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

EXECUTIVE SUMMARY

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Acronyms and Abbreviations

AF	acre-foot
AFY	AF per year
BO	Biological Opinion
CCR	Code of Regulations
CEQA	California Environmental Quality Act
Cfs	cubic feet per second
CO2e	carbon dioxide equivalent
COG	coordinated operations group
CWA	Clean Water Act
Delta	Sacramento–San Joaquin Delta
DFG	Department of Fish and Game
dS/m	deciSiemens per meter
DWR	Department of Water Resources
EC	electrical conductivity
EIR	environmental impact report
FERC	Federal Energy Regulatory Commission
HORB	head of Old River
LSJR	Lower San Joaquin River
MCL	maximum contaminant level
MT	megatons
NOP	Notice of Preparation
NPDES	National Pollution Discharge Elimination System Permit
OMR	Old Middle River
Regional Water Boards	Regional Water Quality Control Boards
SDWA	South Delta Water Agency
SDWQ	southern Delta water quality
SED	substitute environmental document
SJR	San Joaquin River
SJRA	San Joaquin River Agreement
SJRGA	San Joaquin River Group Authority
SJRMEP	San Joaquin River Monitoring and Evaluation Program
State Water Board	State Water Resources Control Board
taf	thousand acre-feet
TMDL	Total Maximum Daily Load
USACE	U.S. Army Corps of Engineers
USBR	U.S. Bureau of Reclamation
USDOI	U.S. Department of the Interior

USFWS	U.S. Fish and Wildlife Service
VAMP	Vernalis Adaptive Management Program
WQCP	water quality control plans

ES1 Introduction

The State Water Resources Control Board (State Water Board) is considering amendments to the 2006 *Water Quality Control Plan for the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* (2006 Bay-Delta Plan). The amendments would establish new flow objectives on the Lower San Joaquin River (LSJR) and its three eastside tributaries[1] for the protection of fish and wildlife beneficial uses, new water quality (salinity) objectives for the protection of agricultural beneficial uses in the southern portion of the Sacramento–San Joaquin Delta (Delta), and a program of implementation to achieve those objectives. The new LSJR flow objectives and southern Delta water quality (SDWQ) objectives and associated program of implementation would replace the existing San Joaquin River (SJR) flow and southern Delta water quality objectives and associated program of implementation in the 2006 Bay-Delta Plan.

The purpose of this report is to document the State Water Board's analysis of the need for, and effects of, potential changes to the 2006 Bay-Delta Plan to establish new LSJR flow and SDWQ objectives and a program of implementation for those objectives. In addition to other legal requirements, the State Water Board must comply with the requirements of the California Environmental Quality Act (CEQA)[2] when adopting water quality control plans (WQCP). CEQA authorizes the Secretary of the Resources Agency to certify a regulatory program of a State agency as exempt from the requirements for preparing environmental impact reports (EIRs), negative declarations, and initial studies if certain conditions are met. (Pub. Resources Code, § 21080.5.) The State Water Board's water quality control planning program is a certified regulatory program and, thus, a SED may be prepared in lieu of an EIR. (*Ibid*.; Cal. Code Regs., tit. 14, § 15251, subd. (g).) The SED fulfills the requirements of CEQA, and the State Water Board's regulations to analyze the environmental and economic effects of the proposed regulatory activity and other factors (e.g., Pub. Resources Code, § 21159 and Porter-Cologne Water Quality Control Act [Porter-Cologne Act], Wat. Code, § 13000 et seq., and the federal Clean Water Act [CWA] [33 U.S.C., §1251 et seq.], as described in Chapter 1, *Introduction*, Section 1.5 of the SED). The SED and other information will inform the State Water Board's consideration of the 2006 Bay-Delta Plan amendments described above.[3] This update of the 2006 Bay-Delta Plan, which describes the actions needed to protect the Bay-Delta ecosystem, does not affect the water rights of anyone either within or outside of the Delta. Any

[1] The LSJR is that portion of the San Joaquin River between its confluence with the Merced River and downstream to Vernalis, and its three eastside tributaries include the Stanislaus, Tuolumne, and Merced Rivers.

[2] CEQA's basic purposes are to: 1) inform the decision makers and public about the potential significant environmental effects of a proposed project, 2) identify ways that environmental damage may be mitigated, 3) prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternative or mitigation measures when feasible, and 4) disclose to the public why an agency approved a project if significant effects are involved. (Cal. Code Regs., tit. 14, § 15002, subd. (a).) To fulfill these functions, a CEQA review need not be exhaustive, and CEQA documents need not be perfect. The CEQA documents should be adequate, complete, and represent a good faith effort at full disclosure.
(Cal. Code Regs., tit.14, § 15151.)

[3] These plan amendments are the "project" as defined in State CEQA Guidelines, Section 15378.

changes to water rights that may be needed to implement the plan will be considered in future proceedings.

The SED evaluated a number of different 2006 Bay-Delta Plan amendment alternatives for State Water Board consideration. This executive summary begins with a description of what the State Water Board is considering as the preferred alternative for the LSJR flow objective and its program of implementation (Preferred LSJR Alternative) and the preferred alternative for the southern Delta water quality objective and its program of implementation (Preferred SDWQ Alternative). This is followed by some SED background information, descriptions of the other LSJR and SDWQ alternatives evaluated, and a summary of the potential environmental and economic impacts of all the alternatives, including the preferred alternatives.

ES2 Preferred Alternatives

The narrative flow objective that the State Water Board is considering for the Preferred LSJR Alternative intends to support and maintain the natural production of viable native SJR watershed fish populations migrating through the Delta. The Preferred LSJR Alternative would, if adopted, establish February–June flow requirements of 35 percent of unimpaired flow for three salmon bearing tributaries-- the Merced, Stanislaus, and Tuolumne Rivers. The Preferred SDWQ Alternative would revise the water quality objectives for salinity to reasonably protect agricultural beneficial uses, and happens to reflect existing conditions, which have been found to be suitable for all crops.

These preferred alternatives are being released, along with this draft SED, which describes the potential environmental effects of these alternatives. The SED evaluates the potential effects of the proposed objectives on hydrology and water quality, flooding, sediment and erosion, aquatic resources, terrestrial and biological resources, ground water resources, recreational resources, agricultural resources, cultural resources, and energy resources and climate change.

The SED relies upon recent scientific studies that conclude a higher and more variable flow regime is needed in salmon bearing tributaries to the SJR to protect fish migrating to the Delta. The SED also relies upon recent studies that conclude that current surface water salinity conditions in the southern Delta are suitable for irrigation of all agricultural crops.

Both the scientific support documents and the modeling of water supply, economic, and hydropower effects have been the subject of numerous public workshops and scientific peer review. The approach taken in developing and evaluating the alternatives were also reviewed by the National Research Council and the Delta Independent Science Board.

ES2.1 Preferred Lower San Joaquin River (LSJR) Alternative

The goal of the Preferred LSJR Alternative is to protect fish and wildlife by supporting and maintaining the natural production of viable native SJR watershed fish populations migrating through the Delta. The Preferred LSJR Alternative establishes February–June flow requirements of 35 percent of unimpaired flow, not to exceed flood control levels, along with base flow requirements. Unimpaired flow is the river flow that would occur if all runoff from the watershed remained in the river, without storage or diversion. Unimpaired flow can be used to approximate flows of a more natural pattern, and as a straightforward means to assist in balancing the competing uses of water. The 35 percent unimpaired flow requirement would strike a balance between

providing water for the protection of fish and other competing uses of water, including agriculture and hydropower generation. Since the SED analyzes the effects of a range of flows from 20 to 60 percent of unimpaired flow, the Board could select an alternative percent of unimpaired flow within this range.

This encourages adaptive management, not rigid adherence to a specific flow in order to respond to evolving scientific information, and allow for integration of the flow requirements with other regulatory processes. Water managers and State and federal fish agencies may develop proposals to maximize protection of fish and wildlife while minimizing water supply costs by releasing an alternative percentage of unimpaired flow, ranging between 25 percent and 45 percent, and/or shifting equivalent amounts of water into times that may be more beneficial to fishery resources.

ES2.2 Preferred Southern Delta Water Quality (SDWQ) Alternative

The goal of the Preferred SDWQ Alternative is to protect agriculture through new numeric objectives and a program of implementation that places responsibility on the USBR, DWR, and others, commensurate with their contribution to the southern Delta salinity impairments. Salinity conditions in the southern Delta are affected by various factors including low flows, salts imported to the SJR Basin in irrigation water, municipal discharges, groundwater percolation, poor circulation and water diversion and discharges from agricultural drainage. Peer reviewed scientific reports, released in 2012, present an approach to estimating crop yield impacts as a function of salinity. The findings of these reports support a salinity objective of 1.0 deciSiemens per meter (dS/m) as a 30-day running average of mean daily electrical conductivity (EC) during all months is protective of the most salt sensitive crops grown in the southern Delta. The reports also concluded that current surface water salinity conditions in the southern Delta are suitable for irrigation of all agricultural crops. The objectives are being revised to reasonably protect agricultural beneficial uses and the program of implementation is intended to either maintain, or improve upon existing conditions.

ES2.3 Summary of Impacts

The SED and supporting appendices have determined that the Preferred LSJR Alternative would generally increase mean annual river flows relative to baseline conditions, with that increase occurring mainly in the spring months. As a result, the quantity of surface water available for diversion in the three tributaries would generally be reduced. This would have a potentially significant impact on agricultural production dependent on these diversions and the associated sectors of the economy, particularly in the Tuolumne and Merced River watersheds where baseline flows on those rivers are lower than on the Stanislaus River. There may also be significant indirect impacts on groundwater and other resources if there is an increase in groundwater pumping in response to reduced surface water diversions.

Also, the amount of hydropower generation (megawatt-hours) each month would shift more into the spring months due to changes in reservoir operations, while average annual power generated would decrease only slightly. The impact on revenues from hydropower generation would be slightly greater because energy prices are generally less during May and June than July and August. The maximum hydropower generating capacity (megawatts) during the peak summer load months of July and August is not significantly impacted.

The Preferred SDWQ Alternative would impact municipal service providers to the extent wastewater treatment plants would have to comply with NPDES effluent limitations based on the new objectives, or a salinity management plan developed by the Central Valley Board that otherwise implements those objectives. Other potential impacts on the environment resulting from the Preferred SDWQ Alternative are less than significant, as they do not require any physical changes to the environment relative to baseline conditions. The potential impacts of both the Preferred LSJR and SDWQ Alternatives are summarized further in Section ES8 below.

ES3 Background

The State Water Board was formed in 1967 when the State Water Rights Board and the State Water Quality Control Board were merged by the legislature based on the realization that decisions affecting water quality and water rights are inseparable. The State Water Board is composed of five full-time appointees of the governor. Under its dual legal authority, the State Water Board allocates rights to the use of surface water and, together with the nine regional water quality control boards (Regional Water Boards), takes actions to ensure the highest reasonable quality for waters of the state through administration of the Porter-Cologne Act and portions of the CWA.

The 2006 Bay-Delta Plan is a WQCP established and periodically reviewed and modified by the State Water Board in accordance with applicable laws. The current 2006 Bay-Delta Plan was adopted by the State Water Board by Resolution No. 2006-0098 on December 13, 2006. The 2006 Bay-Delta Plan identified a number of emerging issues that required additional review and water quality control planning. Two of the emerging issues identified for further evaluation and prioritization were SJR flows and southern Delta salinity, which are the focus of the SED. The State Water Board again identified these issues for further review in the *2009 Staff Report on the Periodic Review of the 2006 Bay-Delta Plan*, adopted by Resolution No. 2009-0065 on August 4, 2009. As discussed above, other portions of the 2006 Bay-Delta Plan will be reviewed and updated as part of Phase II of the 2006 Bay-Delta Plan review.

In July of 2008, the State Water Board adopted the *Strategic Workplan for Activities in the San Francisco Bay/Sacramento–San Joaquin Delta Estuary* and committed to begin the process to review and potentially amend the SJR flow and southern Delta salinity objectives and associated programs of implementation included in the 2006 Bay-Delta Plan. The State Water Board began the amendment process in February of 2009 by issuing a notice of preparation (NOP) of environmental documentation and scheduling a scoping meeting in March of 2009 pursuant to the provisions of CEQA. In April of 2011, the State Water Board issued a revised NOP and notice of an additional scoping meeting for June of 2011. The State Water Board also held several other public meetings and workshops to receive information and conduct discussions regarding issues related to the plan amendment(s). The State Water Board also provided several additional opportunities for public comment related to aspects of the State Water Board's review. A timeline of these activities is provided below in Section ES4.

ES3.1 Lower San Joaquin River Flows

Storage reservoirs were constructed in the SJR Basin beginning with Friant Dam (Millerton Lake) in the 1940s. Since that time, native LSJR fish populations, including Chinook salmon and Central Valley steelhead, have declined. The SJR flows at Vernalis and in the three eastside tributaries are

generally much lower than the natural peaks in flow that would have occurred in spring and early summer because of reservoir storage and diversions. At the same time, the natural low flow periods of the late summer and early fall have been elevated at times due to agricultural return flows and power generation releases of previously stored water. The flow changes and physical habitat modification activities (e.g., gravel mining) have resulted in poor habitat conditions for native fishes.

The State Water Board first established the flow objectives for the SJR at Vernalis in the 1995 Bay-Delta Plan to protect fish and wildlife beneficial uses from the adverse effects of flow modifications. In the 1995 Bay-Delta Plan, the State Water Board developed SJR flow objectives primarily intended to protect fall-run Chinook salmon and provide incidental benefits to Central Valley steelhead from the three eastside tributaries. The State Water Board set different numeric objectives based on water year type for three time periods: February–June, excluding April 15–May 15 (spring flows); April 15–May 15 (pulse flows); and October (fall flows). The spring flows were intended to provide minimum net downstream freshwater flows in the SJR to address habitat concerns from reduced flows and water quality degradation. The pulse flows were developed to increase the success of Chinook salmon smolt outmigration from the SJR through the Bay-Delta. The fall flows were developed to provide attraction flows for adult salmon returning to the SJR watershed to spawn. The spring flow and pulse flow objectives include two levels for each time period. The trigger for the higher flow is linked to the February–June Delta outflow objectives (X2),[4] which are based on hydrologic conditions in the Sacramento River Basin and the SJR Basin.

During proceedings regarding implementation of the 1995 Bay-Delta Plan, the State Water Board tried an alternative approach to deciding the responsibilities of water right holders by providing them with an opportunity to reach settlement agreements with other water right holders and interested persons who proposed allocations that would responsibly meet the flow-dependent objectives in the 1995 Bay-Delta Plan. The result was the San Joaquin River Agreement (SJRA), which proposed an alternate method to meeting the SJR portions of the objectives in the 1995 Bay-Delta Plan. The signatory parties, including the California Resources Agency, the U.S. Department of the Interior (USDOI), San Joaquin River Group, Central Valley Project/State Water Project Export Interests, and two environmental groups, agreed that the San Joaquin River Group Authority (SJRGA) members would meet the experimental flows specified in the Vernalis Adaptive Management Plan (VAMP) in lieu of meeting the spring pulse flow objectives adopted in the 1995 Bay-Delta Plan. In Water Right Decision 1641 (D-1641), revised March 15, 2000, the State Water Board approved the conduct of VAMP for a period of 12 years in lieu of meeting the SJR pulse flow objectives and assigned responsibility to the U.S. Bureau of Reclamation (USBR) for meeting the SJR flow objectives. The State Water Board also approved petitions for water right changes and established the condition for the water rights of various SJRGA members to provide water for VAMP and the October pulse flow objective.

VAMP, which was initiated in 2000 and expired in 2011, was a large-scale, experimental management program that was designed to determine how juvenile fall-run Chinook salmon survival rates change in response to alterations in SJR flows and CVP and SWP exports with the installation of a barrier at the head of Old River (HORB). The VAMP experiment (implemented for a

[4] X2 is the location of the 2 parts per thousand salinity contour (isohaline), one meter off the bottom of the estuary measured in kilometers upstream from the Golden Gate Bridge. The abundance of several estuarine species has been correlated with X2. In the 1995 Bay-Delta Plan, an electrical conductivity value of 2.64 millimhos/centimeter (mmhos/cm) is used to represent the X2 location. Note, in the SED, electrical conductivity is generally expressed in deciSiemens per meter (dS/m). The conversion is 1 mmhos/cm = 1 dS/cm.

31-day period during April and May) was designed to assess a combination of flows, varying between 3,200 cubic feet per second (cfs) and 7,000 cfs, and exports varying between 1,500 and 3,000 cfs. Information from the VAMP experiment was intended to inform potential changes to the SJR flow objectives.

In the 2006 Bay-Delta Plan, the flow objectives were not modified, but the program of implementation was changed to allow for the ongoing staged implementation of the pulse flow objectives through VAMP. In addition, as discussed above, SJR flows were identified as an emerging issue requiring additional review and water quality control planning to address ongoing population declines of salmonids, despite implementation of VAMP, which have been largely attributed to inadequate flow conditions. Along with these population declines, the expiration of the SJRA, and with it the VAMP experiment, also prompted review of the SJR flow objectives.

ES3.2 Southern Delta Water Quality

Elevated salinity in the southern Delta is caused by various factors, including low flows; salts imported to the SJR Basin in irrigation water; municipal discharges; subsurface accretions from groundwater; tidal actions; diversions of water by the CVP, SWP, and local water users; channel capacity; and discharges from land-derived salts, primarily from agricultural drainage. Salinity in the southern Delta is also affected by evapoconcentration of salts due to local agricultural operations and, to a lesser extent, by local municipal wastewater treatment plant discharges. Poor flow or circulation patterns in the southern Delta waterways also cause localized increases in salinity concentrations.

The State Water Board established the current southern Delta salinity/electrical conductivity (EC)[5] objectives for the protection of agricultural beneficial uses in the 1978 Delta Plan. The 1978 Delta Plan includes salinity objectives for the protection of agriculture in the southern Delta at four compliance locations including: the SJR at Vernalis, the SJR at Brandt Bridge, Old River near Middle River, and Old River at Tracy Road Bridge. The approach used in developing the objectives involved an initial determination of the water quality needs of significant crops grown in the area, the predominant soil type, and local irrigation practices. In addition, the extent to which these water quality needs would be satisfied under "without project" (without the CVP and SWP) conditions was also considered. The State Water Board based the southern Delta EC objectives on the calculated maximum salinity of applied water (assuming no precipitation) that sustains 100 percent yields of two important salt-sensitive crops grown in the southern Delta (beans and alfalfa) in conditions typical of the southern Delta (surface irrigation of mineral soils) per the *University of California Guidelines* and *Irrigation and Drainage Paper 29: Water Quality for Agriculture of the Food and Agriculture Organization of the United Nations* . The State Water Board set an objective of 0.7 dS/m during the summer irrigation season (April 1–August 31) based on the salt sensitivity and growing season of beans and an objective of 1.0 dS/m during the winter irrigation season (September 1–March 31) based on the growing season and salt sensitivity of alfalfa during the seedling stage. In the 1978 Delta Plan, the State Water Board found that the most practical solution for long-term protection of southern Delta agriculture was construction of physical facilities to provide adequate circulation and substitute supplies.

