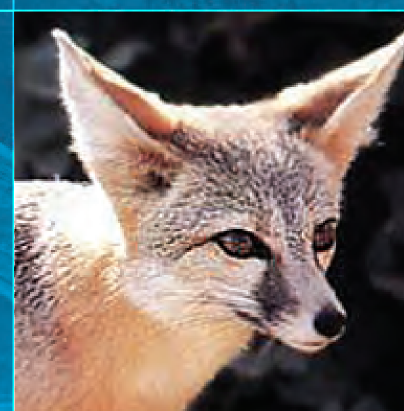
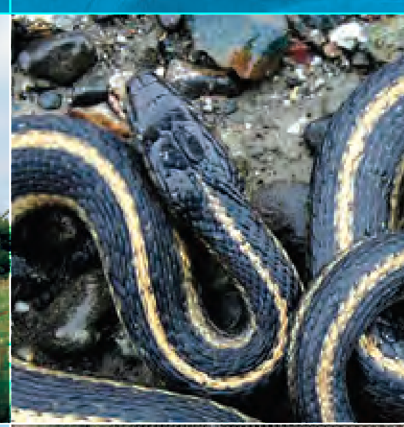
Long-Term Water Transfers Environmental Impact Statement/ Environmental Impact Report
Final





U.S. Department of the Interior
Bureau of Reclamation
Mid-Pacific Region
Sacramento, California

San Luis & Delta-Mendota
Water Authority

March 2015

Long-Term Water Transfers

Environmental Impact Statement/Environmental Impact Report

Final

Prepared by

United States Department of the Interior
Bureau of Reclamation
Mid-Pacific Region

San Luis & Delta-Mendota Water Authority

U.S. Department of the Interior
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Sacramento, California

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March 2015

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Long-Term Water Transfers
Final Environmental Impact Statement/Environmental Impact Report

Lead Agencies: U.S. Department of the Interior, through the Bureau of Reclamation (Reclamation) and the San Luis & Delta-Mendota Water Authority (SLDMWA)

State Clearinghouse # 2011011010

ABSTRACT

This Long-Term Water Transfers Environmental Impact Statement/Environmental Impact Report (EIS/EIR) evaluates the potential impacts of alternatives to help address Central Valley Project (CVP) water supply shortages. SLDWMA Participating Members and other CVP water contractors in the San Francisco Bay Area experience severe reductions in CVP water supplies during dry hydrologic years. A number of entities upstream from the Sacramento-San Joaquin Delta have expressed interest in transferring water to reduce the effects of CVP shortages to these agencies. The alternatives evaluated in this EIS/EIR include transfers of CVP and non CVP water or transfers from north of the Delta to CVP contractors south of the Delta that require the use of CVP and SWP facilities. Water would be made available for transfer through groundwater substitution, cropland idling, crop shifting, reservoir release, and conservation. This EIS/EIR evaluates potential impacts of water transfers over a 10-year period, 2015 through 2024.

This EIS/EIR has been prepared according to requirements of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA). Direct, indirect, and cumulative impacts resulting from the project alternatives on the physical, natural, and socioeconomic environment of the region are addressed.

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Executive Summary

Hydrologic conditions, climatic variability, consumptive use within the watershed, and regulatory requirements for operation of water projects commonly affect water supply availability in California. This variability strains water supplies, making advance planning for water shortages necessary and routine. In the past decades, water entities have been implementing water transfers to supplement available water supplies to serve existing demands, and such transfers have become a common tool in water resource planning.

The United States Department of the Interior, Bureau of Reclamation manages the Central Valley Project (CVP), which includes storage in reservoirs (such as Shasta, Folsom, and Trinity reservoirs) and diversion pumps in the Sacramento-San Joaquin Delta (Delta) to deliver water to users in the San Joaquin Valley and San Francisco Bay Area. When these users experience water shortages, they may look to water transfers to help reduce potential impacts of those shortages.

A water transfer involves an agreement between a willing seller and a willing buyer, and available infrastructure capacity to convey water between the two parties. To make water available for transfer, the willing seller must take an action to reduce the consumptive use of water (such as idle cropland or pump groundwater in lieu of using surface water) or release additional water from reservoir storage. This water would be conveyed to the buyers' service area for beneficial use. Water transfers would be used only to help meet existing demands and would not serve any new demands in the buyers' service areas. Pumping capacity at the Delta pumps is generally only available in dry or critically dry years.

Reclamation and the San Luis & Delta-Mendota Water Authority (SLDMWA) are completing a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR) pursuant to the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA) for water transfers from 2015 through 2024. Reclamation is serving as the Lead Agency under NEPA and SLDMWA is the Lead Agency under CEQA. Reclamation would facilitate transfers proposed by buyers and sellers. The SLDMWA, consisting of federal and exchange water service contractors in western San Joaquin Valley, San Benito, and Santa Clara counties, helps negotiate transfers in years when the member agencies could experience shortages.

This EIS/EIR evaluates water transfers that would be purchased by CVP contractors in areas south of the Delta or in the San Francisco Bay Area. The transfers would be conveyed through the Delta using CVP or State Water

Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area.

