapter 23 – Consultation and Coordination
- Chapter 24 – Distribution of Draft EIS
- Chapter 25 – List of Preparers
- Chapter 26 – Index

As described above, this EIS only addresses long-term operational impacts. It is assumed that the coordinated long-term operation of the CVP and SWP would not result in substantial impacts to transportation, noise, hazards and hazardous materials, infrastructure related to public services and utilities, and paleontological resources because there would not be ongoing construction activities and the operation and maintenance activities would be similar to conditions under the No Action Alternative or the Second Basis of Comparison.

Scoping comments were received related to potential impacts to transportation on highways and airports due to dust generated from noncultivated agricultural lands. The potential for changes in dust generation is addressed in Chapter 16, Air Quality and Greenhouse Gas Emissions; based upon the impact assessment, it does not appear that the amount of noncultivated land would change substantially between the alternatives and result in substantial change in dust generation.

It is recognized that the ability to fund some public services and utilities could be affected through implementation of the alternatives evaluated in this EIS. These potential changes related to water supply costs are addressed in Chapter 19, Socioeconomics.

Chapter 23 includes a discussion of comments received during scoping and meetings that were held throughout preparation of the EIS with stakeholders. Chapter 24 includes a list of recipients of this Draft EIS. Chapter 25 includes a list of preparers of this Draft EIS.

4.3 Methodology for the Environmental Analysis

This EIS assesses the potential impacts of changes that could result on the resources identified above from implementation of each of the alternatives as compared to the No Action Alternative and the Second Basis of Comparison. The impact analysis includes an evaluation of potential direct, indirect, and cumulative effects by resource.

4.3.1 Geographic Range of Analysis

The project area that could be affected varies by resource. As described in Chapter 1, Introduction, the project area includes most of the CVP facilities and CVP service areas, and all of the SWP facilities and the SWP service areas. For the analysis purposes, the project area was divided into five regions, as shown in Figure 4.1 at the end of this chapter. The geographic extent for each resource is described by applicable regions in Chapters 5 through 21. The geographic range of the project area encompasses 35 counties. The locations of CVP and SWP water supply facilities, locations of CVP and SWP water users, and areas potentially affected by the long-term coordinated operation of the CVP and SWP, are summarized in Table 4.1.

Table 4.1 Geographic Range of the EIS Analysis

Region	County	Reasons for Inclusion of County in Project Area
Trinity River	Trinity	CVP Facilities: Trinity Lake, and Lewiston and Whiskeytown reservoirs Trinity River downstream of Lewiston Dam
	Humboldt	Trinity River to confluence of lower Klamath River Lower Klamath River from Trinity County border to Del Norte County border
	Del Norte	Lower Klamath River from Humboldt County border to Pacific Ocean
Central Valley	Shasta	CVP Facilities: Shasta Lake and Keswick Reservoir Sacramento River downstream of Keswick Dam to Tehama County border
		CVP Water Users: Anderson-Cottonwood Irrigation District Bella Vista Water District Centerville Community Services District City of Redding City of Shasta Lake Clear Creek Community Services District Mountain Gate Community Services District Redding Rancheria Tribe Shasta Community Services District Shasta County Service Area No. 25 Shasta County Water Agency U.S. Forest Service Multiple Contracts with Individuals and Businesses
	Plumas	SWP Facilities: Antelope Lake, Lake Davis, and Frenchman Lake
		SWP Water Users: Plumas County Flood Control and Water Conservation District
	Tehama	CVP Facilities: Portion of the Tehama Colusa Canal and Corning Canal Sacramento River within Tehama County
		CVP Water Users: Corning Water District Kirkwood Water District Thomes Creek Water District Proberta Water District Lake California Property Owners Association Multiple Contracts with Individuals and Businesses