[5] EC is electrical conductivity, which is generally expressed in deciSiemens per meter (dS/m). Measuring EC assesses salinity, which is the concentration of dissolved salts (often expressed in parts per thousand or parts per million). Because salinity refers to salt concentration in the water, whereas EC values are the result of one measurement technique to assess salinity, both "EC" and the more general term "salinity" are used in this chapter.

The State Water Board delayed implementation of the southern Delta salinity objectives pending negotiations by the Department of Water Resources (DWR), USBR, and the South Delta Water Agency (SDWA) concerning construction of physical facilities to protect agriculture in the southern Delta (permanent barriers or other devices). Because the negotiations were never completed, the 1991 Bay-Delta Plan provided for a staged implementation of the objectives. The 1991 Bay-Delta Plan called for implementation of the objectives at Vernalis and Brandt Bridge by 1994 and implementation of the objectives at the two Old River sites by 1996 unless a three-party agreement was reached between DWR, USBR, and SDWA. In the 1995 Bay-Delta Plan, the State Water Board further delayed implementation of the EC objectives for the two Old River sites until December 31, 1997.

In D-1641, the State Water Board authorized a staged implementation of the southern Delta EC objectives. Pursuant to D-1641, USBR was required to meet the Vernalis EC objectives using any measures available. DWR and USBR also were required to meet an EC objective of 1.0 dS/m at Brandt Bridge on the SJR, Old River near Middle River, and Old River at Tracy Road Bridge (the interior southern Delta stations) March–September until April 1, 2005. As of April 1, 2005, D-1641 required that DWR and USBR, through their water right permits and license, meet an EC objective of 0.7 dS/m April–August at the interior southern Delta stations unless permanent barriers were constructed or equivalent measures were implemented to protect southern Delta agriculture, along with an operations plan. The appellate court reviewing D-1641 struck down the provision allowing 1.0 EC to be met if such measures were taken. Accordingly, the objectives in the 2006 Bay-Delta Plan are in effect.

Since 1991, DWR has installed temporary rock barriers in the southern Delta at three locations to improve water levels, circulation patterns, and water quality in the southern Delta for local agricultural diversion.[6] DWR and USBR were planning to construct permanent physical facilities in the form of permanent operable gates (known as the South Delta Improvements Program) that would have provided better compliance with the objectives. However, the facilities have not been constructed to date, and their construction is unlikely due to endangered species concerns.

In 2006, the State Water Board issued a cease and desist order (CDO) against USBR and DWR for threatened violation of the interior southern Delta salinity objectives (WR 2006-0006). In 2010, the State Water Board issued Order WR 2010-0002 modifying Order WR 2006-0006. The modified order includes conditions to be met to protect agricultural beneficial uses in the southern Delta. Pursuant to Condition 5 of Order WR 2010-0002, DWR and USBR are required to continue implementing temporary barriers in the southern Delta and are required to pursue and implement feasible improvements to the temporary barriers. Pursuant to Condition 7 of Order WR 2010-0002, they are also required to study the feasibility of controlling salinity by implementing measures other than the temporary barriers project.

Since the issuance of the CDO, there have been many instances of exceedance of the EC objective in the southern Delta, in particular at the Old River near Tracy Road Bridge, Station P-12. Typically this exceedance occurs due to dry hydrologic conditions in the Sacramento River and SJR Basins and degradation occurring downstream of Vernalis**.**

As discussed above, southern Delta salinity was identified as an emerging issue requiring additional review and water quality control planning for objectives protective of agricultural beneficial uses

[6] DWR is the lead agency pursuant to CEQA and has prepared several environmental documents for construction and operations of the barriers.

and a program of implementation. The State Water Board again identified these issues for further review in the *2009 Staff Report on the Periodic Review of the 2006 Bay-Delta Plan*.

ES4 Planning Public Review and CEQA Noticing

The State Water Board considered comments received from regulatory agencies and the public during the scoping and public consultation processes in determining the scope of analysis and content of the SED. Comments received during these processes are posted on the State Water Board's website. Table ES-1 is a timeline of public involvement for the planning process, public workshops for the planning process, and CEQA noticing for the preparation of the SED.

Table ES-1. Timeline of Public Involvement for the Planning Process, Public Workshops, and CEQA Noticing

February 13, 2009	Notice of preparation (NOP) and public notice for the March 30, 2009 scoping meeting for environmental documentation and for the April 22, 2009 public staff workshop regarding the update and implementation of the *Bay-Delta Plan: Southern Delta Salinity and San Joaquin River Flows*.
March 30, 2009	Scoping meeting for environmental documentation for the update and implementation of the *Bay-Delta Plan: Southern Delta Salinity and San Joaquin River Flows*.
April 22, 2009	Public staff workshop concerning potential amendments to the 2006 Bay-Delta Plan relating to southern Delta salinity and SJR flow objectives.
June 19, 2009	Public staff workshop to provide an update regarding development of modeling alternatives and related activities for southern Delta salinity and SJR flow objectives.
August 4, 2009	Resolution 2009-0065. Adoption of the *Periodic Review of the 2006 Bay-Delta Plan* staff report.
August 13, 2009	Public staff workshop and availability of *Draft Study Report: Crop Salt Tolerance in the Southern Sacramento-San Joaquin River Delta*, by Dr. Glenn J. Hoffman.
November 4, 2009	Public staff workshop to discuss response to comments on salt tolerance of crops in the southern Sacramento–San Joaquin Delta.
January 5, 2010	Release of *Final Study Report: Crop Salt Tolerance in the Southern Sacramento–San Joaquin River Delta*.
March 2–3, 2010	The Vernalis Adaptive Management Program (VAMP) review.
May 11, 2010	Final VAMP report of the 2010 review panel.
October 29, 2010	Notice of public board workshop and availability of *Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*, as well as notice to receive comments on the draft technical report and panel participation requests to participate in the January 6 and 7, 2011 public State Water Board workshop.
November 22, 2010	Notice of opportunity for public comment for any additional information related to the SJR flow and southern Delta salinity objectives included in the *2006 Water Quality Control Plan for the San Francisco Bay/ Sacramento-San Joaquin Delta Estuary*.
January 6–7, 2011	Presentation and discussion of *Draft Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*.

April 1, 2011	Revised NOP and Notice of additional scoping meeting for environmental documentation for the update and implementation of the *Bay-Delta Plan: Southern Delta Salinity and San Joaquin River Flows*.
June 6, 2011	Workshop on the discussion of the clarified scope and content of the environmental information to be included in the State Water Board's environmental document relating to the State Water Board's current review of the 2006 Bay-Delta Plan.
August 12, 2011	Request for scientific peer review of the *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*, as well as the study report, *Crop Salt Tolerance in the Southern Sacramento–San Joaquin River Delta*.
November 21, 2011	Web posting of peer reviews of *Technical Report on the on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*.
February 24, 2012 (updated March 5, 2012)	Notice of availability of draft technical appendices to the substitute environmental document (SED) for Phase 1 of the update to the 2006 Bay-Delta Plan. • *Draft Scientific Basis for San Joaquin River Flow and Southern Delta Salinity Objectives* (Scientific Report) (dated February 2012). • *Draft Agricultural Economic Effects of Lower San Joaquin River Flow Alternatives* (Agricultural Economics Report) (Dated February 2012). • *Draft Hydropower and Electric Grid Analysis of Lower San Joaquin River Flow Alternatives* (Hydropower Report) (dated February 2012).
February 2012	Release of *Final Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*.
March 20, 2012	Informational session on the *Agricultural Economics Report* and the *Power Production Report* to provide stakeholders an opportunity to gain a better understanding of these two reports that inform the SED analysis.

ES5 Alternatives

The State CEQA Guidelines (14 California Code of Regulations [CCR] §15126.6) require that an environmental document (e.g., environmental impact report [EIR] or SED as part of a certified regulatory program) present a range of reasonable alternatives to the project, or to the location of the project, which would feasibly attain most of the basic project objectives but would avoid or substantially lessen any significant effects of the project. Section 15126.6 of the State CEQA Guidelines also requires an evaluation of the comparative merits of the alternatives. An environmental document is not required to consider alternatives that are infeasible. The purpose and goals of the plan amendments, the plan area, and the different alternatives are described below.

ES5.1 Purpose and Goals

The 2006 Bay-Delta Plan designates beneficial uses of water, establishes water quality objectives for the reasonable protection of those beneficial uses, and outlines a program of implementation for achieving the water quality objectives. The program of implementation contains actions that the State Water Board will undertake, including monitoring and special studies, to achieve the objectives. It also provides recommendations for other entities of actions they can take that will contribute to achieving the objectives. The purpose for the plan amendments is twofold:

- To establish flow objectives during the February–June period and a program of implementation for the reasonable protection of fish and wildlife beneficial uses in the, including the three eastside, salmon-bearing tributaries (the Stanislaus, Tuolumne, and Merced Rivers) and the LSJR.
- To establish southern Delta water quality objectives for the reasonable protection of southern Delta agricultural beneficial uses and a program of implementation to achieve the objectives.

As described in Appendix C, *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*, scientific information indicates that higher flows of a more natural pattern are needed from the three eastside, salmon-bearing tributaries during the spring (February–June) to protect fish and wildlife beneficial uses (including SJR Basin fall-run Chinook salmon and other important ecosystem processes). Therefore, the goals[7] related to the LSJR flow objectives and associated program of implementation are as follows.

- To provide flow conditions in the LSJR and three eastside tributaries and take other reasonably controllable measures sufficient to support and maintain the natural production of viable native fish populations migrating through the Delta, including flows that mimic the natural hydrographic conditions to which native fish species are adapted.
- To consider relevant factors in establishing the objectives, such as factors identified in Water Code Section 13241, those contained in other applicable laws (e.g., the past, present, and probable future beneficial uses of water), and economic factors.
- To provide for adaptive management of flows in order to respond to evolving scientific understanding and changing environmental conditions while minimizing water supply costs.
- To provide for development and implementation of an appropriate monitoring and evaluation program to inform adaptive management of LSJR flows and future changes to the Bay-Delta Plan.
- To provide for and encourage coordination and integration of existing and future regulatory processes related to LSJR flows.

As described in Appendix C, salt stress can damage crops in several different ways, including stunting growth, diminishing seedling success, and causing foliar damage. Salinity conditions in the southern Delta may increase due to salt loading from the SJR as it enters the southern Delta at Vernalis and by local sources and evapoconcentration of salinity within the southern Delta. Salinity conditions are also affected by the capacity of the southern Delta water bodies to assimilate these salinity inputs. This assimilative capacity is potentially affected by hydrodynamic conditions, such as water levels and the direction and magnitude of flow in the various channels of the southern Delta. The goals related to the SDWQ objectives and associated program of implementation are as follows.

- To provide water quality (i.e., salinity) conditions that reasonably protects agricultural beneficial uses of surface waters (i.e., irrigation water supply) in the southern Delta.

[7] State CEQA Guidelines Section 15124, subdivision (b), requires the lead agency to include a statement of the objectives sought by the proposed project. To avoid confusion with the term "objective" as it is used in reference to flow and water quality objectives, this document will refer to the "objectives" mentioned in Section 15124 instead as "goals."

- To consider relevant factors in establishing the objectives, such as factors identified in Water Code Section 13241, those contained in other applicable laws, (e.g., the past, present, and probable future beneficial uses of water), and economic factors.
- To balance actions needed to reasonably protect southern Delta agricultural beneficial uses with the needs for water to meet other beneficial uses of water.
- To provide for development and implementation of monitoring and modeling studies needed to better understand the characteristics of salinity conditions in the southern Delta and the dynamics of factors controlling or contributing to those conditions.

ES5.2 Plan Area

The plan amendments involve changes in flow requirements in the SJR Basin and changes in water quality objectives for the southern Delta (Figure ES-1). These plan amendments could directly affect portions of the SJR Basin and Delta that drain into, divert water from, or otherwise obtain beneficial use (e.g., surface water supplies) from the following water bodies.

- Stanislaus River from and including New Melones Reservoir to the confluence of the LSJR.
- Tuolumne River from and including New Don Pedro Reservoir to the confluence of the LSJR.
- Merced River from and including Lake McClure to the confluence with the LSJR.
- LSJR between the confluence of the Merced River to Vernalis.
- Southern Delta, including the SJR from Vernalis to Brandt Bridge; Middle River from Old River to Victoria Canal; and Old River/Grant Line Canal from the Head of Old River to West Canal.

These portions of the SJR Basin and Delta are referred to as the "plan area" throughout the SED (Figure ES-2).

ES5.3 Lower San Joaquin River (LSJR) Alternatives

The SED evaluates four alternatives for LSJR flows during the February–June time frame, including the No Project Alternative (LSJR Alternative 1) and three other LSJR alternatives (LSJR Alternatives 2, 3, and 4). The SED does not include changes to flow objectives outside of the February–June time frame (e.g., the October pulse flow objectives). However, the program of implementation does include monitoring, special studies, and evaluation efforts to inform future changes to flow objectives outside of the February–June time frame. In addition, updates to the coordination process for provision of the October pulse flows are being proposed[8] (see Appendix K, *Revised Water Quality Control Plan*) but will not have any effects on the environment and, therefore, are not discussed in the SED.

[8] Under the 2006 Bay-Delta Plan, the October pulse flows are required to be scheduled in consultation with the U.S. Fish and Wildlife Service (USFWS), National Marine Fisheries Service (NMFS), and the Department of Fish and Game (DFG). The 2006 Bay-Delta Plan states that consultation with the CALFED Operations Group, established under the Framework Agreement, will satisfy the consultation requirement. The proposed change to the consultation requirement would delete reference to the CALFED Operations Group. Instead, flows would be coordinated under a new operations group established through changes to the program of implementation.

LSJR Alternatives 2, 3, and 4 are comprised of a narrative objective and an associated program of implementation. The narrative objective includes four compliance points in the LSJR, including the confluence of the SJR at Vernalis and the confluence of the LSJR with the three eastside tributaries.

The narrative objective calls for the following.

> Maintain flow conditions from the San Joaquin River Watershed to the Delta at Vernalis, together with other reasonably controllable measures in the San Joaquin River Watershed, sufficient to support and maintain the natural production of viable native San Joaquin River Watershed fish populations migrating through the Delta. Flow conditions that reasonably contribute toward maintaining viable native migratory San Joaquin River fish populations include, but may not be limited to, flows that mimic the natural hydrographic conditions to which native fish species are adapted, including the relative magnitude, duration, timing, and spatial extent of flows as they would naturally occur. Indicators of viability include abundance, spatial extent or distribution, genetic and life history diversity, migratory pathways, and productivity.

The program of implementation includes specific flow requirements and other measures to implement the narrative objective. Specifically, February–June, the program of implementation would require a specified percent of unimpaired flow from the three eastside tributaries and a baseflow of 1,000 cfs on the SJR at Vernalis. The percent of unimpaired flow would not apply when such flows would cause flooding or other related public safety concerns. These levels would be established through consultation with federal, state, and local agencies and other appropriate interests with expertise in flood management.

The percentages of unimpaired flow under LSJR Alternatives 2, 3, and 4 are described below and range between minimum flows of 20 percent to 60 percent on a 14-day running average. These unimpaired flows were selected as alternatives to capture a range of potential flow alternatives that the State Water Board may implement. The alternative with the lowest flow, LSJR Alternative 2, is 20 percent unimpaired flow and was selected to bracket the low end of flows under current conditions.[9] LSJR Alternative 3 is 40 percent of unimpaired flow, which represents a mid-point for the analysis. LSJR Alternative 4 has the highest level of flow, with 60 percent of unimpaired flow. The State Water Board's 2010 report, *Development of Flow Criteria for the Sacramento–San Joaquin Delta Ecosystem*, determined that approximately 60 percent of unimpaired flow at Vernalis February–June would be fully protective of fish and wildlife beneficial uses in the three eastside tributaries and the LSJR when considering flow alone.

To develop precise requirements for implementation of the provisions described above, LSJR Alternatives 2, 3, and 4 call for establishing an implementation workgroup consisting of persons with expertise in fisheries management, unimpaired flows, and operations on the Stanislaus, Tuolumne, and Merced Rivers to develop recommendations for such measures that would best achieve the February–June flow requirements while minimizing water supply costs. The recommendations would be included in an implementation plan submitted to the Executive Director of the State Water Board for approval within a specified period. The implementation plan would then be considered in State Water Board water right proceedings, Federal Energy Regulatory Commission licensing proceedings, or during other implementation actions to achieve the February–June flows.