This EIS/EIR addresses water transfers to CVP contractors from CVP and non-CVP sources of supply that must be conveyed through the Delta using both CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or the Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA. Other transfers not included in this EIS/EIR could occur during the same time period, but they would receive separate environmental compliance from the implementing agencies (as necessary).

ES.1 Purpose and Need/Project Objectives

The purpose and need statement (under NEPA) and project objectives (under CEQA) describe the underlying need for and purpose of a proposed project. The purpose and need statement and objectives are a critical part of the environmental review process because they are used to identify the range of reasonable alternatives and focus the scope of analysis.

ES.1.1 Purpose and Need

The purpose of the Proposed Action is to facilitate and approve voluntary water transfers from willing sellers upstream of the Delta to water users south of the Delta and in the San Francisco Bay Area. Water users have the need for immediately implementable and flexible supplemental water supplies to alleviate shortages.

ES.1.2 Project Objectives

SLDMWA has developed the following objectives for long-term water transfers through 2024:

- Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands.
- Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

Because shortages are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands.

ES.2 Study Area

The Study Area for potential transfers encompasses the potential buyers and sellers that could participate, which are shown in Figure ES-1.

Figure ES-1. Potential sellers would transfer water to buyers in the Central Valley or Bay Area

ES.2.1 Water Agencies Requesting Transfers

Several CVP contractors have identified interest in purchasing transfer water to reduce potential water shortages and have requested to be included in the EIS/EIR; these agencies are shown in Table ES-1.

Table ES-1. Potential Buyers

San Luis & Delta-Mendota Water Authority Participating Members
Byron-Bethany Irrigation District
Del Puerto Water District
Eagle Field Water District
Mercy Springs Water District
Pacheco Water District
Panoche Water District
San Benito County Water District
San Luis Water District
Santa Clara Valley Water District
Westlands Water District
Contra Costa Water District
East Bay Municipal Utility District

ES.2.1.1 SLDMWA

SLDMWA consists of ~~29~~ 28 member agencies representing water service contractors and San Joaquin River Exchange Contractors, but not all SLDMWA member agencies are participating in the proposed activities that are the subject of this EIS/EIR. Reclamation has an operations and maintenance agreement with SLDMWA to operate and maintain the physical works and appurtenances associated with the Jones Pumping Plant, the Delta-Mendota Canal, the O'Neill Pump/Generating Plant, the San Luis Drain, and associated works. One function SLDMWA serves is to help negotiate water transfers with and on behalf of its member agencies when CVP allocations have been reduced and there is a need for supplemental water.

The SLDMWA service area consists primarily of agricultural lands on the west side of the San Joaquin Valley. Agricultural water use occurs on approximately 850,000 irrigated acres. Water for habitat management occurs on approximately 120,000 acres of refuge lands, which receive approximately 250,000 to 300,000 acre-feet (AF) of water per year. Relative to agricultural uses, there is limited municipal and industrial (M&I) water use in the San Joaquin Valley area. The majority of the M&I use in the SLDMWA service area occurs in the San Felipe Division, primarily the Santa Clara Valley Water District (WD).

South-of-Delta agricultural service contractors, many of which are members of the SLDMWA, experience severe cutbacks in CVP allocations in most years. In 2009, deliveries were cut back to ten percent of CVP contract amounts for agricultural water service contracts. In 2014, agricultural service contracts received a zero percent allocation. Note that the Exchange Contractors are not included in these allocations. SLDMWA member agencies use water transfers as a method to supplement water supplies in years when CVP allocations are reduced.

ES.2.1.2 Contra Costa WD

The Contra Costa WD was formed in 1936 to purchase and distribute CVP water for irrigation and industrial uses. Today, the Contra Costa WD encompasses more than 214 square miles, serves a population of approximately 500,000 people in Central and East Contra Costa County, and is Reclamation's largest urban CVP contractor in terms of contract amount.

Contra Costa WD is almost entirely dependent on CVP diversions from the Delta for its water supply. The 48-mile Contra Costa Canal conveys water throughout the service area. Contra Costa WD's long-term CVP contract with Reclamation was renewed in May 2005 and has a term of 40 years. The contract with Reclamation provides for a maximum delivery of 195,000 AF per year from the CVP for M&I purposes, but Contra Costa WD has historically received well below this contract amount. Contra Costa WD also has limited water supply from groundwater, recycled water, and some long-term water purchase agreements.

ES.2.1.3 East Bay Municipal Utility District (MUD)

East Bay MUD was created in 1923 to provide water service to the east San Francisco Bay Area. Today, East Bay MUD provides water and wastewater services to approximately 1.3 million people over a 332 square mile area in Alameda and parts of Contra Costa counties.

Ninety percent of East Bay MUD's water supply comes from the Mokelumne River watershed in the Sierra Nevada. East Bay MUD has a CVP contract with Reclamation to divert water from the Sacramento River for M&I purposes. East Bay MUD's long-term CVP contract with Reclamation was renewed in April 2006 and has a term of 40 years. The contract provides up to 133,000 AF in a single dry year, not to exceed a total of 165,000 AF in three consecutive dry years. CVP water is available to East Bay MUD only in dry years when certain storage conditions within the East Bay MUD system are met (East Bay MUD 2011). As a result East Bay MUD does not forecast frequent use of CVP water.