Region	County	Reasons for Inclusion of County in Project Area
Central Valley (continued)	Glenn	CVP Facilities: Portion of the Tehama Colusa Canal Sacramento River within Glenn County
		CVP Water Users: 4-E Water District Elk Creek Community Services District Glenn-Colusa Irrigation District Glide Water District Kanawha Water District Orland-Artois Water District Provident Irrigation District Stony Creek Water District U.S. Forest Service Portion of Sacramento National Wildlife Refuge
	Colusa	CVP Facilities: Portion of the Tehama Colusa Canal Sacramento River within Colusa County
		CVP Water Users: 4-M Water District Cachil Dehe Band of Wintu Indians of the Colusa Indian Community Carter Mutual Water Company Colusa County Water District Colusa Drain Mutual Water Company Cortina Water District County of Colusa County of Colusa (Stonyford) Davis Water District Glenn Valley Water District Holthouse Water District La Grande Water District Maxwell Irrigation District Myers-Marsh Mutual Water Company Princeton-Codora-Glenn Irrigation District Reclamation District No. 1004 Reclamation District No. 108 Roberts Ditch Irrigation Company Sartain Mutual Water Company Westside Water District Colusa National Wildlife Refuge Delevan National Wildlife Refuge Portion of Sacramento National Wildlife Refuge Multiple Contracts with Individuals and Businesses
	Butte	SWP Facilities: Lake Oroville and Thermalito Reservoir Sacramento River within Butte County
		CVP Water User: Gray Lodge Wildlife Area
		SWP Water User: Butte County Water and Resources Conservation District

Region	County	Reasons for Inclusion of County in Project Area
Central Valley (continued)	Sutter	Sacramento River within Sutter County
		CVP Water Users: Feather Water District Meridian Farms Water Company Natomas Basin Conservancy Pleasant Grove Verona Mutual Water Company Sutter Mutual Water Company Tisdale Irrigation and Drainage Company Sutter National Wildlife Refuge
		SWP Water Users: City of Yuba City
	Yuba	Sacramento River within Yuba County
		Water Supplies from Yuba County Water Agency are available to CVP and SWP
	Nevada	Water Supplies from Nevada County flow in the Bear River into CVP facilities on the American River
	Placer	CVP Water Facilities: Portion of Folsom Lake
		CVP Water Users: Placer County Water Agency City of Roseville San Juan Water District
	El Dorado	CVP Water Facilities: Portion of Folsom Lake
		CVP Water Users: El Dorado Irrigation District El Dorado County Water Agency
	Sacramento	CVP Water Facilities: Portion of Folsom Lake, Lake Natoma, and Folsom South Canal American River downstream of Nimbus Dam to confluence with Sacramento River Sacramento River and Delta within Sacramento County
		CVP Water Users: City of Folsom City of Sacramento Natomas Central Mutual Water Company Reclamation District No. 1000 Regional Water Authority Sacramento County Sacramento County Water Agency Sacramento Municipal Utility District Sacramento Suburban Water District San Juan Water District Natomas Basin Conservancy

Region	County	Reasons for Inclusion of County in Project Area
Central Valley (continued)	Yolo	CVP Facilities: Portion of the Tehama Colusa Canal Sacramento River and Delta within Yolo County Yolo Bypass
		CVP Water Users: City of West Sacramento Conaway Preservation Group Dunnigan Water District Eastside Mutual Water Company Pelger Mutual Water Company Reclamation District No. 900 Multiple Contracts with Individuals and Businesses
	Solano (included in San Francisco Bay Area Region in some chapters)	SWP Facilities: Portion of the North Bay Aqueduct Sacramento River and Delta within Solano County Yolo Bypass
		SWP Water Users: Solano County Water Agency
	Stanislaus	CVP Facilities: New Melones Reservoir and portion of the Delta Mendota Canal Stanislaus River downstream of New Melones Dam to confluence with San Joaquin River San Joaquin River within Stanislaus County
		SWP Facilities: Portion of the California Aqueduct
		CVP Water Users: Del Puerto Water District Oakdale Irrigation District Patterson Irrigation District West Stanislaus Irrigation District Portion of San Luis National Wildlife Refuge
		SWP Water Users: Oak Flat Water District
	Merced	CVP Facilities: San Luis and O'Neill reservoirs, portions of Delta-Mendota Canal and San Luis Canal San Joaquin River within Merced County
		SWP Facilities: San Luis and O'Neill reservoirs and portion of California Aqueduct