LSJR Alternatives 2, 3, and 4 would allow for adaptive management of the timing of flows. Specifically, the State Water Board's Executive Director could approve changes to the timing of flows

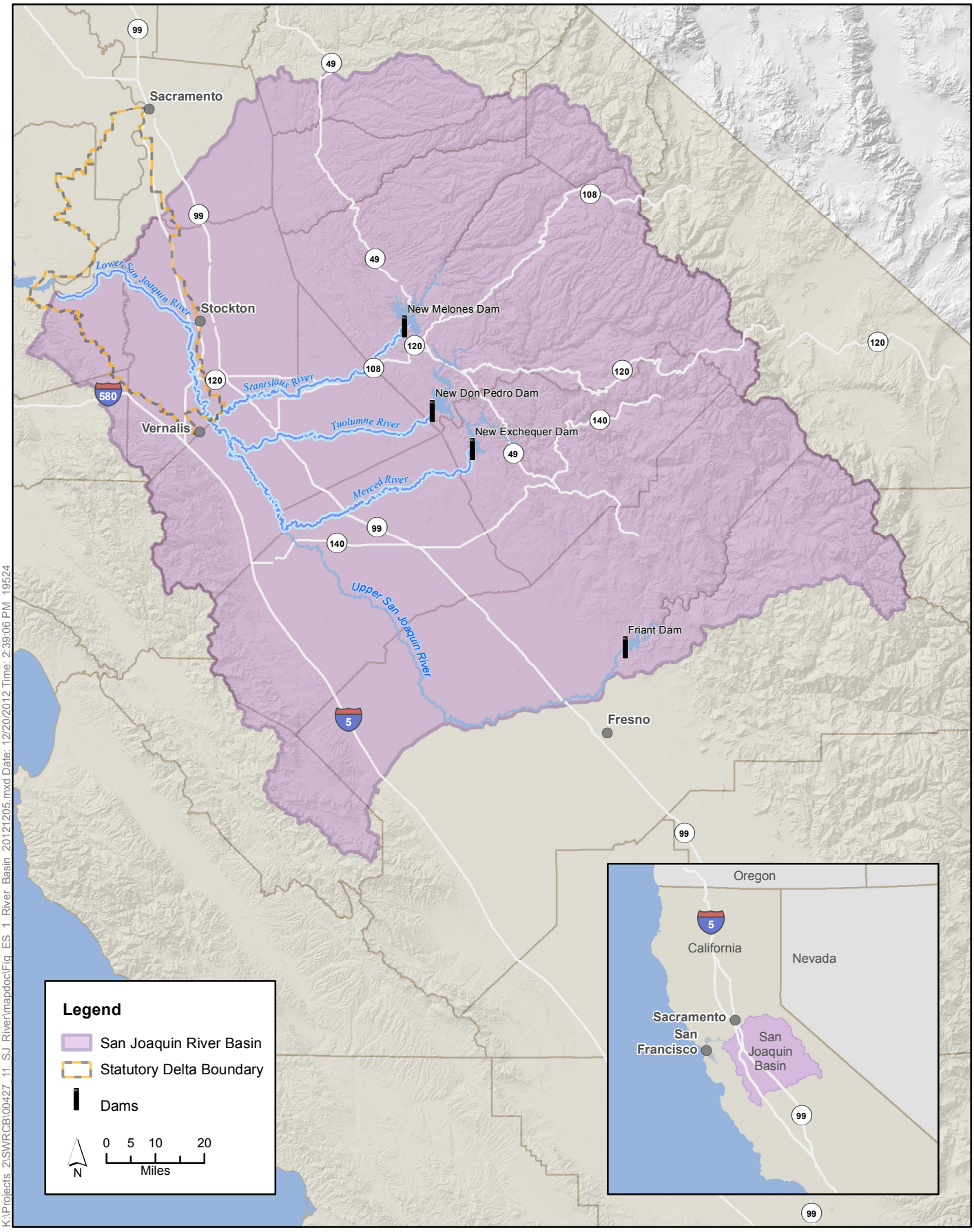

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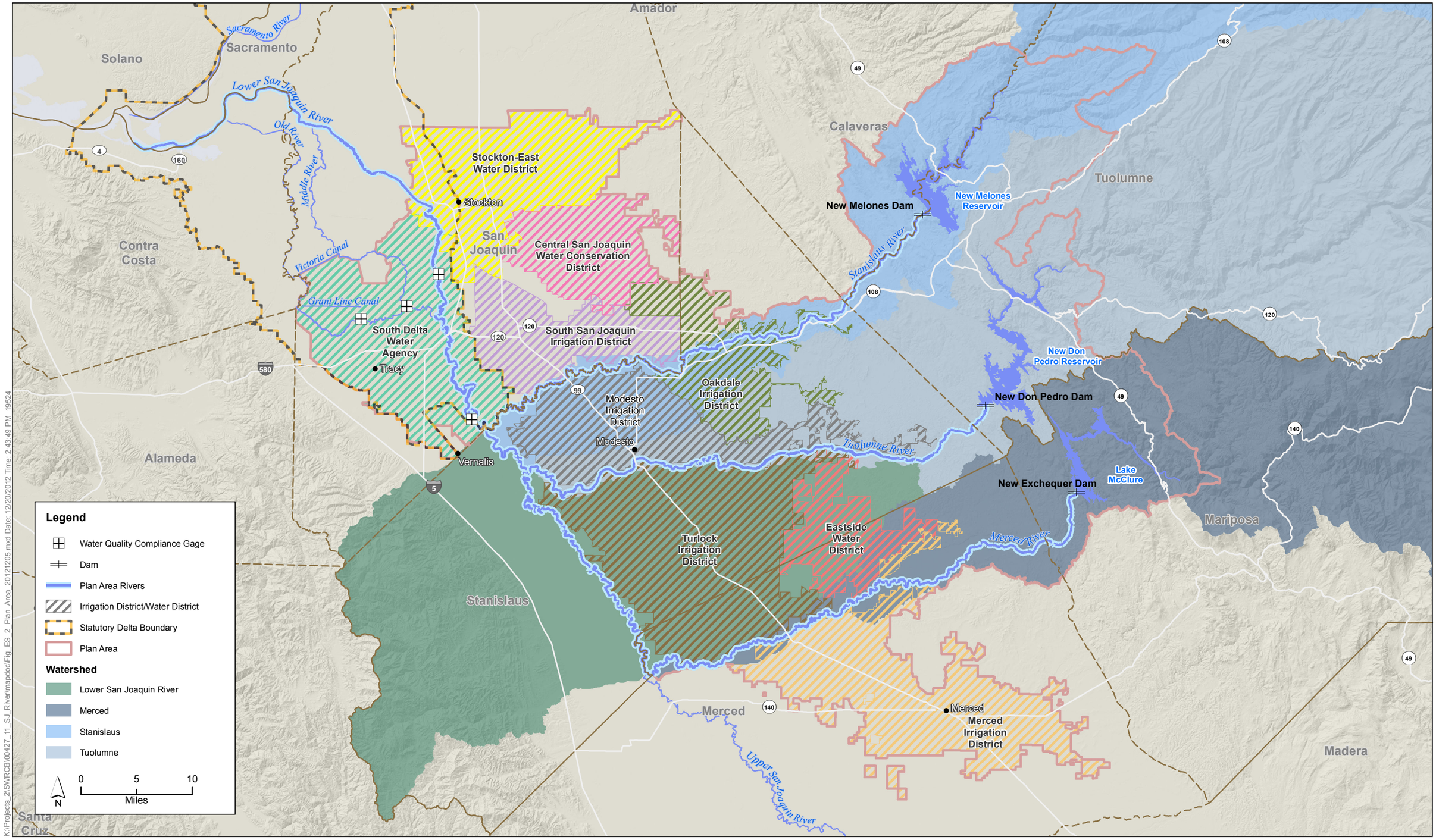
Figure ES-1
San Joaquin River Basin



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ICF INTERNATIONAL

Figure ES-2
Plan Area

under the alternatives to maximize protection of fish and wildlife beneficial uses based on recommendations from the fisheries agencies (DFG, NMFS, and USFWS) or others provided that the total quantity of water provided over the February–June time period is not less than the required percent of unimpaired flow. For example, a portion of the June flows could be provided in April to increase pulse flows during this period if such an action would maximize protection of fish and wildlife beneficial uses. This adaptive management would be coordinated through a coordinated operations group (COG) comprised of DFG; NMFS; USFWS; representatives of water users on the Merced, Tuolumne, and Stanislaus Rivers; and other appropriate representatives deemed appropriate by the State Water Board Executive Director. In order to inform implementation actions, the State Water Board would work with the COG and interested persons to develop procedures for an adaptive management process to be submitted for approval by the Executive Director within a specified time after final approval of the amendment to the 2006 Bay-Delta Plan.

In order to inform real-time adaptive management and long-term management of flows on the SJR for the protection of fish and wildlife beneficial uses, LSJR Alternatives 2, 3, and 4 include requirements for development of a comprehensive program, the San Joaquin River Monitoring and Evaluation Program (SJRMEP). The SJRMEP would, at a minimum, include monitoring, special studies, and evaluations of flow-related factors on the viability of native fish populations, including abundance, spatial extent (or distribution), diversity (both genetic and life history), and productivity. Specifically, the SJRMEP would evaluate the effect of flow conditions at various times of year, including spring (February–June), fall (including October), summer, and winter months on the abundance, spatial extent, diversity, and productivity of native SJR Basin fish species in order to inform adaptive management and future changes to the LSJR flow objectives and their implementation.

In addition to the above, the program of implementation would also include recommendations to other agencies to take additional actions outside of the State Water Board's purview, including nonflow actions, to protect LSJR fish and wildlife beneficial uses.

LSJR Alternatives 1–4 are detailed below. As discussed earlier, LSJR Alternatives 2, 3, and 4 have the same narrative objectives and program of implementation with the exception of the required percent of unimpaired flow.

LSJR Alternative 1

California Code of Regulations, Title 14, Chapter 3, Section 15126.6(e), parts (1) and (3)(A), require that the potential impacts of not approving a proposed project be evaluated under a no project alternative and compared against baseline conditions to determine impacts. For regulatory plans or policies, the no project alternative must assume the continuation of existing plans or policies into the foreseeable future. LSJR Alternative 1 (No Project Alternative) conditions include full compliance with all flow and water quality objectives in the 2006 Bay-Delta Plan as implemented through Water D-1641 and the NMFS biological opinion Stanislaus River reasonable and prudent alternatives, including Action 3.1.3 (NMFS BO) (which is included in the baseline [See Chapter 4, *Introduction to the Analysis*, of the SED, Section 4.6]). SJR flow and SDWQ conditions differ between the No Project Alternative and baseline. Specifically, relative to flow, the VAMP flows were being implemented

[9] Flows in the Stanislaus, Tuolumne, and Merced Rivers and the SJR at Vernalis had median values of 40, 21, 26, and 29 percent of February–June unimpaired flow, respectively, for water years 1986–2009.

under baseline conditions, but VAMP ended in 2011, after the baseline was established. Accordingly, under the No Project Alternative, flow requirements at Vernalis would be those required under D-1641, which are generally higher than those required previously under VAMP. The differences in conditions under baseline and under SDWQ Alternative 1 are described in Section ES5.4.

Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, evaluate the potential impacts of the No Project Alternative. LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative) are evaluated together because flows would be required to achieve full compliance with both the flow and water quality (salinity) objectives identified in the 2006 Bay-Delta Plan.

LSJR Alternative 2

LSJR Alternative 2 would require minimum 14-day running average unimpaired flows February–June of 20 percent from the Stanislaus, Tuolumne, and Merced Rivers. As described above, the State Water Board Executive Director could approve changes to the timing of these flows during the February–June time frame in order to maximize benefits to fishery resources in the SJR and the three eastside tributaries; however, the total volume of flow February–June could not be less than 20 percent of the unimpaired flow for that time period. All other provisions of LSJR Alternative 2 are as described above, including base flow requirements of 1,000 cfs at Vernalis.

LSJR Alternative 3

LSJR Alternative 3 would require minimum 14-day running average unimpaired flows February–June of 40 percent from the Stanislaus, Tuolumne, and Merced Rivers. As described above, the State Water Board Executive Director could approve changes to the timing of these flows during the February–June time frame in order to maximize benefits to fishery resources in the SJR and the three eastside tributaries; however, the total volume of flow February–June could not be less than 40 percent of the unimpaired flow for that time period. All other provisions of LSJR Alternative 3 are as described above, including base flow requirements of 1,000 cfs at Vernalis.

LSJR Alternative 4

LSJR Alternative 4 would require minimum 14-day running average unimpaired flows February–June of 60 percent from the Stanislaus, Tuolumne, and Merced Rivers. As described above, the State Water Board Executive Director could approve changes to the timing of these flows during the February–June time frame in order to maximize benefits to fishery resources in the SJR and the three eastside tributaries; however, the total volume of flow February–June could not be less than 60 percent of the unimpaired flow for that time period. All other provisions of LSJR Alternative 4 are as described above, including base flow requirements of 1,000 cfs at Vernalis.

ES5.4 Southern Delta Water Quality (SDWQ) Alternatives

The SED evaluates the No Project Alternative (SDWQ Alternative 1) and two other SDWQ alternatives (SDWQ Alternatives 2 and 3). SDWQ Alternatives 2 and 3 are comprised of a numeric objective and an associated program of implementation. SDWQ Alternatives 2 and 3 have different numeric objectives, which are described in detail below. The range of alternatives analyzed in the SED is based on the water quality needs of the most salt-sensitive crops grown in the southern Delta,

the predominant soil type, and irrigation practices in the area. Additional information related to these issues is provided in Appendix C, *Technical Report on the Scientific Basis for Alternative San Joaquin River Flow And Southern Delta Salinity Objectives* and Appendix E, *Salt Tolerance of Crops in the Southern Sacramento–San Joaquin Delta*.

The program of implementation for SDWQ Alternatives 2 and 3 would require USBR to continue complying with the existing 2006 Bay-Delta Plan 0.7 dS/m EC objective at Vernalis April–August and 1.0 dS/m September–March as a 30-day average. This would help maintain assimilative capacity downstream of Vernalis into the interior southern Delta during the main growing season and would also help to ensure compliance with existing salinity objectives at the CVP and SWP pumping plants (C-9 and DMC-1 in Table 2 of D-1641). DWR and USBR would also be required to develop a comprehensive operations plan to address the effects of CVP and SWP pumping operations on assimilative capacity in the southern Delta. The program of implementation also provides for DWR and USBR to continue to install and operate the agricultural barriers they currently install and operate in the southern Delta or to take other reasonable measures to meet the objectives. In addition, the program of implementation calls for DWR and USBR to perform monitoring, modeling, special studies, and reporting activities in coordination with other monitoring programs (e.g., the Delta Regional Monitoring Program) to ensure that the SDWQ objectives are effectively implemented. The program of implementation also includes recommendations to other agencies that would assist in meeting the SDWQ objectives. The program of implementation expresses the willingness of the State Water Board to consider changes to these salinity objectives and the program of implementation based on the findings from the Central Valley Salinity Alternatives for Long-Term Sustainability (CV-SALTS) process and/or recommendations from the Central Valley Water Board.

SDWQ Alternatives 1, 2, and 3 are detailed below. As discussed earlier, SDWQ Alternatives 2 and 3 have different numeric objectives but the same programs of implementation.

SDWQ Alternative 1

As discussed above, pursuant to the California Code of Regulations, the environmental analysis must evaluate a no project alternative. The no project alternative must consider what would be reasonably expected to occur in the foreseeable future if the plan amendments are not implemented and be compared against baseline conditions to determine impacts. SDWQ Alternative 1 (No Project Alternative) assumes full compliance with all flow and water quality objectives in the 2006 Bay-Delta Plan as implemented through D-1641 and the NMFS BO on the Stanislaus River (which is included in the baseline [See Chapter 4, *Introduction to the Analysis*, Section 4.6, of the SED]). Specifically, relative to salinity, SDWQ Alternative 1 would result in no changes to the existing water quality objectives for agricultural beneficial uses for the southern Delta established in the 2006 Bay-Delta Plan and implemented in D-1641 (Table 2). The 2006 Bay-Delta Plan states that the maximum 30-day running average of mean daily EC is 0.7 mmhos/cm April 1–August 30 and 1.0 mmhos/cm September 1–March 31 for all water year types. This is applicable to the three interior compliance stations (C-6, C-8, and P-12) and the compliance station at Vernalis (C-10). Under baseline, these salinity levels are not always fully met.

Chapter 15, *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)* and Appendix D, *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*, evaluate the potential impacts of satisfying the assumptions of the No Project Alternative. As described in Chapter 3, *Alternatives Description*, Section 3.3.1, LSJR Alternative 1 and SDWQ Alternative 1 (No

Project Alternative) are evaluated together in Chapter 15 and Appendix D because flows would be required to achieve full compliance with both the flow and salinity water quality objectives identified in the 2006 Bay-Delta Plan.

SDWQ Alternative 2

SDWQ Alternative 2 would establish a numeric salinity objective of 1.0 dS/m as a maximum 30-day running average of mean daily EC for all months in the SJR between Vernalis and Brandt Bridge, Middle River from Old River to Victoria Canal, and Old River/Grant Line Canal from the Head of Old River to West Canal. To maintain assimilative capacity downstream of Vernalis into the interior southern Delta during the main growing season, the program of implementation would continue to require USBR to comply with the existing 2006 Bay-Delta Plan 0.7 dS/m EC objective at Vernalis during the months of April–August and 1.0 dS/m September–March as a 30-day average.

SDWQ Alternative 3

SDWQ Alternative 3 is the same as SDWQ Alternative 2 except the maximum 30-day running average of mean daily EC is 1.4 dS/m for all months. The compliance locations and all other provisions of SDWQ Alternative 3 are the same as for SDWQ Alternative 2.

ES6 SED Impact Analyses and Summary

In order to evaluate potential impacts from the SED alternatives, CEQA requires that the alternatives be evaluated against an environmental baseline representing the physical environmental conditions that existed at the time the CEQA process began. The environmental baseline for the SED is February of 2009, the date that the CEQA process began for the plan amendments. The baseline assumes compliance with the 2006 Bay-Delta Plan objectives and program of implementation and other requirements that existed in 2009, including implementation of VAMP and the NMFS BO flow requirements on the Stanislaus River. The baseline does not include the long-term San Joaquin River Restoration flow requirements; however, these conditions and other conditions are included in the cumulative impacts analysis.

As described above in Sections ES5.3 and ES5.4, the baseline is different from LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative). For flow, LSJR Alternative 1 includes release of water by the USBR from New Melones reservoir, above baseline, to fully comply with 2006 Bay-Delta Plan San Joaquin River April/May pulse flow objectives. The baseline includes releases only to meet the VAMP flow requirements for the pulse flow period. For salinity, the SDWQ Alternative 1 includes release of water by the USBR from New Melones reservoir, above baseline, to fully comply with the 2006 Bay-Delta Plan southern Delta salinity objectives at Vernalis and the three interior southern Delta compliance locations. Baseline includes releases of water sufficient only to meet salinity objectives at Vernalis that were in effect in 2009.

This section discusses the scope of the impacts analysis, compared to baseline, and provides a summary of the resulting impacts and impact determinations.

ES6.1 Scope of the Impact Analysis

In developing the SED, the State Water Board considered the nature of the 2006 Bay-Delta Plan amendment(s), comments received in response to the NOP and during public consultation, other public comments and information, and the environmental issues identified in Appendix A of the State Water Board's CEQA regulations (Cal. Code Regs., tit. 23, §§ 3720–3781) and Appendix G of the State CEQA Guidelines. The State Water Board's determinations regarding other impacts that are not potentially significant and not addressed in the SED are explained in Appendix B, *State Water Board's Environmental Checklist*. The State Water Board determined that potentially significant impacts on the following resources could result from the LSJR alternatives or SDWQ alternatives. These effects are further evaluated in the following chapters.

- Chapter 5: *Water Supply, Surface Hydrology, and Water Quality*
- Chapter 6: *Flooding, Sediment, and Erosion*
- Chapter 7: *Aquatic Resources*
- Chapter 8: *Terrestrial Biological Resources*
- Chapter 9: *Groundwater Resources*
- Chapter 10: *Recreational Resources and Visual Quality*
- Chapter 11: *Agricultural Resources*
- Chapter 12: *Cultural Resources*
- Chapter 13: *Service Providers*
- Chapter 14: *Energy Resources and Climate Change*
- Chapter 15: *LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*
- Chapter 16: *Cumulative Impact Summary, Growth-Inducing Effects, and Irreversible Commitment of Resources*
- Chapter 17: *Summary of Impacts and Comparison of Alternatives*
- Chapter 20: *Preferred LSJR Alternative and SDWQ Alternative*

The content for the SED is primarily based on criteria from the thresholds of significance provided in Appendix A of the State Water Board regulations (Appendix B of the SED, *State Water Board's Environmental Checklist*) for implementation of the State CEQA Guidelines. Some thresholds or criteria have been adapted to the specific circumstances of the alternatives. The impact analysis and significance determinations for each impact, and a conclusion of no impact, less than significant, or significant and unavoidable for each resource are included in Chapters 5–15 and Chapter 20.

Chapter 18, *Economic Analyses*, and Chapter 19, *Antidegradation Analysis*, are required by the Porter-Cologne Act or the CWA.

Several technical appendices support the analysis in the SED chapters, including the following.