ES.2.2 Potential Willing Sellers

Table ES-2 lists the agencies that have expressed interest in being a seller in the Long-Term Water Transfers EIS/EIR and the potential maximum quantities available for sale. Actual purchases could be less, depending on hydrology, the amount of water the seller is interested in selling in any particular year, the interest of buyers, and compliance with Central Valley Project Improvement Act (CVPIA) transfer requirements, among other possible factors. Because of the uncertainty of hydrologic and operating conditions in the future, it is likely that only a portion of the potential transfers identified in Table ES-2 would occur.

Table ES-2. Potential Sellers (Upper Limits)

Water Agency	Maximum Potential Transfer
Sacramento River Area of Analysis	
Anderson-Cottonwood Irrigation District	5,225
Conaway Preservation Group	35,000
Cranmore Farms	8,000
Eastside Mutual Water Company	2,230
Glenn-Colusa Irrigation District	91,000
Natomas Central Mutual Water Company	30,000
Pelger Mutual Water Company	3,750
Pleasant Grove-Verona Mutual Water Company	18,000
Reclamation District 108	35,000
Reclamation District 1004	17,175
River Garden Farms	9,000
Sycamore Mutual Water Company	20,000
Te Velde Revocable Family Trust	7,094
American River Area of Analysis	
City of Sacramento	5,000
Placer County Water Agency	47,000
Sacramento County Water Agency	15,000
Sacramento Suburban Water District	30,000
Yuba River Area of Analysis	
Browns Valley Irrigation District	8,100
Cordua Irrigation District	12,000
Feather River Area of Analysis	
Butte Water District	17,000
Garden Highway Mutual Water Company	14,000
Gilsizer Slough Ranch	3,900
Goose Club Farms and Teichert Aggregates	10,000
South Sutter Water District	15,000
Tule Basin Farms	7,320
Merced River Area of Analysis	
Merced Irrigation District	30,000
Delta Region Area of Analysis	
Reclamation District 2068	7,500
Pope Ranch	2,800
Total	*511,094*

ES.3 Development and Screening of Preliminary Alternatives

NEPA and CEQA require an EIS and EIR, respectively, to identify a reasonable range of alternatives and provide guidance on the identification and screening of such alternatives. Both NEPA and CEQA include provisions that alternatives reasonably meet the purpose and need/project objectives, and be potentially feasible. For this EIS/EIR, the Lead Agencies followed a structured, documented process to identify and screen alternatives for inclusion in the EIS/EIR. Figure ES-2 illustrates the process that the Lead Agencies conducted to identify and screen alternatives.

Figure ES-2. Alternatives Development and Screening Process

ES.3.1 Public Scoping and Screening Criteria Results

During public scoping, the public provided input regarding potential alternatives to the Proposed Action. The Lead Agencies reviewed the purpose and need/project objectives statement, public scoping comments, and previous studies in their initial effort to develop conceptual alternatives. This process identified an initial list of measures described in more detail in Appendix A, Alternatives Development Report. The initial list included more than 27 measures. The Lead Agencies then developed and applied a set of screening considerations to determine which measures should move forward for further analysis and be considered as project alternatives.

The Lead Agencies determined that they would screen the alternatives based on their ability to meet key elements of the purpose and need/basic project objectives:

- Immediate: the term proposed for this EIS/EIR is 2015 through 2024. This period is relatively short, and measures need to be able to provide some measurable benefit within this time period.

- Flexible: project participants need water in some years, but not in others. They need measures that have the flexibility to be used only when needed.

- Provide Water: project participants need measures that have the capability of providing additional water to regions that are experiencing shortages.

Measures had to satisfy these key elements in order to move forward to the alternatives formulation phase. Appendix A includes a detailed discussion of the screening process and results.

ES.3.2 Selected Alternatives

The measures that moved forward for more detailed analysis in this EIS/EIR are those that best meet the NEPA purpose and need and CEQA objectives, minimize negative effects, are potentially feasible, and represent a range of reasonable alternatives. Some alternatives do not fully meet the purpose and need/project objectives, but they have potential to minimize some types of environmental effects or help provide a reasonable range of alternatives for consideration by decision-makers.

Measures that were carried forward from scoping and the screening process for alternatives formulation include:

- Agricultural Conservation (Seller Service Area)
- Cropland Idling Transfers - rice, field crops, grains
- Cropland Idling Transfers - alfalfa
- Groundwater Substitution
- Crop Shifting
- Reservoir Release

The measures remaining after the initial screening were combined into three action alternatives that were selected to move forward for analysis in the EIS/EIR (in addition to the No Action/No Project Alternative). Table ES-3 presents the alternatives carried forward for analysis in the EIS/EIR. Analysis of these alternatives will provide the information needed to make a decision, and potentially to mix and match elements of the alternatives, if needed, to create an alternative that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any significant environmental effects.