Region	County	Reasons for Inclusion of County in Project Area
Central Valley (continued)	Merced (continued)	CVP Water Users: Centinella Water District Central California Irrigation District City of Dos Palos Del Puerto Water District Eagle Field Water District Grasslands Water District Laguna Water District Oro Loma Water District San Luis Canal Company San Luis Water District Turner Island Water District U.S. Department of Veterans Affairs, San Joaquin Valley National Cemetery Widren Water District Merced National Wildlife Refuge Portion of San Luis National Wildlife Refuge Kesterson National Wildlife Refuge Los Banos and Volta Wildlife Areas, Grasslands Resources Conservation District
	Madera	CVP Facilities: Madera Canal
	San Joaquin	San Joaquin River and Delta within San Joaquin County
		CVP Water Users: Banta-Carbona Irrigation District Byron-Bethany Irrigation District Central San Joaquin Water Conservation District City of Tracy Del Puerto Water District South San Joaquin Irrigation District Stockton-East Water District The West Side Irrigation District West Stanislaus Irrigation District
	Fresno	CVP Facilities: Portions of Delta-Mendota Canal and San Luis Canal, Friant Dam and Millerton Lake San Joaquin River within Fresno County

Region	County	Reasons for Inclusion of County in Project Area
Central Valley (continued)	Fresno (continued)	CVP Water Users: Broadview Water District California Department of Fish and Wildlife Central California Irrigation District City of Avenal City of Coalinga City of Huron Coelho Family Trust Columbia Canal Company County of Fresno Eagle Field Water District Firebaugh Canal Company Fresno Slough Water District Hills Valley Irrigation District James Irrigation District Laguna Irrigation District Mercy Springs Water District Meyers Farm Pacheco Water District Panoche Water District Pleasant Valley Water District Reclamation District No. 1606 San Luis Water District Tranquility Irrigation District Tranquility Public Utility District Tri-Valley Water District Westlands Water District Widren Water District
		SWP Water Users: Dudley Ridge Water District
	Kings	SWP Facilities: Portion of the California Aqueduct
		CVP Water Users: Angiola Water District Atwell Island City of Avenal
		SWP Water Users: County of Kings Empire West Side Irrigation District Tulare Lake Basin Water Storage District
	Tulare	CVP Water Users: County of Tulare Tranquility Public Utility District Pixley National Wildlife Refuge
	Kern	CVP Facilities: Cross Valley Canal and portion of the California Aqueduct
		SWP Facilities: Portion of the California Aqueduct

Region	County	Reasons for Inclusion of County in Project Area
Central Valley (continued)	Kern (continued)	CVP Water Users: Kern National Wildlife Refuge Kern Tulare Water District Pixley Irrigation District
		SWP Water Users: Kern County Water Agency
San Francisco Bay Area	Alameda	CVP Facilities: Jones Pumping Plant and northern reaches of Delta-Mendota Canal
		SWP Facilities: Banks Pumping Plant, Bethany Reservoir, Lake Del Valle, and portions of the South Bay Aqueduct and California Aqueduct
		CVP Water Users: East Bay Municipal Utility District
		SWP Water Users: Alameda County Water District Zone 7 Water Agency
	Contra Costa	CVP Facilities: Contra Costa Pumping Plant, Contra Loma Reservoir, and Contra Costa Canal Delta within Contra Costa County
		SWP Facilities: Clifton Court Forebay
		CVP Water Users: Byron-Bethany Irrigation District Contra Costa Water District
	Santa Clara	CVP Facilities: Santa Clara Conduit
		SWP Facilities: Portion of the South Bay Aqueduct
		CVP and SWP Water Users: Santa Clara Valley Water District
	San Benito	CVP Water Facilities: Pacheco Conduit, San Justo Reservoir, and Hollister Conduit
		CVP Water Users: San Benito County Water District
	Napa	SWP Facilities: Portion of the North Bay Aqueduct
		SWP Water Users: County of Napa
Central Coast	San Luis Obispo	SWP Facilities: Portion of Coastal Branch Aqueduct
		SWP Water Users: Central Coast Water Authority San Luis Obispo County Flood Control and Water Conservation District

Region	County	Reasons for Inclusion of County in Project Area
Central Coast (continued)	Santa Barbara	SWP Facilities: Portion of Coastal Branch Aqueduct
		SWP Water Users: Central Coast Water Authority Santa Barbara County Flood Control and Water Conservation District
Southern California	Ventura	SWP Water Users: Ventura County Watershed Protection District
	Los Angeles	SWP Facilities: Portion of California Aqueduct
		SWP Water Users: Antelope Valley-East Kern Water Agency Castaic Lake Water Agency Littlerock Creek Irrigation District Metropolitan Water District of Southern California Palmdale Water District San Gabriel Valley Municipal Water District
	Orange	SWP Water Users: Metropolitan Water District of Southern California
	San Diego	SWP Water Users: Metropolitan Water District of Southern California
	Riverside	SWP Facilities: Portion of California Aqueduct
		SWP Water Users: Desert Water Agency Coachella Valley Water District Metropolitan Water District of Southern California San Gorgonio Pass Water Agency
	San Bernardino	SWP Facilities: Portion of California Aqueduct
		SWP Water Users: Crestline Lake Arrowhead Water Agency Metropolitan Water District of Southern California Mojave Water Agency San Bernardino Valley Municipal Water District