- Appendix A: *NOP Scoping and Other Public Meetings*
- Appendix B: *State Water Board's Environmental Checklist*

- Appendix C: *Technical Report on the Scientific Basis For Alternative San Joaquin River Flow and Southern Delta Salinity Objectives*
- Appendix D: *Evaluation of LSJR Alternative 1 and SDWQ Alternative 1 (No Project Alternative)*
- Appendix E: *Salt Tolerance of Crops in the Southern Sacramento–San Joaquin Delta*
- Appendix F.1: *Hydrologic and Water Quality Modeling*
- Appendix F.2: *Evaluation of Historical Flow and Salinity Measurements of the Lower San Joaquin River and Southern Delta*
- Appendix G: *Agricultural Economic Effects of Lower San Joaquin River Flow Alternatives*
- Appendix H: *Evaluation of Methods of Compliance*
- Appendix I: *Cultural Resources Overview*
- Appendix J: *Hydropower and Electric Grid Analysis of Lower San Joaquin River Flow Alternatives*
- Appendix K: *Revised Water Quality Control Plan*
- Appendix L: *Sensitivity Analyses*

Appendix B also identifies and explains why the alternatives would result in either no impacts or less-than-significant impacts on particular resources. As discussed in more detail in Appendix B, the following resources would experience either no impact or a less-than-significant impact. Therefore, they are not analyzed in the SED chapters.

- Aesthetics
- Air Quality
- Hazards and Hazardous Materials
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Transportation/Traffic

When the State Water Board adopts a rule or regulation requiring the installation of pollution-control equipment or establishing a performance standard or a treatment requirement, it must perform specific analyses, as described in Public Resources Code Section 21159. Appendix H, *Evaluation of Methods of Compliance*, is intended to meet the requirements of Public Resources Code Section 21159 and Section 3777 of the State Water Board's regulations by identifying the reasonably foreseeable methods of compliance and analyzing the reasonably foreseeable significant adverse environmental impacts associated with the methods of compliance, the reasonably foreseeable mitigation measures that would minimize or avoid any such impacts, and the reasonably foreseeable alternative methods of compliance that would have less than significant adverse environmental effects for the LSJR and SDWQ alternatives. (*Id*., subd. (a)(1)-(3); § 3777, subd. (b)(4).) This analysis also takes into account a reasonable range of factors, including economic factors. (Pub. Resources Code, § 21159, subd. (c).) A project-level analysis is not required. (*Id*., subd. (d).) The State Water

Board is providing this analysis to disclose potential costs and environmental effects related to the actions the regulated community may take to comply with the LSJR or SDWQ alternatives. The evaluation does not address the cost and environmental effects related to future actions the State Water Board would take to impose responsibility for implementing the flow or water quality objectives (e.g., conditioning of water rights, water quality certification through the Federal Energy Regulatory Commission [FERC] process).

Appendix H is also intended to meet the Water Code, Section 13141 requirements. Prior to the implementation of an agricultural water quality control program, the State Water Board must provide an estimate of the total cost of the program together with an identification of potential sources of financing (Wat. Code, § 13141). The LSJR and SDWQ alternatives are not specifically intended to regulate agriculture; however, the associated costs and sources of financing are evaluated in Appendix H.

The evaluation in Appendix H is based on the State Water Board's checklist and resources evaluated in Appendix H include all of those on the checklist: aesthetics, agricultural resources, air quality, biological resources, cultural resources, geology/soils, greenhouse gases, hazards and hazardous materials, hydrology and water quality, land use and planning, mineral resources, noise, population and housing, public services, recreation, transportation and traffic, and utility and service systems.

ES6.2 Summary of the Impacts

Table ES-2 presents a summary of the impacts by alternative presented in Chapters 5–15.

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Table ES-2. Summary of Impact Determinations for the LSJR and SDWQ Alternatives