Table ES-3. Alternatives Selected for Analysis in the EIS/EIR

Alternative Number	Alternative Name	Description
Alternative 1	No Action/ No Project	The No Action/No Project Alternative represents the state of the environment without the Proposed Action or any of the alternatives. In the No Action/No Project Alternative, the Buyer Service Area would experience water shortages and could increase groundwater pumping, idle cropland, or retire land to address those shortages.
Alternative 2	Full Range of Transfers (Proposed Action)	This alternative combines all potential transfer measures that met the purpose and need and were carried forward through the screening process.
Alternative 3	No Cropland Modifications	The No Cropland Modifications Alternative includes the following measures: • Agricultural conservation (Seller Service Area) • Groundwater substitution • Reservoir release
Alternative 4	No Groundwater Substitution	The No Groundwater Substitution Alternative includes the following measures: • Agricultural conservation (Seller Service Area) • Cropland idling transfers – rice, field crops, grains, alfalfa • Crop shifting • Reservoir release

ES.4 Potential Water Transfer Methods

A water transfer temporarily moves water from a willing seller to a willing buyer. To make water available, the seller must take an action to reduce consumptive use or use water in storage. Water transfers must be consistent with State and Federal law. Transfers involving water diverted through the Delta are governed by existing water rights, applicable Delta pumping limitations, reservoir storage capacity and regulatory requirements.

The biological opinions on the Coordinated Operations of the CVP and SWP (U.S. Fish and Wildlife Service [USFWS] 2008; National Oceanic and Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze transfers through the Delta from July to September (commonly referred to as the "transfer window") that are up to 600,000 AF in ~~dry and~~ critically ~~dry~~ years and dry years (following dry or critical years). For all other year types, the maximum transfer amount is up to 360,000 AF. Through Delta transfers would be limited to the ~~period when USFWS and NOAA Fisheries find transfers to be acceptable, typically~~ July through September period~~, unless a change is made in a particular water year based on concurrence from USFWS and NOAA Fisheries~~.

This EIS/EIR analyzes transfers to CVP contractors. These transfers could be conveyed through the Delta using either CVP or SWP facilities, depending on availability. Some transfers may not involve CVP contractors as sellers, but they may use CVP facilities. Any non-CVP water that would use CVP facilities would need a Warren Act contract, which is subject to NEPA compliance. This document analyzes the impacts of conveying or storing non-CVP water in CVP facilities to address compliance needs for transfers facilitated by execution of a contract pursuant to the Warren Act of February 21, 1911 (36 Stat. 925).

Some transfers may be accomplished through forbearance agreements rather than transfers that involve the State Water Resources Control Board (SWRCB). Under such agreements, a CVP seller would forbear (i.e., temporarily suspend) the diversion of some of their Base Supply, which in the absence of forbearance, would have been diverted for use on lands within the CVP sellers' service areas. This forbearance would be undertaken in a manner that allows Reclamation to deliver the forborne water supply as Project water to a purchasing CVP water agency. A forbearance agreement would not change the way that water is made available for transfer, conveyed to buyers, or used by the buyers; therefore, it would not change the environmental effects of the transfer.

ES.4.1 Groundwater Substitution

Groundwater substitution transfers occur when sellers choose to pump groundwater in lieu of diverting surface water supplies, thereby making the surface water available for transfer. Sellers making water available through groundwater substitution actions are agricultural and M&I users. Water could be made available for transfer by the agricultural users during the irrigation season of April through September. If there are issues related to water supply availability or conveyance capacity at the Delta, sellers could shorten the window when transfer water is available by switching between surface water sources and groundwater pumping for irrigation or M&I use.

Groundwater substitution would temporarily decrease levels in groundwater basins near the participating wells. Water produced from wells initially comes from groundwater storage. Groundwater storage would refill (or "recharge") over time, which affects surface water sources. Groundwater pumping captures some groundwater that would otherwise discharge to streams as baseflow and can also induce recharge from streams. Once pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges.

ES.4.2 Reservoir Release

Buyers could acquire water by purchasing surface water stored in reservoirs owned by non-Project entities (not part of the CVP or SWP). To ensure that purchasing this water would not affect downstream users, Reclamation would limit transferred water to what would not have otherwise been released downstream absent the transfer.

When the willing seller releases stored reservoir water for transfer, these reservoirs are drawn down to levels lower than without the water transfer. To refill the reservoir, a seller must capture some flow that would otherwise have gone downstream. Sellers must refill the storage at a time when downstream users would not have otherwise captured the water, either in downstream reservoirs or at the CVP and SWP (collectively “the Projects”) or non-Project pumps in the Delta. Typically, refill can only occur during Delta excess conditions as defined in the “Agreement Between the United States of America and the State of California for Coordinated Operation of the Central Valley Project and State Water Project” (commonly referred to as the “Coordinated Operations Agreement”, or “COA”), as “periods when it is agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in basin uses, plus exports,” or when any downstream reservoirs are in flood control operations. Refill of the storage vacated for a transfer may take more than one season to refill if the above conditions are not met in the wet season following the transfer. Each reservoir release transfer would include a refill agreement between the seller and Reclamation (developed in coordination with DWR) to prevent impacts to downstream users following a transfer.

ES.4.3 Cropland Idling

Cropland idling makes water available for transfer that would have been used for agricultural production. Water would be available on the same pattern throughout the growing season as it would have been consumed had a crop been planted. The irrigation season generally lasts from April or May through September for most crops in the Sacramento Valley.