4.3.2 Regulatory Environment and Compliance Requirements

Potential actions that could be implemented under the alternatives evaluated in this EIS that are located on Federal or state lands, or actions that are implemented, funded, or approved by Federal and state agencies, need to be compliant with appropriate Federal and state agency policies and regulations. Federal and state policies and regulations that could be relevant to implementation of the alternatives evaluated in this EIS are summarized in Appendix 4A.

4.3.3 Affected Environment

The Affected Environment portions of Chapters 5 through 21 provide an adequate level of detail for the quantitative and qualitative impact analyses presented in this EIS. Changes in CVP and SWP operations could result in changes to:

- Water elevations in reservoirs that store CVP and SWP water supplies, including reservoirs owned by regional and local water agencies that use CVP and/or SWP water, and associated use of the reservoir or surrounding areas to support biological resources, visual resources, recreation, and cultural resources
- Flow rates and water quality in rivers downstream of CVP and SWP reservoirs, and associated use of the rivers to support biological resources, protection of soils from erosion along the rivers, and recreation
- Flows and water quality in the Delta, including Delta outflow and reverse flows, and associated use of the rivers to support beneficial uses including biological resources and food and water supplies for human consumption
- CVP and SWP deliveries, and associated changes in groundwater use, CVP and SWP energy use and generation, and land use which could affect air quality, human health, soil erosion, and cultural resources.

References are provided for each chapter and not compiled for the entire EIS.

4.3.4 Impact Analysis

In accordance with the Council on Environmental Quality regulations, an EIS must evaluate the effects of implementation of the alternatives on the environment, any adverse environmental effects which cannot be avoided, the relationship between short-term uses of the human environment and long-term productivity, and any irreversible or irretrievable commitments of resources if the alternatives are implemented. The impact analyses sections address direct, indirect, and cumulative effects of the alternatives in each resource chapter (Chapters 5 through 21), and are organized in the following manner to describe the approach and present the results of the impact assessment.

- Potential Mechanisms for Change and Analytical Tools
- Conditions in Year 2030 without Implementation of Alternatives 1 through 5
- Evaluation of Alternatives
  - Comparison of the No Action Alternative to the Second Basis of Comparison
  - Comparison of Alternatives 1 through 5 to the No Action Alternative
  - Comparison of Alternatives 1 through 5 to the Second Basis of Comparison
  - Summary of Impact Analysis
  - Potential Mitigation Measures
  - Cumulative Effects Analysis

The impact analysis includes quantitative and qualitative analyses depending upon the availability of acceptable numerical analytical tools and available information. The quantitative analyses include numerous analytical tools, as summarized in Figure 4.2.

An EIS must identify relevant, reasonable mitigation measures that are not already included in the proposed action or alternatives to the proposed action that could avoid, minimize, rectify, reduce, eliminate, or compensate for the project's adverse environmental effects (40 Code of Federal Regulations [CFR] 1502.14, 1502.16, 1508.8). Mitigation measures are presented for each resource to avoid, minimize, rectify, reduce, eliminate, or compensate for adverse environmental effects of Alternatives 1 through 5 as compared to the No Action Alternative. Mitigation measures were not included to address adverse impacts under the alternatives as compared to the Second Basis of Comparison because this analysis was included in this EIS for information purposes only.

The cumulative effects of implementation of reasonably foreseeable projects and the alternatives as compared to conditions under the No Action Alternative and Second Basis of Comparison are discussed for each resource in Chapters 5 through 21. Cumulative effects are impacts on the environment that result from the incremental impacts of an alternative when added to other past, present, and reasonably foreseeable future actions of Federal, state, or local agencies or individual entities or persons (40 CFR 1508.7). Such impacts can result from individually minor, but collectively significant, actions taking place over time (40 CFR 1508.8).

4.3.5 Other NEPA Considerations

The irreversible and irretrievable commitments of resources, and the relationship between short-term uses of the environment and long-term productivity are discussed in Chapter 22, Other NEPA Considerations.