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Chapter 5: Water Supply, Surface Hydrology, and Water Quality						
HYD-1: Substantially reduce monthly river flow values caused by the percent unimpaired flow objective	Significant and unavoidable – Flows would be greater than the LSJR Alternative 3 flows on the Stanislaus River; therefore, it is expected that monthly river flows would not be reduced when compared to the baseline. Additionally, the No Project Alternative flow on the Tuolumne is expected to be similar to baseline flows and thus is not expected to substantially reduce the monthly river flows. However, the flows on the Merced River would be less than the baseline flows without Vernalis Adaptive Management Program (VAMP) (particularly during lower flow times in drier periods) when compared to the baseline. Therefore, monthly river flows values would be reduced. The Vernalis salinity objective would continue to be maintained and does not represent a change from baseline with respect to flow.	Significant and unavoidable - Flows are reduced substantially on the Stanislaus River such that the average February—June flows value are reduced by 5% of the maximum flow when compared to the baseline flows; adaptive management cannot modify flows on this river as there would not be enough water to reallocate between months. Therefore, monthly river flow values would be substantially reduced on the Stanislaus. The average monthly flow values on the Merced and Tuolumne Rivers and LSJR would not be reduced by 5% of the maximum flow values.	Less than significant - The average monthly flow value would increase on the Stanislaus, Merced and Tuolumne rivers and LSJR; therefore, monthly river flow values would not be substantially reduced on these rivers.	Less than significant – The average monthly flow value would increase on the Stanislaus, Merced and Tuolumne rivers and LSJR; therefore, monthly river flow values would not be substantially reduced on these rivers.	No Impact - The Vernalis objective would continue to be maintained and would not represent a change from baseline with respect to flow. Furthermore, this alternative would not be related to percent of unimpaired flow.	No Impact - The Vernalis objective would continue to be maintained and would not represent a change from baseline with respect to flow. Furthermore, this alternative would not be related to percent of unimpaired flow.
HYD-2: Substantially alter hydrology such that regulating reservoir operations are limited	Less than significant – The monthly average hydropower release flow variations would continue to be within the baseline on the three rivers and the No Project would not cause substantial changes in the flows or water elevations in the regulating reservoirs or in the river segments that connect the rim dams to the downstream regulating reservoirs. Dam operators would continue to have the flexibility with hydroelectric production to choose to generate with reduced capacity for more hours each day or with increased capacity for less hours.	Less than significant – The monthly average hydropower release flow variations would be within the baseline. No substantial changes in the flows or water elevations in the regulating reservoirs or in the river segments that connect the rim dams to the downstream regulating reservoirs would occur.	Less than significant – The monthly average hydropower release flow variations would be within the baseline. No substantial changes in the flows or water elevations in the regulating reservoirs or in the river segments that connect the rim dams to the downstream regulating reservoirs would occur.	Less than significant – The monthly average hydropower release flow variations would be within the baseline. No substantial changes in the flows or water elevations in the regulating reservoirs or in the river segments that connect the rim dams to the downstream regulating reservoirs would occur.	No Impact - The Vernalis objective would continue to be maintained and would not represent a change from baseline with respect to flow; therefore, substantial alterations to hydrology are not expected that would affect regulating reservoirs.	No Impact – The Vernalis objective would continue to be maintained and would not represent a change from baseline with respect to flow. Therefore, substantial alterations to hydrology are not expected that would affect regulating reservoirs.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Impact WS-1: Substantially reduce surface water supply diversions caused by a change in river flows or reduce exports to CVP and SWP export service areas caused by a change in river flows	Significant and unavoidable - Surface water diversions would be greatly reduced when compared to baseline conditions on the Stanislaus River. The surface water diversion reductions would be greater than those expected under LSJR Alternative 4 and, therefore, impacts associated with surface water diversion reductions would be greater. The modeled surface water diversions on the Tuolumne and Merced Rivers are not expected to be reduced significantly when compared to baseline conditions. A reduction in exports to the CVP/SWP export service areas is not expected because the Stanislaus River flow would be higher than baseline flows and because the Tuolumne River flows would remain the same as baseline conditions.	Less than significant - Surface water diversions would not be reduced greater than 5% of the maximum demand from the Stanislaus, Tuolumne, or Merced Rivers. A reduction in annual average exports to the CVP and SWP export service areas is not expected as a result of reduced inflow in some months from the LSJR. Therefore, a substantial reduction in surface water supply diversions or reduced exports would not occur.	Significant and unavoidable – Surface water diversions would be reduced greater than 5% of the maximum demand and would be unable to be replaced by additional surface water diversions on the Stanislaus, Tuolumne, or Merced Rivers. A reduction in the annual average exports to the CVP and SWP export service areas is not expected as inflow would increase from the LSJR. Therefore, a substantial reduction in surface water supply diversions would occur, but a reduction in exports would not occur.	Significant and unavoidable – Surface water diversions would be reduced greater than 5% of the maximum demand and would be unable to be replaced by additional surface water diversions on the Stanislaus, Tuolumne, or Merced Rivers. A reduction in the annual average exports to the CVP and SWP export service areas is not expected as inflow would increase from the LSJR. Therefore, a substantial reduction in surface water supply diversions would occur, but a reduction in exports would not occur.	No Impact – See HYD-1.	No Impact – See HYD-1.
WQ-1: Violate water quality objectives by increasing the number of months with EC above the water quality objectives for salinity at Vernalis or southern Delta compliance stations	Less than significant - The Vernalis and/or southern Delta EC objective would be met because the purpose of the No Project Alternative is to meet the flow and EC objectives. Therefore, a violation of water quality objectives above the water quality objectives for salinity at Vernalis or southern Delta compliance stations would not occur	Less than significant - There would be an increased incidence of EC values above the existing EC objectives for the interior southern Delta compliance stations; but they would not increase greater than 5%. Therefore, a violation of water quality objectives above the water quality objectives for salinity at Vernalis or southern Delta compliance stations would not occur because it is expected the slight increase would continue to protect beneficial uses.	Less than significant - There would be an overall reduction in the incidence of EC values above the existing EC objectives for the interior southern Delta compliance stations. Therefore, a violation of water quality objectives above the water quality objectives for salinity at Vernalis or southern Delta compliance stations would not occur	Less than significant - There would be an overall reduction in the incidence of EC values above the existing EC objectives for the interior southern Delta compliance stations. Therefore, a violation of water quality objectives above the water quality objectives for salinity at Vernalis or southern Delta compliance stations would not occur	Less than significant - There would be an overall reduction of EC values above 1. 0 dS/m when compared to existing EC objectives. Therefore, a violation of water quality objectives above the water quality objectives for salinity at Vernalis or southern Delta compliance stations would not occur.	Less than significant - There would be a reduction of monthly exceedances when compared to existing EC objectives. Therefore, a violation of water quality objectives above the water quality objectives for salinity at Vernalis or southern Delta compliance stations would not occur.
WQ-2: Substantially degrade water quality by increasing Vernalis and/or southern Delta salinity (EC) such that agricultural beneficial uses are impaired	Less than significant - Vernalis and/or southern Delta EC would not be expected to increase because part of the purpose of the No Project flow is to maintain EC at Vernalis.	Less than significant - The range of average EC values during the irrigation season of April–September in the SJR at Vernalis and in the southern Delta channels under LSJR Alternative 2 would remain very similar to baseline salinity conditions, and would not experience an increase of more than 5% of the EC objective (0.035 dS/m); accordingly, it is not anticipated that agricultural beneficial uses would be impaired.	Less than significant - The range of average EC values during the irrigation season of April–September in the SJR at Vernalis in the southern Delta channels is expected to be reduced; accordingly, it is not anticipated that agricultural beneficial uses would be impaired.	Less than significant - The range of average EC values during the irrigation season of April–September in the SJR at Vernalis in the southern Delta channels is expected to be reduced; accordingly, it is not anticipated that agricultural beneficial uses would be impaired.	Less than significant - There would be no change in water quality relative to baseline; accordingly, it is not anticipated agricultural beneficial uses would be impaired.	Less than significant - There would be no change in water quality relative to baseline; accordingly, it is not anticipated agricultural beneficial uses would be impaired.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
WQ-3: Substantially degrade water quality by increasing water temperature caused by reduced river flows	Significant and unavoidable - Water temperatures are not expected to increase because flow in the Stanislaus River would remain above baseline. Temperature effects are not expected on the Tuolumne because flows would not change. However, on the Merced River, flows would be reduced when compared to baseline and would likely result in an increase in temperature in this river above baseline conditions.	Significant and unavoidable - The average monthly water temperatures would not increase more than 2°F in the Merced and Tuolumne Rivers and LSJR but are expected to increase in April, May, and June by more than the 2°F in the Stanislaus River because of the reduced river flows when compared to baseline. Therefore, it is expected that the increase in water temperatures would substantially degrade water quality.	Less than significant - The average monthly water temperatures would not increase more than 2°F in the Merced, Tuolumne, and Stanislaus Rivers and the LSJR. Therefore, it is expected that the change in water temperatures would not substantially degrade water quality.	Less than significant - The average monthly water temperatures would not increase more than 2°F in the Merced, Tuolumne, and Stanislaus Rivers and the LSJR. Therefore, it is expected that the change in water temperatures would not substantially degrade water quality	No Impact – this alternative does not have the ability to change temperature in a river because it sets a water quality objective for salinity (not temperature).	No Impact – this alternative does not have the ability to change temperature in a river because it sets a water quality objective for salinity (not temperature).
WQ-4: Substantially degrade water quality by increasing contaminant concentrations caused by reduced river flows	Significant and unavoidable – Flows are not expected to be reduced on the Tuolumne, LSJR or Stanislaus such that contaminant concentrations would increase. However, on the Merced River, flows would be reduced when compared to baseline and would likely result in an increase in contaminant concentrations above baseline conditions.	Significant and unavoidable – Flows are reduced on the Stanislaus and Tuolumne Rivers in some months such that contaminant concentrations would increase by more than 50% of the baseline concentrations. Therefore, it is expected that this increase in concentration would substantially degrade water quality. Flows are not reduced substantially on the Merced River or LSJR.	Less than significant – Flows are not reduced substantially and baseline contaminant concentrations would not increase by more than 50% of the baseline concentrations on the Stanislaus, Tuolumne, or Merced Rivers or in the LSJR. Therefore, it is expected that the change in concentrations would not substantially degrade water quality	Less than significant – Flows are not reduced substantially and baseline contaminant concentrations would not increase by more than 50% of the baseline concentrations on the Stanislaus, Tuolumne, or Merced Rivers or in the LSJR. Therefore, it is expected that the change in concentrations would not substantially degrade water quality	No Impact – this alternative does not have the ability to result in an increase in contaminant concentrations because the Vernalis objective would continue to be maintained and does not represent a change from baseline with respect to flow.	No Impact – this alternative does not have the ability to result in an increase in contaminant concentrations because The Vernalis objective would continue to be maintained and does not represent a change from baseline with respect to flow.
Chapter 6: Flooding, Sediment, and Erosion						
FLO-1: Substantially alter the existing drainage pattern of the site or area through the alteration of the course of a stream or river in a manner that would result in substantial erosion or siltation on or offsite	Less than Significant - Flows would be lower than channel capacities on the Stanislaus, Tuolumne, and Merced Rivers. Sediment transport, bank erosion or meander-bend migration issues, and contribution to levee instability are not expected. Very occasional gravel transport and bank erosion would occur in the upper gravel-bedded reaches of the Stanislaus, Tuolumne, and Merced Rivers. The amount of bank erosion would be limited by flood action levels and existing bank armoring.	Less than significant - Flows would be much lower than channel capacities, so there would be no sediment transport, bank erosion or meander-bend migration issues, and no contribution to levee instability. Therefore, substantial alterations of the existing drainage patterns would not occur and would not result in substantial erosion or siltation.	Less than significant - Same as LSJR Alternative 2 although very occasional gravel transport and bank erosion would occur in the upper gravel-bedded reaches of the eastside tributaries. The amount of bank erosion is limited by flood action levels and existing bank armoring. Therefore, substantial alterations of the existing drainage patterns would not occur and would not result in substantial erosion or siltation.	Less than significant - Same as LSJR Alternative 3 with occasional gravel transport and bank erosion in the upper gravel-bedded reaches of the eastside tributaries. The amount of bank erosion is limited by the action stage and existing bank armoring. Therefore, substantial alterations of the existing drainage patterns would not occur and would not result in substantial erosion or siltation. m	No Impact – this alternative does not have the ability to result in flooding, sediment, or erosion because it sets a water quality objective for salinity.	No Impact – this alternative does not have the ability to result in flooding, sediment, or erosion because it sets a water quality objective for salinity.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
FLO-2: Substantially alter the existing drainage pattern of the site or area through the alteration of the course of a stream or river or substantially increase the rate of surface runoff in manner that would result in flooding on or offsite	Less than significant - Flows would be much lower than channel capacities on the Stanislaus, Tuolumne, and Merced Rivers. Therefore, significant flooding impacts are not expected to occur outside of floodways. The No Project Alternative would not change reservoir flood storage capacity and would not violate U.S. Army Corps of Engineers (USACE) flood reservation, so there would be no changes in flood control releases during major flood events.	Less than significant - Flows would be much lower than channel capacities, and no significant flooding impact would occur outside of floodway. Flow objectives would not change reservoir flood storage capacity and would not violate USACE flood reservation, so there would be no changes in flood-control releases during major flood events. On an annual basis, flows greater than 1,500 cubic feet per second (cfs) on the Stanislaus River would be less frequent than under baseline conditions. Therefore, substantial alterations of the existing drainage patterns would not occur and would not result in flooding.	Less than significant – Same as Alternative 2. Therefore, substantial alterations of the existing drainage patterns would not occur and would not result in flooding.	Less than significant - Flows greater than 1,500 cfs on the Stanislaus River would occur with greater frequency than baseline conditions from April–June; however, the associated seepage would not have an effect on erosion due to the rate and volume of water and would not be surface inundating. Therefore, substantial alterations of the existing drainage patterns would not occur and would not result in flooding.	No Impact – See FLO-1.	No Impact – See FLO-1.
Chapter 7: Aquatic Resources						
AQUA-1: Changes in availability of warmwater species reservoir habitat resulting from change in reservoir water levels	Less than significant - Reservoir elevations at New Melones, New Don Pedro, or Lake McClure are expected to remain similar to the baseline elevations. They are not expected to be significantly reduced when compared to baseline conditions. Therefore, changes in the availability of warmwater reservoir species habitat are not expected.	Less than significant - Changes in the occurrence of 15 foot fluctuations in reservoir levels would be less than 10%; therefore, a reduction in spawning/rearing success of warmwater species is not expected.	Less than significant - Changes in the occurrence of 15 foot fluctuations in reservoir levels would be less than 10%; therefore, a reduction in spawning/rearing success of warmwater species is not expected.	Less than significant - Changes in the occurrence of 15 foot fluctuations in reservoir levels would be less than 10%; therefore, a reduction in spawning/rearing success of warmwater species is not expected.	No Impact – this alternative does not have the ability to result in changes to reservoir salinity because it is not applied at the reservoirs.	No Impact – this alternative does not have the ability to result in changes to reservoir salinity because it is not applied at the reservoirs.
AQUA-2: Changes in availability of coldwater species reservoir habitat resulting from changes in reservoir storage	Less than significant - Reservoir elevations at New Melones, New Don Pedro, or Lake McClure are expected to remain similar to the baseline elevations. They are not expected to be significantly reduced when compared to baseline conditions. Therefore, changes in the availability of coldwater reservoir species habitat are not expected.	Less than significant - Changes to reservoir storage levels in the end of September would be less than 10%; therefore, a reduction in the availability of coldwater habitat is not expected.	Less than significant - Changes to reservoir storage levels in the end of September would be less than 10%; therefore, a reduction in the availability of coldwater habitat is not expected.	Less than significant - Changes to reservoir storage levels in the end of September would be less than 10%; therefore, a reduction in the availability of coldwater habitat is not expected.	No Impact – See AQUA-1.	No Impact – See AQUA.1.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
AQUA-3: Changes in quantity/ quality of spawning, rearing, and migration habitat resulting from changes in flow	Significant and unavoidable - Flow on the Stanislaus River would be increased relative to the baseline flows and would not reduce the quantity and quality of spawning, rearing, and migration habitat. The Tuolumne River would experience flow conditions similar to baseline conditions. However, the Merced River would experience a reduction in flow when compared to the baseline and would likely reduce habitat quantity and quality on this river.	Significant and unavoidable - Flows would be reduced greater than 10% during rearing and outmigrating periods on the Stanislaus River; furthermore, insufficient water would be available in the spring period (February–June) when compared to baseline conditions for adaptive management. Therefore, substantial impacts to the quantity/quality of spawning, rearing, and migration habitat would occur. The monthly median flow or the overall volume of water February–June would not substantially decrease on the Tuolumne and Merced Rivers and the LSJR during salmonid rearing and outmigrating periods; furthermore, the overall volume of water would be similar to baseline conditions on the Merced River during this time period, thus there would be sufficient water during the spring period to adaptively manage flows. Therefore, a reduction in the quantity/quality of spawning, rearing, and migration habitat on these rivers would not occur.	Less than Significant - The overall volume of water February–June would be similar to baseline conditions on the Stanislaus River; therefore, there would be sufficient water during the spring period to adaptively manage flows. Furthermore, flows would not be reduced greater than 10% during salmonid rearing and outmigrating periods on the Tuolumne, Merced, and LSJR. Therefore, a reduction in the quantity/quality of spawning, rearing, and migration habitat would not occur.	Less than significant - Flows would not be reduced greater than 10% on the major SJR tributaries or LSJR; therefore, a reduction in the quantity/quality of spawning, rearing, and migration habitat would not occur.	No Impact - this alternative does not have the ability to result in changes to flow because it is a water quality objective for salinity; furthermore, the volume of water needed to meet the Vernalis EC objective is included in the modeling results and, thus, in the impact determinations, for the LSJR alternatives.	No Impact – this alternative does not have the ability to result in changes to flow because it is a water quality objective for salinity; furthermore the volume of water needed to meet the Vernalis EC objective is included in the modeling results and, thus, in the impact determinations, for the LSJR alternatives.
AQUA-4: Changes in exposure of fish to stressful water temperatures resulting from changes in reservoir storage and releases	Significant and unavoidable - Temperatures would not increase on the Stanislaus or Tuolumne Rivers because flows would increase on the Stanislaus River and would remain similar to baseline flows on the Tuolumne However, the reduction in flow on the Merced River when compared to the baseline would likely increase temperatures on this river during lower flow periods resulting in stressful water temperatures.	Significant and unavoidable - The frequency of temperatures exceeding U.S. Environmental Protection Agency recommended criteria are anticipated to increase by over 10% on the Stanislaus River, therefore, significant impacts would occur on rearing and emigrating salmonids. The monthly median flow or the overall volume of water February–June would not substantially decrease on the Tuolumne and Merced Rivers and the LSJR; therefore, changes in the exposure of fish to stressful water temperatures would not occur.	Less than Significant - The overall volume of water February–June would be similar to baseline conditions on the Stanislaus River; therefore, there would be sufficient water during the spring period to adaptively manage flows and changes in exposure of fish to stressful water temperatures would not occur. Flows are expected to generally increase on the Tuolumne and Merced Rivers and not substantially change on the LSJR from baseline conditions; therefore, changes in the exposure of fish to stressful water temperatures would not occur.	Less than significant - The frequency of water temperatures potentially causing thermal stress in juvenile salmon and steelhead during the spring rearing and outmigration period would decrease in each of the rivers; therefore, changes in the exposure of fish to stressful water temperatures would not occur.	No Impact – See AQUA-3.	No Impact – See AQUA-3.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
AQUA-5 : Changes in exposure to pollutants resulting from changes in flow (dilution/mobilization effects)	Significant and unavoidable - The exposure to pollutants resulting from changes in flow would not increase on the Stanislaus or Tuolumne Rivers because the Tuolumne River would experience flow conditions similar to baseline conditions and the Stanislaus River flows would be increased However, the reduction in flow on the Merced River when compared to the baseline would likely increase pollutant exposure to fish on this river during lower flow periods.	Significant and unavoidable - Lower flows and increased thermal stress is anticipated on the Stanislaus River, therefore, substantially low dilution effects would be expected resulting in an increased vulnerability of fish to the effects of pollutants. The monthly median flow or the overall volume of water February–June would not substantially decrease on the Tuolumne and Merced Rivers and the LSJR; therefore, substantially low dilution effects would not be expected and there would not be an increased vulnerability of fish to the effects of pollutants.	Less than Significant - The overall volume of water February– June would be similar to baseline conditions on the Stanislaus River; therefore, substantially low dilution effects are not expected and there would not be an increased vulnerability of fish to the effects of pollutants because there would be sufficient water during the spring period to adaptively manage flows. Flows are expected to generally increase on the Tuolumne and Merced Rivers and not substantially change on the LSJR from baseline conditions; therefore, substantially low dilution effects are not expected and there would not be an increased vulnerability of fish to the effects of pollutants.	Less than significant - Dilution would potentially increase as a result of the increase in flows, and temperatures would either be maintained or reduced; thus, an increase in exposure to pollutants would not occur.	No Impact– See AQUA-3.	No Impact – See AQUA-3.
AQUA-6: Changes in exposure to suspended sediment and turbidity resulting from changes in flow (mobilization)	Less than significant - Peak flows are not expected to affect the frequency of overbank or bed mobilization flows on the Stanislaus River. Similar but fewer impacts, as those described above, would occur on the Tuolumne because flows would be similar to baseline conditions, and flows on the Merced River would not be more than baseline. Therefore, the change in flows would not mobilize more suspended sediment.	Less than Significant - Changes in the frequency, duration, and magnitude of increased suspended sediment and turbidity levels are expected to be minor and within the range of historical levels experienced by native fishes and other aquatic species on the three eastside tributaries and the LSJR.	Less than Significant - Changes in the frequency, duration, and magnitude of increased suspended sediment and turbidity levels are expected to be minor and within the range of historical levels experienced by native fishes and other aquatic species on the three eastside tributaries and the LSJR.	Less than Significant - Changes in the frequency, duration, and magnitude of increased suspended sediment and turbidity levels are expected to be minor and within the range of historical levels experienced by native fishes and other aquatic species on the three eastside tributaries and the LSJR.	No Impact - See AQUA-3.	No Impact - See AQUA-3
AQUA-7: Changes in redd dewatering and fish stranding losses resulting from flow fluctuations	Less than significant - Redd dewatering on the Stanislaus, Tuolumne, and Merced Rivers would be similar to baseline conditions. All of these rivers have operational controls at the reservoirs that require establishing flow conditions that reduce redd dewatering. These conditions would not be expected to change under the No Project Alternative.	Significant and unavoidable - Increases in the frequency of flow reductions of 1 foot or more by 14 percent in March could substantially increase the frequency of dewatering and stranding impacts on steelhead redds and Chinook salmon fry in the Stanislaus River. Redd dewatering would be similar to baseline conditions on the Tuolumne and Merced.	Less than significant - The potential for significant redd dewatering and fish stranding impacts would be similar to baseline conditions or would be reduced when compared to baseline conditions. Although the potential for significant impacts exist on the Stanislaus River in March (e.g., increases in the frequency of flow reductions of 1 foot or more by 15%), the overall volume of water February—June would be similar to baseline conditions such that there would be sufficient water to adaptively manage flows to minimize potential redd dewatering and stranding impacts. All other rivers would either result in no change from the baseline with respect to redd dewatering or a reduction in the potential for redd dewatering.	Less than significant - The potential for significant redd dewatering and fish stranding impacts would be similar to baseline conditions or would be reduced when compared to baseline conditions. Although the potential for significant impacts exist on the Stanislaus River in March (e.g., increases in the frequency of flow reductions of 1 foot or more by 11%) , the overall volume of water February—June would be similar to baseline conditions such that there would be sufficient water to adaptively manage flows to minimize potential redd dewatering and stranding impacts. All other rivers would either result in no change from the baseline with respect to redd dewatering or a reduction in the potential for redd dewatering.	No Impact - See AQUA-3.	No Impact - See AQUA-3.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
AQUA-8: Changes in spawning habitat quality resulting from changes in flood flows	Less than significant - Higher peak flows are expected to occur, as described in AQUA-6; however, they would not be expected to occur with the frequency or duration such that they would damage existing spawning habitat on the Stanislaus River because flows would generally be limited at the higher flows on the Stanislaus that cause damage (e.g., 5,000–8,000 cfs) and similar peak flows would occur. Additionally, similar peak flows would occur on the Merced and Tuolumne Rivers because they would be associated with flood flows that currently occur.	Less than significant - Changes in the frequency of peak flows are not expected to be substantially modified from baseline conditions, therefore, there would be no substantial impact on spawning habitat quality resulting from changes in peak flow.	Less than significant - Changes in the frequency of peak flows are not expected to be substantially modified from baseline conditions, therefore, there would be no substantial impact on spawning habitat quality resulting from changes in peak flow.	Less than significant - Changes in the frequency of peak flows are not expected to be substantially modified from baseline conditions, therefore, there would be no substantial impact on spawning habitat quality resulting from changes in peak flow.	No Impact - See AQUA-3	No Impact - See AQUA-3
AQUA-9: Changes in food availability resulting from changes in flow, nutrient transport, and water quality (food web support)	Less than significant - Changes in the primary processes (i.e. bed mobilizing flows, and floodplain inundating flows see AQUA-6) that alter food web support would not be substantial because these peak flows would continue to occur as they do under the baseline, therefore, there would be no substantial impact to food availability.	Less than significant - Changes in the primary processes (i.e. bed mobilizing flows, and floodplain inundating flows) that alter food web support would not be substantial, therefore, there would be no substantial impact to food availability.	Less than significant - Changes in the primary processes (i.e. bed mobilizing flows, and floodplain inundating flows) that alter food web support would not be substantial, therefore, there would be no substantial impact to food availability.	Less than significant - Changes in the primary processes (i.e. bed mobilizing flows, and floodplain inundating flows) that alter food web support would not be substantial, therefore, there would be no substantial impact to food availability.	No Impact - See AQUA-3.	No Impact - See AQUA-3.
AQUA-10: Changes in predation risk resulting from changes in flow and water temperature	Significant and unavoidable - Flow on the Stanislaus and Tuolumne Rivers would not change the predation risk because it would be greater than, or similar to, the baseline. However, the reduction in flow on the Merced River when compared to the baseline would likely result in substantial change and increase in predation risk to fish on this river.	Significant and unavoidable - Lower flows and higher temperatures are expected on the Stanislaus River when compared to baseline conditions; therefore, it is expected that there would be an increase predation risk . Flows and temperatures would remain unchanged compared to baseline conditions on the Tuolumne River, and the overall volume of water available February–June would be similar to baseline conditions on the Merced River and the LSJR; therefore, it is expected that there would not be an increase in predation risk.	Less than significant - The overall volume of water February– June would be similar to baseline conditions on the Stanislaus River; therefore, there would be sufficient water during the spring period to adaptively manage flows and as a result there would not be an increase in predation risk. Flows are expected to generally increase on the Tuolumne and Merced Rivers and not substantially change on the LSJR from baseline conditions; therefore, it is expected there would not be an increase in predation risk.	Less than significant - Changes in flow and temperatures are not anticipated to result in stress to fish; therefore, it is expected that there would not be an increase in predation risk.	No Impact - See AQUA-3.	No Impact - See AQUA-3.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
AQUA-11: Changes in disease risk resulting from changes in flow, water temperature, and water quality	Significant and unavoidable - Flow on the Stanislaus and Tuolumne Rivers would not change the exposure to disease risk because it would be greater to, or similar to, the baseline. However, the reduction in flow on the Merced River when compared to the baseline would likely result in reduced flows, increased temperatures, and a potential increase in disease risk to fish on this river.	Significant and unavoidable - In April, water temperatures exceeding 59°F at the confluence of the Stanislaus River are predicted to occur 91% of the time when compared to baseline conditions; therefore; there is the potential for a substantial increase in disease risk in the Stanislaus River. Monthly median flows and the overall volume of water February–June would not substantially decrease on the Tuolumne and Merced Rivers and the LSJR; therefore, an increase in occurrence of disease above 59°F is not expected to exceed 20%, and the risk of disease is not expected to increase.	Less than significant - The overall volume of water February–June would be similar to baseline conditions on the Stanislaus River. An increase in occurrence of disease above 59°F is not expected to exceed 12%. Therefore, there would be sufficient water during the spring period to adaptively manage flows and a substantial increase in disease risk is not expected. Monthly median flows and the overall volume of water February–June would not substantially decrease on the Tuolumne and Merced Rivers and the LSJR; therefore, an increase in occurrence of disease above 59°F is not expected to exceed 20%, and the risk of disease is not expected to increase.	Less than significant - An increase in the occurrence of temperatures above 59°F would be less than 1%; therefore, there would be no substantial increase in the risk of disease.	No Impact - See AQUA-3	No Impact - See AQUA-3
AQUA-12: Changes in fish transport resulting from changes in flow	Significant and unavoidable - Flow on the Stanislaus River would be higher than baseline so fish transport would increase. The Tuolumne River flow would not change and fish transport would not change. However, the reduction in flow on the Merced River when compared to the baseline would likely result in a reduced fish transport on this river.	Significant and unavoidable - Flows would be lower during the outmigrating period on the Stanislaus River; furthermore, insufficient water would be available in the spring period (February–June) when compared to baseline conditions for adaptive management. Therefore, there it is expected that travel times of juveniles to the Bay-Delta would be significantly impacted. The monthly median flow or the overall volume of water February–June would not substantially decrease on the Tuolumne, Merced, and LSJR during salmonid rearing and outmigrating periods; furthermore, the overall volume of water during this time period would be similar to baseline conditions on the Merced River and, therefore, there would be sufficient water during the spring period to adaptively manage flows. Thus, it is not expected fish transport would decrease relative to baseline conditions.	Less than significant - The overall volume of water February–June would be similar to baseline conditions on the Stanislaus River; therefore, there would be sufficient water during the spring period to adaptively manage flows. Thus, it is not expected fish transport flows would decrease relative to baseline conditions. Monthly median flows and the overall volume of water February–June would not substantially decrease on the Tuolumne and Merced Rivers and the LSJR; therefore, it is not expected fish transport flows would decrease relative to baseline conditions	Less than significant - Changes in flows are expected to decrease average travel times to the Bay-Delta and as a result, fish transport would increase. .	No Impact - See AQUA-3.	No Impact - See AQUA-3.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
AQUA-13: Changes in southern Delta and estuarine habitat resulting from changes in SJR inflows and export effects	Less than significant - Delta operations would continue to be governed by current restrictions on export pumping rates, inflow/export ratios, and Old Middle River (OMR) flows to protect listed fish species from direct and indirect impacts of southern Delta operations. Although potential substantial increases in southern Delta pumping could be expected in June based on the increase in Stanislaus River flows, no long-term changes in the inflow/outflow ratio would occur as described under LSJR Alternative 4 because of higher SJR flows at Vernalis. Consequently, no long-term significant impacts on juvenile salmonids or other special-status fish species are expected.	Less than significant –No substantial change in export pumping or the direction or magnitude of flows in the southern Delta is expected. The combination of monthly increases and decreases in pumping rates would not have substantial long-term effects on export pumping or flow patterns in the southern Delta. Furthermore, there would be little effect on Delta outflows and the position of X2, Delta operations would continue to be governed by current restrictions on export pumping rates, inflow/export ratios, and Old Middle River (OMR) flows to protect listed fish species from direct and indirect impacts of southern Delta operations. Therefore, changes in southern Delta and estuarine habitat are expected to be less than significant.	Less than significant –. No substantial change in export pumping or the direction or magnitude of flows in the southern Delta is expected. The combination of monthly increases and decreases in pumping rates would not have substantial long-term effects on export pumping or flow patterns in the southern Delta. Furthermore, there would be little effect on Delta outflows and the position of X2, Delta operations would continue to be governed by current restrictions on export pumping rates, inflow/export ratios, and Old Middle River (OMR) flows to protect listed fish species from direct and indirect impacts of southern Delta operations. Therefore, changes in southern Delta and estuarine habitat are expected to be less than significant.	Less than significant –. No substantial change in export pumping or the direction or magnitude of flows in the southern Delta is expected. The combination of monthly increases and decreases in pumping rates would not have substantial long-term effects on export pumping or flow patterns in the southern Delta. Furthermore, there would be little effect on Delta outflows and the position of X2, Delta operations would continue to be governed by current restrictions on export pumping rates, inflow/export ratios, and Old Middle River (OMR) flows to protect listed fish species from direct and indirect impacts of southern Delta operations. Therefore, changes in southern Delta and estuarine habitat are expected to be less than significant.	No Impact - See AQUA-3.	No Impact - See AQUA-3.
Chapter 8: Terrestrial Biological Resources						
BIO-1: Have a substantial impacts on any riparian habitat or other sensitive natural terrestrial communities identified in local or regional plans, policies, regulations or by Department of Fish and Game (DFG) and U.S. Fish and Wildlife Service (USFWS)	Significant and unavoidable - Flow on the Stanislaus and Tuolumne Rivers would not substantially alter the riparian habitat because flows would be similar to baseline conditions on the Tuolumne and would be greater than baseline conditions on the Stanislaus and, therefore, support existing riparian habitat. However, the reduction in flow on the Merced River when compared to the baseline would likely result in a substantial alteration of riparian habitat or other sensitive terrestrial communities on this river.	Significant and unavoidable - The lower spring median monthly flows and overall cumulative distribution of flows on the Stanislaus River would substantially affect existing riparian or sensitive terrestrial communities. Changes to median monthly flows and the overall cumulative distribution of flows on the Merced and Tuolumne Rivers and the LSJR would not substantially affect riparian or sensitive terrestrial communities because those flows would be within the historical range of existing flow variations. Fluctuations in reservoir elevations would not be substantially different than those that currently occur.	Less than significant - The change in median monthly flows or overall cumulative distribution of flows on the Stanislaus, Tuolumne, and Merced Rivers and the LSJR would not substantially effect riparian habitat or other sensitive terrestrial communities because the plants located within the area of potential effects can survive inundation, are resistant to the effects of scouring and deposition, and are limited by water availability. Fluctuations in reservoir elevations would not be substantially different than those that currently occur	Less than significant - The change in median monthly flows or the overall cumulative distribution of flows on the Stanislaus, Tuolumne, and Merced Rivers and the LSJR would not substantially effect riparian habitat or other sensitive terrestrial communities because those plants located within the area of potential effects can survive inundation, are resistant to the effects of scouring and deposition, and are limited by water availability. Fluctuations in reservoir elevations would not be substantially different than those that currently occur.	No Impact - this alternative does not have the ability to result in changes to flow because it is a water quality objective for salinity; furthermore, the volume of water needed to meet the Vernalis EC objective is included in the modeling results and, thus, in the impact determinations, for the LSJR alternatives. Finally, salinity in the southern Delta would remain within the historical range, and the terrestrial plant and animal species can adapt to the variable salinity levels that the southern Delta currently experiences.	No Impact - this alternative does not have the ability to result in changes to flow because it is a water quality objective for salinity; furthermore, the volume of water needed to meet the Vernalis EC objective is included in the modeling results and, thus, in the impact determinations, for the LSJR alternatives. Finally, salinity in the southern Delta would remain within the historical range, and the terrestrial plant and animal species can adapt to the variable salinity levels that the southern Delta currently experiences.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
BIO-2: Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrologic interruption, or other means.	Less than significant - Flow on the Stanislaus, Tuolumne, and Merced Rivers would not substantially alter wetland communities resulting from changes in flow on these rivers. The Stanislaus River is not expected to have reductions in flow that would substantially alter wetland communities when compared to baseline conditions. The Tuolumne River would experience flow conditions similar to baseline conditions. While flows are expected to be reduced on the Merced River, which may change community composition and wetland habitat location as a result, emergent wetlands typically occur in the river bed adjacent to the low-flow river channels. Furthermore, wetlands are highly resilient ecosystems that are able to withstand a range of hydrologic conditions. Therefore, a substantial adverse effect on wetlands communities would not occur.	Less than significant - Community composition and wetland habitat location may change as a result of reduced monthly median flows on the Stanislaus River, Merced River, and LSJR; however, emergent wetlands typically occur in the river bed adjacent to the low-flow river channels and wetlands are highly resilient ecosystems that are able to withstand a range of hydrologic conditions. Therefore, a substantial adverse effect on wetlands communities would not occur. Monthly median flows on the Tuolumne River are expected to be similar to baseline conditions and, thus, would not pose a substantial adverse effect to wetland communities.	Less than significant - Community composition and wetland habitat location may change as a result of reduced monthly median flows on the Stanislaus River; however, emergent wetlands typically occur in the river bed adjacent to the low-flow river channels and wetlands are highly resilient ecosystems that are able to withstand a range of hydrologic conditions, Therefore, substantial impacts on wetlands communities would not occur. Monthly median flows or the cumulative distribution of flows on the Tuolumne and Merced Rivers and the LSJR would generally increase. Increased flow would not adversely affect wetland communities because wetland plants can survive inundation, are resistant to the effects of scouring and deposition, and are growth-limited by water availability. Therefore, a substantial adverse effect on wetland communities would not occur.	Less than significant - Monthly median flows or the cumulative distribution of flows on the Stanislaus, Tuolumne, and Merced Rivers and the LSJR would generally increase and would not adversely affect wetland communities because wetland plants can survive inundation, are resistant to the effects of scouring and deposition, and are growth-limited by water availability. Therefore, substantial adverse effects on wetland communities would not occur.	No Impact - See BIO-1.	No Impact – See BIO-1.
BIO-3: Facilitate an increase in distribution and abundance of invasive plants or nonnative wildlife that would have a substantial adverse effect on native terrestrial species.	Less than significant - Invasive plants and animals already exist throughout the watersheds of the Stanislaus, Tuolumne, and Merced Rivers. While some alteration of vegetation patterns at specific locations, there is no information available to suggest that increased flows would substantially alter or facilitate the establishment of invasive plant or animal species.	Less than significant - Changes in flows and reservoir elevations may result in alteration of vegetation patterns in specific locations, but there is no information to suggest increased flows would substantially increase the distribution and abundance of invasive plant species.	Less than significant - Changes in flows and reservoir elevations may result in alteration of vegetation patterns in specific locations, but there is no information to suggest increased flows would substantially increase the distribution and abundance of invasive plant species.	Less than significant - Changes in flows and reservoir elevations may result in alteration of vegetation patterns in specific locations, but there is no information to suggest increased flows would substantially increase the distribution and abundance of invasive plant species.	No Impact - See BIO-1.	No Impact - See BIO-1.
BIO-4: Have a substantial adverse effect, either directly or through habitat modifications, on any terrestrial animal species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG and USFWS	Significant and unavoidable – Impacts on special-status animal species dependent on riparian habitat and impacts on riparian habitat would be the same as those described above for BIO-1. Therefore, it is expected that special- status animal species would be adversely affected.	Significant and unavoidable - The special-status animal species present in the area of potential effects are dependent on riparian habitat. Reduced flows on the Stanislaus River would have a substantial adverse effect on riparian habitat, as described above for BIO-1; therefore, it is expected that special-status animal species would be adversely affected.	Less than significant - The special-status animal species present in the area of potential effects are dependent on riparian habitat. As described above for BIO-1, there would not be a substantial change to available riparian habitat. Therefore, it is not expected that special-status animal species would be adversely affected.	Less than significant - The special-status animal species present in the area of potential effects are dependent on riparian habitat. As described above for BIO-1, there would not be a substantial change to available riparian habitat. Therefore, it is not expected that special-status animal species would be adversely affected.	No Impact - See BIO-1.	No Impact - See BIO-1.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
BIO-5: Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan, or conflict with any local policies or ordinances protecting biological resources	Significant and unavoidable – Impacts on biological resources would be significant on the Merced River. By impacting habitat value, there would be a potential to conflict with habitat conservation plans or natural community conservation plans; therefore, conflicts with plans protecting biological resources would occur.	Significant and unavoidable - The lower spring median monthly flows and overall cumulative distribution of flows on the Stanislaus River would substantially affect existing riparian or sensitive terrestrial communities (BIO-1 and BIO-4). Therefore, impacts on biological resources would be significant on the Stanislaus River. By impacting habitat value, there would be a potential to conflict with plans protecting biological resources. Changes to median monthly flows and the overall cumulative distribution of flows on the Merced and Tuolumne Rivers and the LSJR would not substantially affect riparian or sensitive terrestrial communities because those flows would be within the historical range of existing flow variations. Therefore, impacts to habitat value would not occur and there would not be a potential to conflict with plans protecting biological resources.	Less than significant - The change in median monthly flows or overall cumulative distribution of flows on the Stanislaus, Tuolumne, and Merced Rivers and the LSJR would not substantially effect riparian habitat or other sensitive terrestrial communities or the special-status animal species dependent on them (BIO-1and BIO-4). Therefore, impacts to habitat value would not occur and there would not be a potential to conflict with plans protecting biological resources.	Less than significant - The change in median monthly flows or the overall cumulative distribution of flows on the Stanislaus, Tuolumne, and Merced Rivers and the LSJR would not substantially effect riparian habitat or other sensitive terrestrial communities or the special-status animal species dependent on them (BIO-1 and BIO-4). Therefore, impacts to habitat value would not occur and there would not be a potential to conflict with plans protecting biological resources. .	No Impact - See BIO-1.	No Impact - See BIO-1.
Chapter 9: Groundwater Resources						
Impact GW-1: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge	Significant and unavoidable - An increase in groundwater pumping would be needed to potentially offset the expected reduction in surface water diversions on the Stanislaus River. The reduction in surface water diversions would be greater than those expected for LSJR Alternative 4. Therefore, it is expected that a substantial depletion of groundwater supplies or substantial interference with groundwater recharge would occur. The surface water diversions on the Tuolumne and Merced Rivers would not be expected to be reduced significantly and, therefore, it is anticipated that a substantial increase in groundwater pumping would not occur when compared to baseline conditions.	Less than significant - Groundwater pumping to replace reduction in surface water diversions is expected to increase less than 5% of existing pumping. Therefore, a substantial depletion of groundwater supplies or substantial interference with groundwater recharge would not occur.	Significant and unavoidable - Groundwater pumping to replace reduction in surface water diversion is expected to be more than 5% of existing pumping in three subbasins (Modesto, Turlock, and Merced). Therefore, it is expected that a substantial depletion of groundwater supplies or substantial interference with groundwater recharge would occur.	Significant and unavoidable - Groundwater pumping to replace reduction in surface water diversion is expected to be more than 5% of existing pumping in four subbasins (Eastern San Joaquin, Modesto, Turlock, and Merced). Therefore, it is expected that a substantial depletion of groundwater supplies or substantial interference with groundwater recharge would occur.	No Impact – a change in groundwater pumping would not occur as a result of this alternative because there is no ability for this alternative to affect groundwater.	No Impact – a change in groundwater pumping would not occur as a result of this alternative because there is no ability for this alternative to affect groundwater.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Chapter 10: Recreational Resources and Visual Quality						
REC-1: Substantially reduce the use of existing recreation facilities or opportunities on rivers or at reservoirs	Less than significant - Reservoir elevations at are expected to remain relatively constant, not significantly reduced, when compared to baseline conditions. Therefore, changes to recreation facilities or opportunities at the reservoirs are not expected. Since the modeled Stanislaus River flows are expected to be greater than LSJR Alternative 3, but less than LSJR Alternative 4, it is not expected that these flows would substantially reduce the use of existing recreation facilities or opportunities on the rivers and reservoirs since neither of these alternatives would result in significant impacts. The Tuolumne and Merced Rivers would experience similar higher flows when compared to baseline conditions; therefore, it is not expected the use of existing recreation facilities or opportunities on the rivers and reservoirs would be substantially reduced.	Less than significant - The modeled seasonal average frequency of river flows that support recreation would not be reduced by more than 10%. The change in reservoir elevations would not be greater than 10 feet or decrease below designated recreational elevations. Therefore, it is expected that recreational opportunities would not be substantially reduced.	Significant and unavoidable – There would be a change in river flow such that the modeled average seasonal frequency of lower flows on the Merced and Tuolumne would be reduced by more than 10% and, therefore, it is expected that low-flow recreation opportunities (e.g., swimming, wading, floating) would be substantially reduced.	Significant and unavoidable – There would be a change in river flow such that the modeled average seasonal frequency of lower flows on the Merced and Tuolumne and mid-range flows on Tuolumne would be reduced by more than 10% and, therefore, it is expected that low-flow recreation opportunities (e.g., swimming, wading, floating) would be substantially reduced.	No Impact - Changes in salinity would not result in changes to water-dependent or water-enhanced recreation opportunities in the southern Delta. Salinity levels are imperceptible to recreationists who use the southern Delta for water-dependent activities, such as boating or kayaking and water-enhanced activities, such as wildlife viewing.	No Impact - Changes in salinity would not result in changes to water-dependent or water-enhanced recreation opportunities in the southern Delta. Salinity levels are imperceptible to recreationists who use the southern Delta for water-dependent activities, such as boating or kayaking, and water-enhanced activities, such as wildlife viewing.
REC-2: Substantially degrade the functionality of existing recreation facilities on the rivers or at reservoirs	Less than significant – There would be no change in the frequency or magnitude of the highest river flows or increase in reservoir elevations above capacity; thus, the functionality of existing recreational facilities would not be degraded.	Less than significant –There would be no change in the frequency or magnitude of the highest river flows or increase in reservoir elevations above capacity; thus the functionality of existing recreational facilities would not be degraded.	Less than significant – There would be no change in the frequency or magnitude of the highest river flows or increase in reservoir elevations above capacity; thus the functionality of existing recreational facilities would not be degraded.	Less than significant – There would be no change in the frequency or magnitude of the highest river flows or increase in reservoir elevations above capacity; thus the functionality of existing recreational facilities would not be degraded.	No Impact – See REC-1.	No Impact – See REC-1.
REC-3: Substantially degrade the existing visual character or quality of the reservoirs	Less than significant - Reservoir elevations at New Melones, New Don Pedro, and Lake McClure are expected to remain relatively constant, and not substantially reduced, when compared to baseline conditions. Therefore, a substantial degradation of the visual character and quality of the area surrounding the reservoirs is not expected.	Less than significant - No decrease in reservoir elevation levels such that a substantial degradation of existing visual character or quality would occur.	Less than significant - No decrease in reservoir elevation levels such that a substantial degradation of existing visual character or quality would occur.	Less than significant - No decrease in reservoir elevation levels such that a substantial degradation of existing visual character or quality would occur.	No Impact – This alternative would not apply directly to the reservoirs, and the USBR Vernalis salinity requirement in the program of implementation for this alternatives is the same as under baseline conditions.	No Impact –This alternative would not apply directly to the reservoirs, and the USBR Vernalis salinity requirement in the program of implementation for this alternatives is the same as under baseline conditions