ES.4.4 Crop Shifting

For crop shifting transfers, water is made available when farmers shift from growing a higher water use crop to a lower water use crop. The difference between the water used by the two crops would be the amount of water that can be transferred. Transfer water generated by crop shifting is difficult to account for. Farmers generally rotate between several crops to maintain soil quality, so water agencies may not know what type of crop would have been planted in a given year absent a transfer. To calculate water available from crop shifting, agencies would estimate what would have happened absent a transfer using an average water use over a consecutive 5-year baseline period. The change in consumptive use between this baseline water use and the lower water use crop determines the amount of water available for transfer.

ES.4.5 Conservation

Conservation transfers must include actions to reduce the diversion of surface water by the transferring entity by reducing irrecoverable water losses. The amount of reduction in irrecoverable losses determines the amount of transferrable water. Conservation measures may be implemented on the water-district and individual user scale. These measures must reduce the irrecoverable losses at a site without reducing the amount of water that otherwise would have been available for downstream beneficial uses. Irrecoverable losses include water that would not be usable because it currently flows to a salt sink, to an inaccessible or degraded aquifer, or escapes to the atmosphere.

ES.5 Environmental Consequences/Environmental Impacts

A summary of the environmental impacts identified for the action alternative (including beneficial effects pursuant to NEPA) is presented in Tables ES-4 and ES-5. The No Action/No Project Alternative considers the potential for changed conditions during the 2015-2024 period when transfers could occur, but because this period is relatively short, the analysis did not identify changes from existing conditions. Alternative 1 is therefore not included in the tables.

The purpose of Table ES-4 is to consolidate and disclose the significance determinations made pursuant to CEQA made throughout the EIS/EIR. The impacts listed in Table ES-4 are NEPA impacts as well as CEQA impacts, but they are judged for significance only under CEQA. Pursuant to NEPA, significance is used to determine whether an EIS or some other level of documentation is required, and once the decision to prepare an EIS is made, the magnitude of the impact is evaluated and no further judgment of significance is required. Table ES-5 summarizes impacts for resources that were analyzed only under NEPA and do not include findings of significance.