4.3.6 Consultation and Coordination

Public outreach and agency involvement efforts related to preparation of the Draft EIS and Final EIS are presented in Chapter 23, Consultation and Coordination. A listing of the agencies, other entities, and interest groups that received a copy of the Draft EIS and Final EIS is presented in Chapter 24, Distribution of Draft EIS. A list of preparers of the EIS is presented in Chapter 25.

Figure 4.1 Study Area

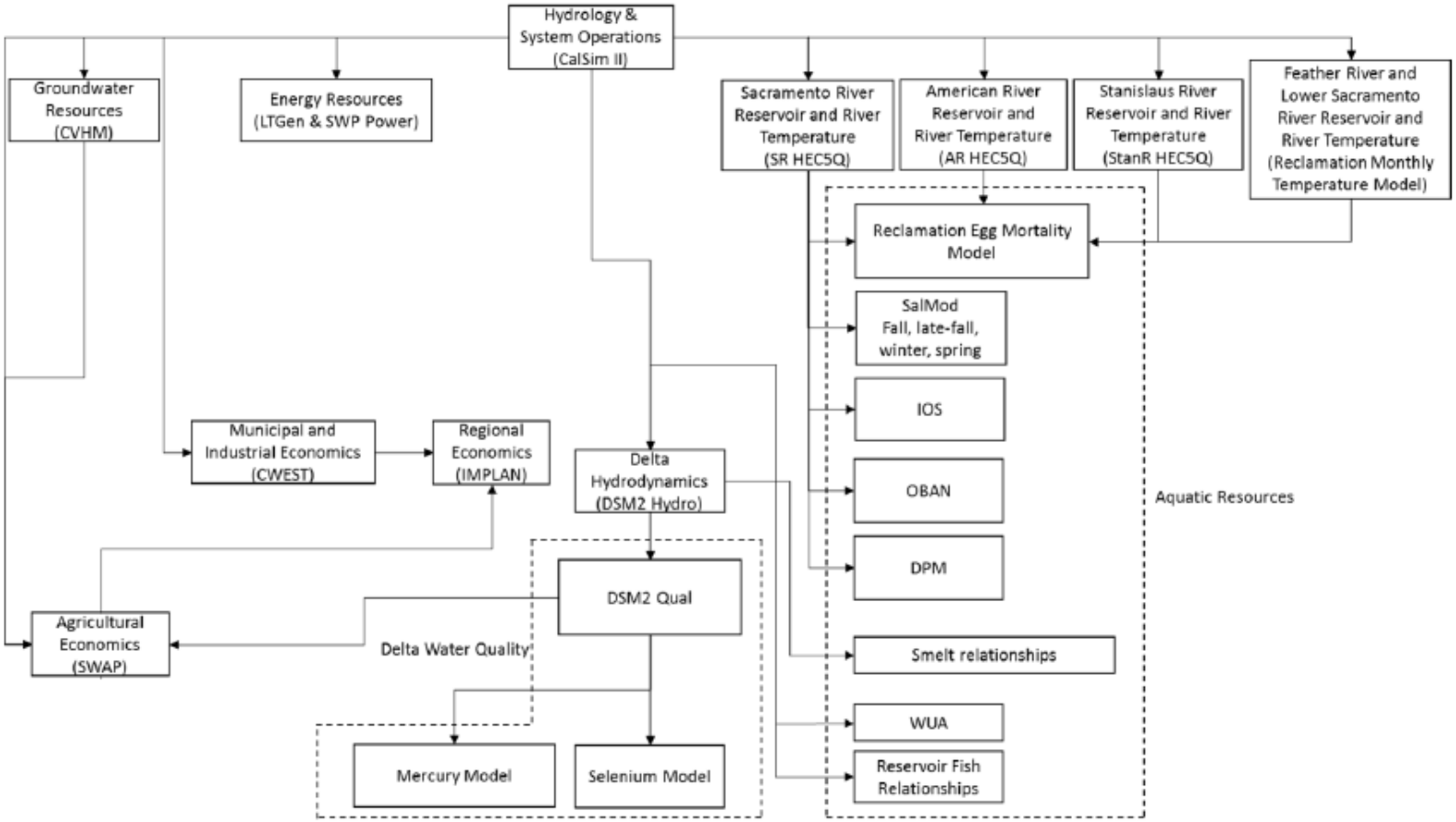

Figure 4.2 Analytical Framework Used to Evaluate Impacts of the Alternatives

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