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Chapter 11: Agricultural Resources						
AG-1: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to nonagricultural uses	Significant and unavoidable - Substantial reductions in crop acreage as a result of the reductions in surface water diversions on the Stanislaus River is expected. The reduction in surface water diversions would be greater than that expected for LSJR Alternative 4 on the Stanislaus River and LSJR Alternative 4 would result in significant impacts to agricultural resources. The surface water diversions on the Tuolumne and Merced Rivers are not expected to be reduced significantly and, therefore, it is anticipated that a substantial reduction in crop acreage would not occur in these watersheds.	Less than significant - Surface water diversions in the LSJR area of potential effects are expected to be similar to past and present diversions, and no significant reduction in surface water supply is expected; therefore, conversion of Prime or Unique farmland or farmland of Statewide Importance to nonagricultural uses would not occur.	Significant and unavoidable - Reductions in surface water diversions are expected to result in a 10% (or greater) reduction in acres of irrigated land for Corn, Field, Pasture, and Rice. Approximately 81,858 acres of Prime or Unique farmland or farmland of Statewide Importance requiring irrigation in 8 out of every 10 years could potentially be converted to nonagricultural use.	Significant and unavoidable - Reductions in surface water diversions are expected to result in a 10% (or greater) reduction in acres of irrigated land for Alfalfa, Corn, Field, Pasture, and Rice. Approximately 210,812 acres of Prime or Unique Farmland or farmland of Statewide Importance requiring irrigation in 8 out of 10 years could potentially be converted to nonagricultural use.	Less than significant - Water quality within the southern Delta is expected to remain unchanged as USBR would be responsible for complying with the same salinity requirements that currently exist at Vernalis. No reduction or conversion of agricultural acreage is likely.	Less than significant - Water quality within the southern Delta is expected to remain unchanged as USBR would be responsible for complying with the same salinity requirements that currently exist at Vernalis. No reduction or conversion of agricultural acreage is likely.
AG-2: Other changes in the existing environment which, due to their location or nature, could result in a conversion of farmland to nonagricultural use	Significant and unavoidable - It is expected that the significant reduction in agricultural acreage described in AG-1 would result in the conversion of farmland to nonagricultural uses.	Less than significant - No significant reduction in surface water supply and corresponding reduction in agricultural acreage is expected; therefore, no conversion of farmland to nonagricultural uses is likely. Impacts on irrigated agriculture from a high water table resulting from increased river flows on the Stanislaus River are expected to occur on less than 0.01% of irrigated acreage therefore crop production would not be substantially reduced.	Less than significant - The total irrigated acreage is likely to be reduced due to reduction in surface water supply, however acreage could be rotated through alternate year irrigated production on approximately 40,000 acres, such that less than 10% of the remaining acreage could be converted to nonagricultural uses. Impacts on irrigated agriculture from a high water table resulting from increased river flows on the Stanislaus River are expected to occur on less than 0.01% of irrigated acreage therefore, crop production would not be substantially reduced.	Significant and unavoidable - The total irrigated acreage potentially reduced, due to surface water supply reductions, would be too great to maintain less than a 10% reduction through the use of dryland faming in alternating years and the acreage could be converted to nonagricultural uses. Impacts on irrigated agriculture from a high water table resulting from increased river flows on the Stanislaus River are expected to occur on less than 0.01% of irrigated acreage therefore, crop production would not be substantially reduced.	Less than significant –Water quality within the southern Delta is expected to remain unchanged as USBR will be responsible for complying with the same salinity requirements that currently exist at Vernalis. This is not expected to result in the conversion of farmland to non-agricultural use.	Less than significant – Water quality within the southern Delta is expected to remain unchanged as USBR will be responsible for complying with the same salinity requirements that currently exist at Vernalis. This is not expected to result in the conversion of farmland to non-agricultural use.
Chapter 12: Cultural Resources						
CUL-1: Substantial adverse change in the significance of a historical or archaeological resource	Less than significant - Changes in river flows are not expected to alter the low potential for significant cultural resources to exist along rivers due to previous natural and anthropogenic disturbances. Reservoir elevations at New Melones, New Don Pedro, and Lake McClure are expected to remain relatively constant or generally greater, not significantly reduced, when compared to baseline conditions. Therefore, substantial adverse changes in the significance of historical or archeological resources are not expected.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations, and known or unknown significant cultural resources are expected to continue to be inundated or exposed as usual under current operations. Changes in river flows are not expected to alter the low potential for significant cultural resources to exist along rivers due to previous natural and anthropogenic disturbances.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations, and known or unknown significant cultural resources are expected to continue to be inundated or exposed as usual under current operations. Changes in river flows are not expected to alter the low potential for significant cultural resources to exist along rivers due to previous natural and anthropogenic disturbances.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations, and known or unknown significant cultural resources are expected to continue to be inundated or exposed as usual under current operations. Changes in river flows are not expected to alter the low potential for significant cultural resources to exist along rivers due to previous natural and anthropogenic disturbances.	No Impact – This alternative would not result in activities that could affect cultural resources.	No Impact - This alternative would not result in activities that could affect cultural resources.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
CUL-2: Disturbance of human remains, including those interred outside formal cemeteries	Less than significant - The potential for the presence of undocumented human remains within and adjacent to the LSJR and the Stanislaus, Tuolumne, and Merced Rivers is considered low due to prior disturbance of the riparian corridors by natural and historic-era anthropogenic processes. Any human remains discovered within and adjacent to the LSJR and the three tributaries outside of formal cemeteries would also have been treated in accordance with state or federal regulations. Reservoir elevations at New Melones, New Don Pedro, and Lake McClure are expected to remain relatively constant or generally greater, not significantly reduced, when compared to baseline conditions. Therefore, a disturbance of human remains as a result of reservoir elevation changes is not expected.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations and are not expected to affect human remains due to low potential and prior treatment under existing state and federal regulations. Changes in river flows are not expected to alter the low potential for undocumented human remains to exist along rivers due to previous natural and anthropogenic disturbances.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations and are not expected to affect human remains due to low potential and prior treatment under existing state and federal regulations. Changes in river flows are not expected to alter the low potential for undocumented human remains to exist along rivers due to previous natural and anthropogenic disturbances.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations and are not expected to affect human remains due to low potential and prior treatment under existing state and federal regulations. Changes in river flows are not expected to alter the low potential for undocumented human remains to exist along rivers due to previous natural and anthropogenic disturbances.	No Impact – See CUL-1.	No Impact – See CUL-1.
CUL-3: Disturbance or destruction of a unique paleontological resource or site or unique geologic feature	Less than significant - The potential for paleontological resources within and adjacent to the LSJR and the Stanislaus, Tuolumne, and Merced Rivers is considered low due to the depth of occurrence of rock units with high paleontological potential below reworked surficial sediments and Holocene-age floodplain and channel deposits. Buried paleontological resources would be found at soil and rock depth too deep for the rivers to modify or change. Reservoir elevations at New Melones, New Don Pedro, and Lake McClure are expected to remain relatively constant or generally greater, not significantly reduced, when compared to baseline conditions. Therefore, disturbance of unique paleontological resources is not expected.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations, and caves are expected to continue to be inundated and exposed as they currently are under operations. Changes in river flows are not expected to alter the low potential for paleontological resources to exist along rivers due to depth of occurrence or previous natural and anthropogenic disturbances.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations, and caves are expected to continue to be inundated and exposed as they currently are under operations. Changes in river flows are not expected to alter the low potential for paleontological resources to exist along rivers due to depth of occurrence or previous natural and anthropogenic disturbances.	Less than significant - The expected changes in reservoir elevations are within historical fluctuations, and caves are expected to continue to be inundated and exposed as they currently are under operations. Changes in river flows are not expected to alter the low potential for paleontological resources to exist along rivers due to depth of occurrence or previous natural and anthropogenic disturbances.	No Impact – See CUL-1.	No Impact – See CUL-1.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Chapter 13: Service Providers						
SP-1: Substantially degrade water quality for municipal drinking water purposes	Less than significant – Flows would result in compliance with the existing salinity objectives in the southern Delta. Thus, water quality would not be substantially degraded such that service providers diverting drinking water from the southern Delta would be affected.	Less than significant - The resulting inflow from the LSJR would not substantially modify the historical range of salinity (0.2 dS/m–1.2 dS/m) in the southern Delta; therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur.	Less than significant - The resulting inflow from the LSJR would not substantially modify the historical range of salinity (0.2 dS/m–1.2 dS/m) in the southern Delta; therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur.	Less than significant - The resulting inflow from the LSJR would not substantially modify the historical range of salinity (0.2 dS/m–1.2 dS/m) in the southern Delta; therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur.	Less than significant - The USBR Vernalis salinity requirement contained in the program of implementation would maintain the historical range of salinity in the southern Delta. Furthermore, the objectives would be under the upper limit for the secondary drinking water maximum contaminant level (MCL) for EC. Therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur.	Less than significant - The USBR Vernalis salinity requirement contained in the program of implementation would maintain the historical range of salinity in the southern Delta. Furthermore, the objectives would be under the upper limit for the secondary drinking water maximum contaminant level (MCL) for EC. Therefore, a substantial degradation of water quality affecting service providers diverting drinking water from the southern Delta would not occur.
SP-2: Require or result in the construction of new or expanded water treatment facilities or water supply infrastructure, the construction of which could cause significant environmental effects	Significant and unavoidable - The surface water reductions expected on the Stanislaus River would likely result in insufficient water supplies for service providers that primarily rely on surface water sources because they would generally be greater than those described in LSJR Alternative 4 on the Stanislaus River. The construction and operation of new water supply facilities or infrastructure may be needed to provide alternative sources of water supply, which could cause significant environmental effects.	Less than significant - Surface water diversions would be similar to baseline conditions on the Stanislaus, Tuolumne, and Merced Rivers; therefore, it is not expected that service providers would construct or operate new water treatment facilities or water supply facilities or infrastructure.	Significant and unavoidable - Surface water diversion reductions on the Tuolumne and Merced Rivers are expected to be approximately 20% and 17%, respectively; the reductions in surface water diversions on the Tuolumne and Merced Rivers could result in the construction of new or expanded water treatment facilities or water supply infrastructure, the construction of which could result in significant environmental effects. Surface water diversions on the Stanislaus River would be similar to baseline conditions; therefore, the construction of new or expanded water treatment facilities or water supply facilities would not occur.	Significant and unavoidable - Surface water diversion reductions on the Stanislaus, Tuolumne, and Merced Rivers are expected to be approximately 20%, 37%, and 31%, respectively; the reductions in surface water diversions could result in the construction of new or expanded water treatment facilities or water supply infrastructure, which could result in significant environmental effects.	Less than significant - The USBR Vernalis salinity requirement contained in the program of implementation would not change and thus would maintain the general historical range of salinity in the southern Delta. Therefore, it is not expected that service providers would need to construct or modify water treatment or water supply facilities. Facilities that could be constructed as a result of wastewater treatment providers complying with new NPDES effluent limitations are discussed under SP-4.	Less than significant - The USBR Vernalis salinity requirement contained in the program of implementation would not change and thus would maintain the general historical range of salinity in the southern Delta. Therefore, it is not expected that service providers would need to construct or modify water treatment or water supply facilities. Facilities that could be constructed as a result of wastewater treatment providers complying with new NPDES effluent limitations are discussed under SP-4.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
SP-3: Result in substantial changes to San Joaquin River inflows to the Delta such that insufficient water supplies would be available to service providers relying on CVP/SWP exports.	Less than significant – Exports are not anticipated to result in a substantial change from baseline conditions. Vernalis flows are expected to increase and thus a reduction of exports would not occur.	Less than significant - Annual average exports would not change from baseline conditions and annual average exports would be reduced by approximately 2% in February–June; insufficient water supplies to service providers relying on exports would not occur.	Less than significant - Annual average exports would not decrease from baseline conditions; insufficient water supplies to service providers relying on exports would not occur.	Less than significant - Annual average exports would not decrease from baseline conditions; insufficient water supplies to service providers relying on exports would not occur.	No Impact – The flows to satisfy the USBR Vernalis EC requirement contained in the program of implementation are already included in the modeling results for the LSJR alternatives.	No Impact – The flows to satisfy the USBR Vernalis EC requirement contained in the program of implementation are already included in the modeling results for the LSJR alternatives.
SP-4: Require or result in the construction of new wastewater treatment facilities or expansion of existing facilities or infrastructure, the construction or operation of which could cause significant environmental effects	Significant and unavoidable - The existing EC objectives for the southern Delta and Vernalis would be enforced and adopted by the State Water Board as the wastewater treatment requirements. While the increase in flow expected would reduce the salinity in the southern Delta at the interior compliance stations and would achieve compliance at these stations, existing wastewater treatment plant dischargers (service providers), such as The City of Tracy, City of Stockton, and City of Manteca, would likely be unable to meet the current 2006 Bay-Delta Plan salinity objective of 0.7 dS/m April–August. The City of Tracy and City of Stockton would also likely not meet the current 2006 Bay-Delta Plan salinity objective of 1.0 dS/m. Therefore, it is expected that these service providers would exceed wastewater treatment requirements during some parts of the year such that new wastewater treatment facilities, or expansion of existing facilities or infrastructure could result, the construction or operation of which could cause significant environmental effects.	Wastewater treatment facilities and infrastructure associated with water supply facilities and infrastructure are discussed above under SP-2.	Wastewater treatment facilities and infrastructure associated with water supply facilities and infrastructure are discussed above under SP-2.	Wastewater treatment facilities and infrastructure associated with water supply facilities and infrastructure are discussed above under SP-2.	Significant and unavoidable - Tracy and Stockton may need to construct new wastewater treatment facilities or expand existing facilities to comply with changes to NPDES effluent limitation implementing a 1.0 dS/m salinity objective , set by the Central Valley Water Board. A change in baseline conditions with respect to Deuel would not result from this alternative.	Less than significant - The construction of new wastewater treatment facilities or expanding existing facilities are not expected in order to comply with changes to NPDES effluent limitations implementing a 1.4 dS/m objective for salinity, set by the Central Valley Water Board. This is because, with the exception of Deuel Vocational Institution (Deuel), their existing discharges are already below this objective. A change in baseline conditions with respect to Deuel would not result from this alternative.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Chapter 14: Energy Resources and Climate Change						
ECC-1: Adversely affect the reliability of California's electric grid	Less than significant - LSJR Alternatives 3 and 4 are not anticipated to result in an adverse effect on the reliability of California's electric grid. The No Project Alternative flows on the Stanislaus River would be somewhat greater than LSJR Alternative 3 flows; however, they are less than LSJR Alternative 4 flows. Therefore, it is expected that the electric grid would be maintained under the No Project Alternative. Furthermore, reservoir elevations at New Melones, New Don Pedro, and Lake McClure are expected to remain relatively constant or generally greater, not significantly reduced, when compared to baseline conditions. Therefore, adverse effects on the reliability of California's electric grid would not occur.	Less than significant - Transmission line loadings would not exceed the limits under contingency outage conditions because hydropower generation and reservoir elevation would not be substantially modified. Therefore, adverse effects on the reliability of California's electric grid would not occur.	Less than significant - Transmission line loadings would not exceed the limits under contingency outage conditions because hydropower generation and reservoir elevation would not be substantially modified. Therefore, adverse effects on the reliability of California's electric grid would not occur.	Less than significant - Transmission line loadings would not exceed the limits under contingency outage conditions after redispatch of generator facilities to correct a minor violation between Borden and Gregg substations and Gregg and Storey substations. Re-dispatches are regular occurrences in the California energy grid, and they provide a solution to redistribute power based on the redispatch. Therefore, adverse effects on the reliability of California's electric grid would not occur.	No Impact - The water quality objective for salinity could not affect energy resources or climate change.	No Impact - The water quality objective for salinity could not affect energy resources or climate change.
ECC-2: Result in inefficient, wasteful, and unnecessary energy consumption	Less than significant - Additional energy consumption could occur as a result of groundwater pumping, it would not result in inefficient, wasteful, and unnecessary consumption of energy because the groundwater pumping is necessary to maintain water supply irrigation demand. Furthermore, it is anticipated that if new groundwater wells were to be installed, they would be efficient. Additional energy generation could be needed at other facilities to compensate for a potential loss of hydropower that could occur. However, this increased electricity generation is not considered inefficient, wasteful, and unnecessary as it is energy that would be generated to maintain the energy supply level that is currently supplied by hydropower.	Less than significant - Very little additional energy would be consumed under this alternative when compared to baseline conditions. Therefore, there would be no inefficient, wasteful or unnecessary energy consumption.	Less than significant - Additional groundwater pumping would not result in inefficient, wasteful, and unnecessary consumption of energy because the groundwater pumping is necessary to maintain water supply irrigation demand. Additional energy generation at other facilities to compensate for a potential loss of hydropower would not be considered inefficient, wasteful, and unnecessary as it is energy that would be generated to maintain the energy supply level that is currently supplied by hydropower. Therefore, there would be no inefficient, wasteful or unnecessary energy consumption.	Less than significant - Additional groundwater pumping would not result in inefficient, wasteful, and unnecessary consumption of energy because the groundwater pumping is necessary to maintain water supply irrigation demand. Additional energy generation at other facilities to compensate for a potential loss of hydropower would not be considered inefficient, wasteful, and unnecessary as it is energy that would be generated to maintain the energy supply level that is currently supplied by hydropower. Therefore, there would be no inefficient, wasteful or unnecessary energy consumption.	No Impact – See ECC-1.	No Impact – See ECC-1.