Table ES-4. Potential Impacts Summary

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
3.1 Water Supply				
Groundwater substitution transfers could decrease flows in surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP reservoirs.	2, 3	S	WS-1: Streamflow Depletion Factor	LTS
Water supplies on the rivers downstream of reservoirs could decrease following stored reservoir water transfers, but would be limited by the refill agreements	2, 3, 4	LTS	None	LTS
Changes in Delta diversions could affect Delta water levels ~~and cause local users' diversion pumps to be above the water surface.~~	2, 3, 4	LTS	None	LTS
Transfers would increase water supplies in the Buyers Service Area	2, 3, 4	B	None	B
3.2 Water Quality				
Cropland idling transfers could result in increased deposition of sediment on water bodies.	2, 4	LTS	None	LTS
Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff.	2, 4	LTS	None	LTS
Cropland idling/shifting transfers could change the quantity of organic carbon in waterways.	2, 4	LTS	None	LTS
Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows.	2, 3	LTS	None	LTS
Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change river flow rates in the Seller Service Area and could affect water quality.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta inflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta outflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta salinity and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal.	2, 3, 4	LTS	None	LTS
Use of transfer water in the Buyer Service Area could result in increased irrigation on drainage impaired lands in the Buyer Service Area which could affect water quality.	2, 3, 4	LTS	None	LTS
Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
3.3 Groundwater Resources				
Groundwater substitution transfers could cause a reduction in groundwater levels in the Seller Service Area.	2, 3	S	GW-1: Mitigation and Monitoring Plans	LTS
Groundwater substitution transfers could cause subsidence in the Seller Service Area.	2, 3	S	GW-1: Mitigation and Monitoring Plans	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Groundwater substitution transfers could cause changes to groundwater quality in the Seller Service Area.	2, 3	LTS	None	LTS
Cropland idling transfers could cause reduction in groundwater levels in the Seller Service Area due to decreased applied water recharge.	2, 4	LTS	None	LTS
Water transfers via cropland idling could cause groundwater level declines in the Seller Service Area that lead to permanent land subsidence or changes in groundwater quality.	2, 4	LTS	None	LTS
Water transfers could reduce groundwater pumping during shortages in the Buyer Service Area, which could increase groundwater levels, decrease subsidence, and improve groundwater quality.	2, 3, 4	B	None	B
3.4 Geology and Soils				
Cropland idling transfers in the Seller Service Area that temporarily convert cropland to bare fields could increase soil erosion.	2, 4	LTS	None	LTS
Cropland idling water transfers could cause expansive soils in the Seller Service Area to shrink due to the reduction in applied irrigation water.	2, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil erosion.	2, 3, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil movement.	2, 3, 4	LTS	None	LTS
Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
3.5 Air Quality				
Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants in the Sellers Service Area.	2, 3	S	AQ-1: Reducing pumping to reduce emissions, AQ-2: Operate electric engines	LTS
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the Sellers Service Area.	2, 4	B	None	B
Water transfers via cropland idling would increase fugitive dust emissions from wind erosion of bare fields and decrease fugitive dust emissions associated with land preparation and harvesting in the Sellers Service Area.	2, 4	B	None	B
Use of water from transfers on agricultural fields in the Buyer Service Area could reduce windblown dust.	2, 3, 4	B	None	B
Water transfers via groundwater substitution and cropland idling could exceed the general conformity de minimis thresholds.	2, 3, 4	LTS	None	LTS
3.6 Climate Change				
Increased groundwater pumping for groundwater substitution transfers could increase emissions of greenhouse gases.	2, 3	LTS	None	LTS
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the study area.	2, 4	LTS	None	LTS
Changes to the environment from climate change could affect the action alternatives.	2, 3, 4	LTS	None	LTS
Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
3.7 ~~Aquatic Resources~~Fisheries				
Transfer actions could affect reservoir storage and reservoir surface area in reservoirs supporting fisheries resources	2, 3, 4	LTS	None	LTS
Groundwater substitution could reduce stream flows supporting fisheries resources in small streams	2, 3	LTS	None	LTS
Transfer actions could ~~decrease~~ alter flows of rivers and creeks supporting fisheries resources in the Sacramento and San Joaquin river watersheds	2, 3, 4	LTS	None	LTS
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	None	LTS
Transfer actions could affect the habitat of special-status species associated with mainstem rivers, tributaries, and the Delta.	2, 3, 4	LTS	None	LTS
3.8 Vegetation and Wildlife				
Groundwater substitution could reduce groundwater levels and available groundwater for~~supporting~~ natural communities	2, 3	LTS	None	LTS
Transfers could impact reservoir storage and reservoir surface area and alter habitat availability and suitability associated with those reservoirs	2, 3, 4	LTS	None	LTS
Groundwater substitution could reduce stream flows supporting natural communities in small streams	2, 3	S	GW-1	LTS
Cropland Idling/shifting could alter habitat availability and suitability for upland species	2, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Transfers could reduce flows in large rivers in the Sacramento and San Joaquin River watersheds, altering habitat availability and suitability associated with these rivers	2, 3, 4	LTS	None	LTS
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	None	LTS
Transfer actions could impact San Luis Reservoir storage and surface area.	2, 3, 4	LTS	None	LTS
Cropland idling/shifting under could alter the amount of suitable habitat for natural communities ~~and~~ , special-status wildlife species, and migratory birds associated with seasonally flooded agriculture and associated irrigation waterways	2, 4	LTS	None	LTS
Transfer actions could alter planting patterns and urban water use in the Buyer Service Area	2, 3, 4	LTS	None	LTS
Transfers could affect wetlands that provide habitat for special status plant species.	2, 3, 4	LTS	None	LTS
Transfers could affect giant garter snake and Pacific pond turtle by reducing aquatic habitat.	2, 3, 4	LTS	None	LTS
Transfers could affect the San Joaquin kit fox by reducing available habitat.	2, 3, 4	LTS	None	LTS
Transfers could impact special status bird species and migratory birds.	2, 3, 4	LTS	None	LTS
3.9 Agricultural Land Use				
Cropland idling water transfers could ~~permanently or substantially~~ decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.	2	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
	4	S	Mitigation Measure LU-1: Avoiding changes in FMMP land use classifications	LTS
Cropland idling water transfers could convert agricultural lands under the Williamson Act and other land resource programs to an incompatible use.	2, 4	LTS	None	LTS
Cropland idling water transfers could conflict with local land use policies.	2, 4	NI	None	NI
Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields and maintain agricultural land uses.	2, 3, 4	B	B	B
3.13 Cultural Resources				
Transfers that draw down reservoir surface elevations beyond historically low levels could result in a potentially significant effect on cultural resources.	2, 3, 4	LTS	None	LTS
Stored reservoir release transfers that draw down reservoir surface elevations at local reservoirs beyond historically low levels could affect cultural resources.	2, 3, 4	LTS	None	LTS
3.14 Visual Resources				
Water transfers could degrade the existing landscape character or scenic attractiveness of Class A and B visual resources at CVP and SWP reservoirs	2, 3, 4	LTS	None	LTS
Water transfers could degrade the existing landscape character or scenic quality of Class A and B visual resources along surface water bodies	2, 3, 4	LTS	None	LTS
Stored reservoir release transfers could substantially degrade the existing landscape character or scenic attractiveness of Class A and B visual resources participating reservoirs	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Cropland idling transfers could substantially degrade the existing landscape character and scenic attractiveness of Class A and B visual resources	2, 4	LTS	None	LTS
Water transfers could substantially degrade the existing landscape character and quality in the Buyer's Service Area	2, 3, 4	LTS	None	LTS
3.15 Recreation				
Changes in surface water elevation at Shasta, Folsom, Merle Collins, Oroville, Camp Far West, and Lake McClure reservoirs as a result of water transfers could affect reservoir-based recreation.	2, 3, 4	LTS	None	LTS
Changes in surface water elevations at Hell Hole and French Meadows Reservoirs as a result of water transfers could affect reservoir-based recreation.	2, 3, 4	LTS	None	LTS
Changes in river flows from water transfers could affect river-based recreation on the Sacramento, Yuba, Feather, American, San Joaquin, and Merced rivers.	2, 3, 4	LTS	None	LTS
Changes in average flow into the Delta from the San Joaquin River from water transfers could affect river-based recreation.	2, 3, 4	NI	None	NI
Changes in surface water elevation at San Luis Reservoir as a result of water transfers could affect reservoir-based recreation	2, 3, 4	NI	None	NI
3.16 Power				
Acquisition of water via groundwater substitution or crop idling may cause changes in power generation from CVP and SWP reservoirs	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Acquisition of water via stored reservoir water may cause changes in power generation from the facilities that ~~sell~~ provide water	2, 3, 4	LTS	None	LTS
3.17 Flood Control				
Water transfers would change storage levels in CVP and SWP reservoirs, potentially affecting flood control	2, 3, 4	LTS	None	LTS
Water transfers ~~could~~ would ~~decrease~~ change storage levels in non-Project reservoirs and potentially affecting flood control	2, 3, 4	B	None	B
Water transfers could ~~change~~ increase river flows, potentially affecting flood capacity or levee stability	2, 3, 4	LTS	None	LTS
Water transfers would change storage at San Luis Reservoir, potentially affecting flood control	2, 3, 4	LTS	None	LTS