Table ES-2. Continued

Impact	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
ECC-3: Generate GHG emissions, either directly or indirectly, that have a significant impact on the environment	Significant and unavoidable - An increase in groundwater pumping and a potential shift from hydropower to nonhydropower energy production as a result of the expected reduction in surface water diversions and change to flow on the Stanislaus River. Both of these would be expected to generate GHG emissions greater than the threshold of 10,000 megatons (MT) of GHGs, as described for both LSJR Alternative 3 and 4.	Less than significant - Emissions would not exceed the 10,000 MT carbon dioxide equivalent (CO_2e) threshold. Therefore, GHG emissions would not have a significant impact on the environment.	Significant and unavoidable - Emissions exceed the 10,000 MT CO_2e threshold. Therefore, GHG emissions would have a significant impact on the environment.	Significant and unavoidable - Emissions exceed the 10,000 MT CO_2e threshold. Therefore, GHG emissions would have a significant impact on the environment.	No Impact – See ECC-1.	No Impact – See ECC-1.
ECC-4: Conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing the GHG emissions	Significant and unavoidable - Since the No Project Alternative would be expected to exceed the 10,000 MT GHG threshold, it would conflict with existing applicable plans, policies, or regulations adopted for the purposes of reducing GHG emissions, such as AB32.	Less than significant - Since GHG emissions would not exceed the 10,000 MT CO_2e threshold it is expected there would be no conflict with applicable plans, policies or regulations adopted for the purpose of reducing GHGs.	Significant and unavoidable –Since GHG emissions would exceed the 10,000 MT CO_2e threshold it is expected there would be a conflict with applicable plans, policies or regulations adopted for the purpose of reducing GHGs.	Significant and unavoidable - Since GHG emissions would exceed the 10,000 MT CO_2e threshold it is expected there would be a conflict with applicable plans, policies or regulations adopted for the purpose of reducing GHGs.	No Impact – See ECC-1.	No Impact – See ECC-1.
ECC-5: Effect of global climate change on the LSJR and SDWQ alternatives	Less than significant - The State Water Board is required to prepare Water Quality Control Plans (WQCPs) and regularly review the plans to update water quality standards. As a result, the planning process continually accounts for changing conditions related to water quality and water planning, such as climate change. Therefore, it is anticipated that the effect of global climate change on the No Project Alternative would be less than significant.	Less than significant - Climate change would not affect the impacts of the LSJR alternatives because of the adaptive management framework required to respond to changing circumstances with respect to flow and water quality that might arise due to climate change. Furthermore, the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality, and water planning such as climate change.	Less than significant - Climate change would not affect the impacts of the LSJR alternatives because of the adaptive management framework required to respond to changing circumstances with respect to flow and water quality that might arise due to climate change. Furthermore, the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality and water planning, such as climate change.	Less than significant - Climate change would not affect the impacts of the LSJR alternatives because of the adaptive management framework required to respond to changing circumstances with respect to flow and water quality that might arise due to climate change and because the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality and water planning, such as climate change.	Less than significant - Climate change would not affect the impacts of the SDWQ alternatives since the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality and water planning, such as climate change.	Less than significant – Climate change would not affect the impacts of the SDWQ alternatives since the State Water Board is required to regularly review the WQCPs. The planning process continually accounts for changing conditions related to water quality and water planning, such as climate change.

EC	=	electrical conductivity (salinity)
dS/m	=	deciSiemens per meter
USBR	=	United States Bureau of Reclamation
NPDES	=	National Pollution Discharge Elimination System
GHG	=	greenhouse gas
AB32	=	Assembly Bill 32, California Global Warming Solutions Act

ES6.3 Significant and Unavoidable Impacts

Significant and unavoidable impacts were identified for several resources under the different alternatives evaluated. The SED discusses the feasibility of implementing mitigation measures to reduce significant impacts; however, as described in Chapters 5–17, mitigation is either infeasible or will not reduce impacts to less than significant. Table ES-3 below summarizes the resources that have significant and unavoidable impacts by alternative.

Table ES-3. Significant and Unavoidable Impacts of the LSJR and SDWQ Alternatives

	Alternative					
Environmental Resource Area	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2	SDWQ Alternative 3
Water Supply, Surface Hydrology, and Water Quality	S	S	S	S	L	L
Flooding, Sediment, and Erosion	L	L	L	L	N	N
Aquatic Resources	S	S	L	L	N	N
Terrestrial Biological Resources	S	S	L	L	L	L
Groundwater Resources	S	L	S	S	N	N
Recreational Resources and Visual Quality	L	L	S	S	N	N
Agricultural Resources	S	L	S	S	L	L
Cultural Resources	L	L	L	L	N	N
Service Providers	S	L	S	S	S	L
Energy Resources and Climate Change	S	L	S	S	N	N

Notes:

Gray cells indicated significant and unavoidable impacts

S = significant and unavoidable impact

L = less than significant impact

N = no impact

The significant impacts summarized in Table ES-4 would need either lower flows or higher flows on certain rivers to reduce impacts to less than significant. Evaluating the effects of lower and higher flows on the different rivers is part of other alternatives (e.g., LSJR Alternatives 1 and 2 for lower flows on some rivers and LSJR Alternatives 3 and 4 for higher flows on some rivers) and is separately considered in this document. Requiring lower flows or higher flows to reduce the impacts under certain alternatives cannot be independently applied as a mitigation measure because requiring these flows would be inconsistent with the terms of the different alternatives (e.g., requiring 40 percent of unimpaired flow [LSJR Alternative 3]). Thus, impacts under the respective alternatives would be significant and unavoidable.

Table ES-4. Significant Impacts that Would Require Modification to LSJR Alternatives

	LSJR Alternative 1 and SDWQ Alternative 1 (No Project)	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2
Water Supply, Surface Hydrology, and Water Quality	HYD-1, WS-1, WQ-3, WQ-4				N/A
Aquatic Resources	AQUA-3, AQUA-4, AQUA-5, AQUA-10, AQUA-11, AQUA-12		N/A	N/A	N/A
Terrestrial Biological Resources	BIO-1, BIO-4, BIO-5				
Groundwater Resources	GW-1	N/A	GW-1		N/A
Recreational Resources and Visual Quality	N/A	N/A	REC-1		N/A
Agricultural Resources	AG-1, AG-2	N/A	AG-1	AG-1, AG-2	N/A
N/A = not applicable					

The significant impacts summarized in Table ES-5 would need actions from other entities or agencies to reduce them to less than significant. The possible actions and the State Water Board's authority to require these actions are detailed in Chapter 7, *Aquatic Resources*, Chapter 8, *Terrestrial Biological Resources*, Chapter 9, *Groundwater Resources*, Chapter 11, *Agricultural Resources*, Chapter 13, *Service Providers*, and Chapter 14, *Energy and Climate Change*. Some of these actions would include resource agencies implementing riparian habitat restoration to reduce temperature impacts to aquatic species and riparian impacts to terrestrial species; irrigation districts implementing irrigation efficiency measures to reduce impacts to agriculture and GHG emissions; local and regional groundwater agencies and authorities implementing groundwater management goals, conjunctive use opportunities, and regulating groundwater to reduce impacts to groundwater; and service providers implementing project specific best management practices and design features to reduce impacts associated with construction or operation of new or modified water supply facilities or infrastructure and/or wastewater treatment facilities or infrastructure. Generally, as described in the respective chapters, the State Water Board does not have the authority to require these types of actions, thus impacts would be significant and unavoidable.

Table ES-5. Significant Impacts that Would Require Actions from Other Entities or Agencies

	LSJR Alternative 1 and SDWQ Alternative 1	LSJR Alternative 2	LSJR Alternative 3	LSJR Alternative 4	SDWQ Alternative 2
Aquatic Resources	AQUA-4, AQUA-11		N/A	N/A	N/A
Terrestrial Biological Resources	BIO-1, BIO-4, BIO-5		N/A	N/A	N/A
Groundwater Resources	GW-1	N/A	GW-1		N/A
Agricultural Resources	AG-1, AG-2	N/A	AG-1	AG-1, AG-2	N/A
Service Providers	SP-2, SP-4	N/A	SP-2,		SP-4
Energy Resources and Climate Change	ECC-3, ECC-4	N/A	ECC-3, ECC-4		N/A
N/A = not applicable					

There are a few impacts (AQUA-4 and AQUA-11) associated with LSJR Alternative 2 that the State Water Board can and will reduce through several actions as described in Chapter 7, *Aquatic Resources*. These actions include development and implementation of a coldwater pool management program designed to maintain best available water temperatures for sensitive fish species and life stages. The program of implementation for LSJR Alternatives 2, 3, or 4 states that during the implementation proceeding for the plan amendments, the State Water Board may establish requirements, including minimum reservoir carryover storage or other requirements, to assure that implementation of LSJR flows pursuant to the plan amendments does not have adverse impacts on coldwater pool levels and related fisheries impacts. However, the effectiveness of these measures would depend on the downstream extent to which water temperatures can be controlled during these critical periods. Given the dominant influence of meteorological conditions on large valley streams, such measures may not fully offset potential temperature impacts associated with reduced flows, especially in the lowermost tributary reaches. Consequently, significant impacts may still occur under LSJR Alternative 2.