Key:
B = beneficial
LTS = less than significant
NI = no impact
None = no feasible mitigation identified and/or required
S = significant

Table ES-5. Impacts for NEPA-Only Resources

Potential Impact	Alternative	Impact
3.10 Regional Economics		
Seller Service Area		
Revenues from cropland idling water transfers could increase incomes for farmers or landowners selling water.	2, 4	Beneficial
Cropland idling transfers in Glenn, Colusa, and Yolo counties could reduce employment, labor income, and economic output for businesses and households linked to agricultural activities.	2, 4	Employment: -492 Labor Income: -$19.38 Million Output: -$90.43 Million
Cropland idling transfers in Sutter and Butte counties could reduce economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Employment: -163 Labor Income: -$5.50 Million Output: -$26.76 Million
Cropland idling transfers in Solano County could reduce economic output, labor income, and employment for businesses and households linked to agricultural activities.	2, 4	Employment: -32 Labor Income: -$1.13 Million Output: -$4.58 Million
Cropland idling transfers could have adverse local economic effects.	2, 4	Adverse
Water transfers from idling alfalfa could increase costs for dairy and other livestock feed.	2, 4	Adverse, but minimal
Cropland idling transfers could decrease net revenues to tenant farmers whose landowners choose to participate in transfers.	2, 4	Adverse
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Adverse, but minimal
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Adverse, but minimal
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	2, 4	Adverse
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	2, 4	Adverse
Reductions in local sales associated with cropland idling transfer effects could reduce tax revenues and increase costs to county governments.	2, 4	Adverse, but minimal
Groundwater substitution transfers could increase groundwater pumping costs for water users in areas where groundwater levels decline as a result of the transfer.	2, 3	Adverse
Revenues from groundwater substitution water transfers could increase incomes for farmers or landowners selling water.	2, 3	Beneficial
Groundwater substitution water transfers could increase management costs for local water districts.	2, 3	Adverse
Revenues received from stored reservoir and conservation transfers could increase operating incomes for sellers.	2, 3, 4	Beneficial, but minimal

Potential Impact	Alternative	Impact
Buyer Service Area		
Water transfers would provide water for agricultural uses that could support revenues, economic output, and employment.	2, 3, 4	Beneficial
Water transfers would provide water for M&I uses that could support revenues, economic output, and employment.	2, 3, 4	Beneficial
3.11 Environmental Justice		
Cropland idling transfers could adversely and disproportionately affect minority and low-income farm workers in the Seller Service Area.	2, 4	No disproportionately high or adverse effect
Crop shifting transfers could adversely and disproportionately affect minority and low-income farm workers in the Seller Service Area.	2, 3	No disproportionately high or adverse effect
Use of cropland modification transfers could adversely and disproportionately affect minority and low-income farm workers in the Buyer Service Area.	2, 3, 4	Beneficial
3.12 Indian Trust Assets		
Groundwater substitution transfers could adversely affect ITAs by decreasing groundwater levels, which would potentially interfere with the exercise of a federally-reserved water right use, occupancy, and or character	2, 3	No effect
Groundwater substitution transfers could adversely affect ITAs by reducing the health of tribal members by decreasing water supplies	2, 3	No effect
Groundwater substitution transfers could affect ITAs by affecting fish and wildlife where there is a federally-reserved hunting, gathering, or fishing right.	2, 3	No effect
Groundwater substitution transfers could adversely affect ITAs by causing changes in stream flow temperatures or stream depletion, which would potentially interfere with the exercise of a federally-reserved Indian right	2, 3	No effect
Use of groundwater substitution transfers could affect reservations or Rancherias in the Buyer Service Area to reduce CVP shortages.	2, 3, 4	Beneficial

ES.~~5~~6 Growth Inducing Impacts

Water proposed for transfer would be transferred from willing sellers to buyers to meet existing demands when there are shortages in Central Valley Project supplies. The proposed water transfers would not directly or indirectly affect growth beyond what is already planned. The term proposed for the transfers under the Proposed Action is 10 years beginning in 2015. The Proposed Action would not induce development growth or remove a barrier for growth because it is not a reliable source of water that could be used to approve development projects by local agencies. Therefore, the Proposed Action would have no growth inducing impacts.