ES7 Economics

Chapter 18, *Economic Analyses*, presents economic analyses of the various alternatives. Under CEQA, project-related social or economic effects are not, as a general rule, required to be analyzed in CEQA documents; however, a lead agency may decide to include an assessment of economic or social effects in an EIR (or, by extension, an SED), particularly if these effects are perceived as being important or substantial. Under the California Water Code, the need for economic analysis associated with State Water Board actions is required by two sections. Water Code Section 13141 states:

> . . . prior to implementation of any agricultural water quality control program, an estimate of the total cost of such a program, together with an identification of potential sources of financing, shall be indicated in any regional water quality control plan.

Water Code Section 13241 states that "economic considerations" should be considered in establishing water quality objectives. In practice, compliance with these statutory provisions typically involves quantifying the costs to affected parties (e.g., farmers and water districts), and assessing impacts on affected local and regional economies of related changes in economic activity. Evaluation of other potential economic effects, such as water quality benefits, typically is conducted more qualitatively.

The economic analysis presented in the SED will help inform the State Water Board's consideration of potential changes to the 2006 Bay-Delta Plan related to LSJR flows and southern Delta water quality objectives. Any project-level changes to water rights or other measures that may be needed to implement any approved changes to the 2006 Bay-Delta Plan will be considered in a subsequent proceeding and would require project-level analysis as appropriate. Therefore, the economic analysis, which summarizes results from topic-specific analyses presented elsewhere in the SED and its appendices, is limited by the programmatic nature of this document.

Under the LSJR alternatives, changes in flows would result both in potential costs (e.g., reduction in agricultural production and/or hydropower production) and potential benefits (e.g., fisheries and river recreation opportunities) in the three eastside tributary watersheds (the Stanislaus, Tuolumne, and Merced Rivers) and the SJR Basin. The anticipated economic effects of the LSJR alternatives are summarized in Table ES-6.

Table ES-6. Summary of Average Annual Effects of the LSJR Alternatives, Relative to Baseline

	LSJR Alternative 2		LSJR Alternative 3		LSJR Alternative 4	
Impact Category	Change	% Change	Change	% Change	Change	% Change
Agricultural Production						
Irrigated acreage	+12,280	+1.0	-66,500	-7.0	-155,720	-16.0
Crop revenues ($M)	+$9	+0.3	-$40	-1.5	-$124	-4.5
Hydropower Production						
Generation (GWh)	+6	+0	-38	-2	-68	-4
Hydropower revenue ($M)	-$0.852	+0.9	-$2.45	-3.0	-$5.06	-4
Recreation						
Use (visitor days)	0	0.0	-44,600	–	-119,600	–
User net benefits ($M)	$0	0.0	-0.56	–	-1.5	–
Visitor spending ($M)	$0	0.0	-0.67	–	-1.8	–
Recreational Fisheries	Effects not quantified but anticipated to be minor.		Effects not quantified but anticipated to be adverse for the Stanislaus River due to lower flows, particularly during the February–June period, and related effects on fisheries.		Effects not quantified but anticipated to be minor.	

Impact Category	LSJR Alternative 2		LSJR Alternative 3		LSJR Alternative 4	
	Change	% Change	Change	% Change	Change	% Change
Regional Economic Effects						
Agriculture-related effects						
Total sector output ($M)	+$15	+0.3	-$69	-1.5	-$210	-4.5
Total sector jobs	+102	+0.3	-465	-1.5	-1,432	-4.5
Hydropower-related effects	Regional effects not quantified but anticipated to be minor.		Regional effects not quantified but anticipated to be minor.		Regional effects not quantified but anticipated to be minor.	
Recreation-related effects	No effects.		Regional effects not quantified but anticipated to be minor.		Regional effects not quantified; anticipated to be greater than LSJR Alternative 3 but still minor.	
Recreational fisheries-related effects	Regional effects not quantified but anticipated to be minor.		Regional effects not quantified but anticipated to be adverse for the Stanislaus River.		Regional effects not quantified but anticipated to be minor.	

M = millions
GWh = gigawatt hour

The SDWQ alternatives would establish revised salinity objectives to protect the beneficial use of agriculture in the southern Delta. Revising the objective could involve costs of dischargers complying with a National Pollution Discharge Elimination System Permit (NPDES) discharge permit, waste discharge requirements, or complying with a total maximum daily load (TMDL) that is established for protecting agricultural beneficial uses, all of which would be established through subsequent actions of the Central Valley Regional Water Quality Control Board (Central Valley Water Board). Potential compliance costs would be expected mostly from increased wastewater treatment costs at various wastewater treatment districts, although costs also could be incurred by agricultural operators for return flow salinity controls. Potential ratepayer effects and regional economic impacts resulting from higher treatment costs would also be possible. Because the actual methods of compliance that would ultimately be used are necessarily site- and discharge- specific, only general costs of compliance for agencies could be developed, as described below.

- **Reduce salinity discharges by developing new, higher-quality water supplies.** The cost for a permanent water purchase by a water purveyor in the southern Delta portion of the plan area would be $1,716 per acre-foot (AF), or $310 per AF for a long term transfer, not including capital costs, administrative, engineering, or legal costs related to securing the water supply (Tables H-1 and H-2 in Appendix H, *Evaluation of Methods of Compliance*). These costs could range from $235 to $337 million to develop 33,600–44,000 AF per year (AFY) of new surface water resources (Table H-11 in Appendix H).
- **Implement salinity pretreatment programs.** A wastewater treatment agency could implement a program that involves replacing 2,000 salt-regenerating water softeners over 5 years. Under such a program, the wastewater treatment agency could reasonably be expected to

pay $900,000–$9,000,000 over the life of the program ($185,000–$1,800,000 per year) (Tables H-13 and H-14).

- **Develop desalination processes at the wastewater treatment plant.** Assuming a 10 million gallon per day discharger, a wastewater treatment agency could be expected to pay $5 million–$22 million to construct a reverse osmosis system at the wastewater treatment plant.
- **Implement agricultural return flow salinity controls.** Control options include real-time management (e.g., changing the timing of the release of agricultural discharge to receiving waters) or containing agricultural discharge in evaporation ponds. Assuming 11 real-time management systems to effectively cover the major water users in the plan area, estimated construction costs could total $4.7 million, with an operations and maintenance budget of $1.1 million per year (excluding costs to construct and operate temporary detention ponds). Assuming a maximum of 50 TAF storage is needed for zero surface water discharge, constructing evaporation ponds could cost an estimated $17 million, with $2.5 million per year to operate. Hauling concentrated salts to a landfill could cost $200 per ton, and $25 per ton for landfill operations and maintenance.
- **Provide additional low lift pumping stations at existing south Delta temporary barriers.** Assuming a two-pumping site alternative with 1,000 cfs pumping capacity, with combined pumping at Middle and Old River barriers, estimated construction costs could range from $55.5 to $540.7 million, with annual operating costs ranging from $4.5 to $62.7 million.

Under the SDWQ alternatives, costs for complying with salinity objectives could result in rate increases for ratepayers in wastewater treatment districts that do not currently meet salinity objectives set by the alternatives. The following wastewater treatment agencies could face increased compliance costs, potentially resulting in higher costs to ratepayers to offset compliance-related expenditures for development and operation of programs and/or facilities.

- **SDWQ Alternative 1: No Project:** City of Tracy, City of Stockton, City of Manteca
- **SDWQ Alternative 2: 1.0 dS/m Salinity:** City of Tracy, City of Stockton
- **SDWQ Alternative 3: 1.4 dS/m Salinity:** none

Rate increases could shift a portion of the spending by residential, commercial, and industrial ratepayers on consumer goods and services, business employee wages, and business supplies and services to monthly sewer utility bills.

ES8 Summary of Impacts of Preferred Alternatives

The Preferred LSJR and SDWQ Alternatives were identified after considering the impact analyses contained in the SED. The evaluation of the potential impacts of the preferred alternatives is presented in Chapter 20, *Preferred LSJR Alternative and SDWQ Alternative* and summarized below. Proposed amendments to the 2006 Bay-Delta Plan language based on these preferred alternatives are presented in Appendix K, *Revised Water Quality Control Plan*.

ES8.1 Preferred LSJR Alternative

The Preferred LSJR Alternative falls within the range of alternatives analyzed in the SED. The narrative objective of the Preferred LSJR Alternative is the same as that for LSJR Alternatives 2, 3, and 4. The program of implementation for the Preferred LSJR Alternative, however, has a minimum flow requirement of 35 percent unimpaired February–June flow for the Stanislaus, Tuolumne, and Merced Rivers, which is a hybrid between LSJR Alternative 2 (20% unimpaired flow) and LSJR Alternative 3 (40% unimpaired flow). The analysis in Chapter 20 is based on interpolating between the modeling and other impact analyses and determinations from LSJR Alternatives 2 and 3.

Environmental Impacts

The Preferred LSJR Alternative would generally increase mean annual river flows relative to baseline conditions, and improve conditions for fish and wildlife beneficial uses. The hydrologic modeling performed in the SED, and summarized in Table ES-7 below, shows the average February–June river flow across 82 years of simulation would be increased on the Tuolumne and Merced River by 21 percent and 20 percent respectively, while the Stanislaus River is decreased by seven percent. To demonstrate the variability across these 82 years of simulation, Table ES-7 also presents the 10th, 50th, and 90th percentile values. As presented in Table ES-8, however, this increase in flow would be expected to reduce the average total annual quantity of water available for diversion on all three tributaries by 181 thousand acre-feet (TAF) per year, representing a 9 percent reduction in average annual diversions and a significant impact. There may also be significant impacts on groundwater and other resources associated with any increase in pumping in response to such reduced surface water diversions. The agricultural economic analysis conservatively calculates the maximum possible economic impacts if there is no additional groundwater pumping to replace reduced surface water supplies. In all likelihood, some of the potential supply reductions would be made up through increased groundwater pumping, thus potentially reducing some of the possible economic impacts. The groundwater analysis conservatively calculates the maximum possible groundwater impact if all modeled shortfalls in surface water supplies are replaced by pumped groundwater. Table ES-9 summarizes the expected environmental impacts of the Preferred LSJR Alternative.

Table ES-7. Baseline and 35% Alternative February– June Tributary Flow (TAF) at the Confluence with the San Joaquin River and the San Joaquin River at Vernalis

River	Alternative	Average (TAF)	Difference from Baseline (TAF) (%)	10th Percentile (TAF)	50th Percentile (TAF)	90th Percentile (TAF)
Stanislaus	Baseline	355	-24 (-7%)	167	325	531
	35% Alternative	331		182	311	485
Tuolumne	Baseline	540	+111 (+21%)	137	304	1,189
	35% Alternative	651		236	575	1,127
Merced	Baseline	270	+54 (+20%)	74	154	678
	35% Alternative	324		115	252	611
Vernalis	Baseline	1,804	+141 (+8%)	507	1162	3,624
	35% Alternative	1,945		649	1577	3,633

TAF = thousand acre-feet

Table ES-8. Baseline and 35% Alternative Annual Diversions from Each Tributary and Average of Three Tributaries Combined

River	Alternative	Average (TAF)	Difference from Baseline (TAF) (%)	10th Percentile (TAF)	50th Percentile (TAF)	90th Percentile (TAF)
Stanislaus	Baseline	577	+18 (+3%)	455	593	656
	35% Alternative	595		419	631	730
Tuolumne	Baseline	885	-132 (-15%)	762	906	1,042
	35% Alternative	753		545	801	896
Merced	Baseline	527	-67 (-13%)	421	552	593
	35% Alternative	460		310	499	542
Combined	Baseline	1,989	-181 (-9%)	1,787	2,044	1,270
	35% Alternative	1,808		2,252	1,919	2,151

TAF = thousand acre-feet

Table ES-9. Impact Determinations for the Preferred LSJR Alternative

Impact	Significance Determination
HYD-1: Substantially reduce monthly river flow values caused by the percent unimpaired flow objective	Less than significant
HYD-2: Substantially alter hydrology such that regulating reservoir operations are limited	Less than significant
WS-1: Substantially reduce surface water supply diversions caused by a change in river flows or reduce exports to CVP and SWP export service areas caused by a change in river flows	Significant and unavoidable
WQ-1: Violate water quality objectives by increasing the number of months with EC above the water quality objectives for salinity at Vernalis or southern Delta compliance stations	Less than significant
WQ-2: Substantially degrade water quality by increasing Vernalis and/or southern Delta salinity (EC) such that agricultural beneficial uses are impaired	Less than significant
WQ-3: Substantially degrade water quality by increasing water temperature caused by reduced river flows	Less than significant
WQ-4: Substantially degrade water quality by increasing contaminant concentrations caused by reduced river flows	Less than significant
FLO-1: Substantially alter the existing drainage pattern of the site or area through the alteration of the course of a stream or river in a manner that would result in substantial erosion or siltation on or offsite	Less than significant
FLO-2: Substantially alter the existing drainage pattern of the site or area through the alteration of the course of a stream or river or substantially increase the rate of surface runoff in manner that would result in flooding on or offsite	Less than significant
AQUA-1: Changes in availability of warmwater species reservoir habitat resulting from change in reservoir water levels	Less than significant
AQUA-2: Changes in availability of coldwater species reservoir habitat resulting from changes in reservoir storage	Less than significant
AQUA-3: Changes in quantity/ quality of spawning, rearing, and migration habitat resulting from changes in flow	Less than significant
AQUA-4: Changes in exposure of fish to stressful water temperatures resulting from changes in reservoir storage and releases	Less than significant
AQUA-5 : Changes in exposure to pollutants resulting from changes in flow (dilution/mobilization effects)	Less than significant
AQUA-6: Changes in exposure to suspended sediment and turbidity resulting from changes in flow (mobilization)	Less than significant
AQUA-7: Changes in redd dewatering and fish stranding losses resulting from flow fluctuations	Less than significant
AQUA-8: Changes in spawning habitat quality resulting from changes in flood flows	Less than significant
AQUA-9: Changes in food availability resulting from changes in flow, nutrient transport, and water quality (food web support)	Less than significant

Impact	Significance Determination
AQUA-10: Changes in predation risk resulting from changes in flow and water temperature	Less than significant
AQUA-11: Changes in disease risk resulting from changes in flow, water temperature, and water quality	Less than significant
AQUA-12: Changes in fish transport resulting from changes in flow	Less than significant
AQUA-13: Changes in southern Delta and estuarine habitat resulting from changes in SJR inflows and export effects	Less than significant
BIO-1 : Have a substantial impacts on any riparian habitat or other sensitive natural terrestrial communities identified in local or regional plans, policies, regulations or by Department of Fish and Game (DFG) and U.S. Fish and Wildlife Service (USFWS)	Less than significant
BIO-2: Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrologic interruption, or other means	Less than significant
BIO-3: Facilitate an increase in distribution and abundance of invasive plants or nonnative wildlife	Less than significant
BIO-4: Have a substantial adverse effect, either directly or through habitat modifications, on any terrestrial animal species identified as a candidate, sensitive, or special-status species in local or regional plans, policies, or regulations, or by DFG and USFWS	Less than significant
BIO-5: Conflict with the provisions of an adopted habitat conservation plan, natural community conservation plan, or other approved local, regional, or state habitat conservation plan, or conflict with any local policies or ordinances protecting biological resources	Less than significant
GW-1: Substantially deplete groundwater supplies or interfere substantially with groundwater recharge	Significant and unavoidable
REC-1: Substantially reduce the use of existing recreation facilities or opportunities on rivers or at reservoirs	Significant and unavoidable
REC-2: Substantially degrade the functionality of existing recreation facilities on the rivers or at reservoirs	Less than significant
REC-3: Substantially degrade the existing visual character or quality of the reservoirs	Less than significant
AG-1: Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance to nonagricultural uses	Significant and unavoidable
AG-2: Other changes in the existing environment which, due to their location or nature, could result in a conversion of farmland to nonagricultural use	Less than significant
CUL-1: Substantial adverse change in the significance of a historical or archaeological resource	Less than significant
CUL-2: Disturbance of human remains, including those interred outside formal cemeteries	Less than significant
CUL-3: Disturbance or destruction of a unique paleontological resource or site or unique geologic feature	Less than significant

Impact	Significance Determination
SP-1: Substantially degrade water quality for municipal drinking water purposes	Less than significant
SP-2: Require or result in the construction of new or expanded water treatment facilities or water supply infrastructure, the construction of which could cause significant environmental effects	Significant and unavoidable
SP-3: Result in substantial changes to San Joaquin River inflows to the Delta such that insufficient water supplies would be available to service providers relying on CVP/SWP exports	Less than significant
SP-4: Require or result in the construction of new wastewater treatment facilities or expansion of existing facilities or infrastructure, the construction or operation of which could cause significant environmental effects	Significant and unavoidable
ECC-1: Adversely affect the reliability of California's electric grid	Less than significant
ECC-2: Result in inefficient, wasteful, and unnecessary energy consumption	Less than significant
ECC-3: Generate GHG emissions, either directly or indirectly, that have a significant impact on the environment	Significant and unavoidable
ECC-4: Conflict with an applicable plan, policy, or regulation adopted for the purposes of reducing the GHG emissions	Significant and unavoidable
ECC-5: Effect of global climate change on the LSJR and SDWQ alternatives	Less than significant

Economics

Total agricultural sector economic output for the lower SJR watershed is estimated to decrease by around one percent for the Preferred LSJR Alternative due to the reduced surface water diversions as summarized in Table ES-8 above. The impact will be greatest in the Tuolumne and Merced River watersheds because baseline flows are lower than on the Stanislaus River. The estimation of this impact for the Preferred LSJR Alternative is presented in Chapter 20, *Preferred LSJR Alternative and SDWQ Alternative*, which is based in turn on the analysis presented in SED Appendix G, *Agricultural Economic Effects of Lower San Joaquin River Flow Alternatives*, and Chapter 18, *Economic Analyses*.

The amount of hydropower generation (megawatt-hours) would shift earlier in the season due to changes in reservoir operations, and average annual power generated would decrease by approximately 1.4 percent as shown in Table ES-10. The impact on hydropower-related revenues would be slightly greater because energy prices are generally less during May and June than July and August. The maximum hydropower generating capacity (megawatts) during the peak summer load months of July and August is not significantly impacted as modeled reservoir operations for this alternative are not significantly different than under baseline conditions.

Table ES-10. Total Baseline and 35% Alternative Net Energy Generation (GWh) within the Three Tributaries

Period	Alternative	Average (GWh)	Difference from Baseline (GWh) (%)
March–June	Baseline	772	+15 (+1.9%)
	35% Alternative	787	
July–September	Baseline	494	-35 (-7.1%)
	35% Alternative	459	
Annual Total	Baseline	1607	-22 (-1.4%)
	35% Alternative	1585	

GWh = gigawatt hours

ES8.2 Preferred SDWQ Alternative

The Preferred SDWQ Alternative is SDWQ Alternative 2, which is analyzed explicitly in the SED. The Preferred SDWQ Alternative would impact municipal service providers to the extent wastewater treatment plants would have to comply with NPDES effluent limitations based on the new objectives, or a salinity management plan developed by the Central Valley Board that otherwise implements those objectives. Other potential impacts on the environment resulting from the Preferred SDWQ Alternative are less than significant. A summary of SDWQ Alternative 2 impacts, which is the same as the Preferred SDWQ Alternative, is presented in Table ES-2.