ES.~~6~~7 References

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Abbreviations and Acronyms

μg/m³	micrograms per cubic meter
AB	Assembly Bill
ac	acre
AD	Anno Domini
AF	acre-feet
AG	Agriculture
AP	Agricultural Preserve
AP-42	Compilation of Air Pollutant Emission Factors
APCD	Air Pollution Control District
AQMD	Air Quality Management District
ARBCA	American River Basin Cooperating Agencies
ARBCUP	American River Basin Regional Conjunctive Use Program
ARPA	Archaeological Resources Protection Act
ASIPs	action specific implementation plans
ATCM	Airborne Toxic Control Measure
ATV	all-terrain vehicle
BA	biological assessment
BAMM	Best Available Mitigation Measures
BARDP	Bay Area Regional Desalination Project
BC	Before Christ
BCC	birds of conservation concern
BDCP	Bay-Delta Conservation Plan
bgs	below ground surface
bhp	brake-horsepower
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BMO	basin management objective
BMPs	best management practices
BO	Biological Opinion
BRCP	Butte Regional Conservation Plan
CA	California Aqueduct
CAA	Clean Air Act
CAAQS	California Ambient Air Quality Standards
Cal/EPA	California Environmental Protection Agency
CALFED	State (CAL) and Federal (FED) agencies participating in the Bay-Delta Accord

Caltrans	California Department of Transportation
CARB	California Air Resources Board
CCAA	California Clean Air Act
CCCC	California Climate Change Center
CCR	California Code of Regulations
CCSM	Community Climate System Model
CDFA	California Department of Food and Agriculture
CDFG	California Department of Fish and Game (currently the California Department of Fish and Wildlife)
CDFW	California Department of Fish and Wildlife
CDPH	California Department of Public Health
CDPR	California Department of Parks and Recreation
CEC	California Energy Commission
CEQ	Council on Environmental Quality
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFCP	California Farmland Conservancy Program
CFR	Code of Federal Regulations
cfs	cubic feet per second
CH_4	methane
cm	centimeters
cm/s	centimeters per second
CNDDB	California Natural Diversity Database
CNPPA	California Native Plant Protection Act
CNPS	California Native Plant Society
CNRM	Centre National de Recherches Meteorologiques
CO	carbon monoxide
CO	Conservation
CO_2	carbon dioxide
CO_2e	carbon dioxide equivalent
COA	Coordinated Operation Agreement
CPRR	Central Pacific Railroad
CPUC	California Public Utilities Commission
CRHR	California Register of Historical Resources
CRP	Conservation Reserve Program
CSHMS	California Scenic Highway Mapping System
CV	Central Valley
CVHM	Central Valley Hydrologic Model

CVP	Central Valley Project
CVPIA	Central Valley Project Improvement Act
CV-SALTS	Central Valley Salinity Alternatives for Long-Term Sustainability
CWA	Clean Water Act
CWHR	California Wildlife Habitat Relationships
CWSRA	California Wild and Scenic Rivers Act
DDT	dichlorodiphenyltrichloroethane
Delta	Sacramento-San Joaquin Delta
DEM	digital elevation model
DLRP	Division of Land Resource Protection
DMC	Delta-Mendota Canal
DOC	Department of Conservation
DOI	Department of the Interior
DPM	diesel particulate matter
DPS	Distinct Population Segment
DWR	Department of Water Resources
EA	Environmental Assessment
EC	electrical conductivity
EDD	Employment Development Department
eGRID	Emissions & Generation Resource Integrated Database
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
EIS/EIR	Environmental Impact Statement/Environmental Impact Report
ESA	Endangered Species Act
ESU	Evolutionarily Significant Unit
ETAW	evapotranspiration of applied water
EWA	Environmental Water Account
FEMA	Federal Emergency Management Agency
FERC	Federal Energy Regulatory Commission
FMMP	Farmland Mapping and Monitoring Program
FONSI	Finding of No Significant Impact
FORTRAN	Formula Translating System programming language
FR	Federal Register
FSZ	Farmland Security Zone
FWCA	Fish and Wildlife Coordination Act
GAMA	Groundwater Ambient Monitoring and Assessment
GAMAQI	Guide for Assessing and Mitigating Air Quality Impacts

GCM	global climate model
GFDL	Geophysical Fluids Dynamics Laboratory
GHG	greenhouse gas
GIS	geographic information system
GMP	Groundwater Management Plan
GPS	Global Positioning System
GWP	global warming potential
HCP	Habitat Conservation Plan
hp	horsepower
ID	Irrigation District
IMPLAN	IMpact analysis for PLANning
InSAR	Interferometric Sythetic Aperture Radar
IO	input-output
IPCC	Intergovernmental Panel on Climate Change
IPR	indirect potable reuse
ITAs	Indian Trust Assets
km	kilometer
lbs/day	pounds per day
LOD	Level of Development
LU	Land Use
M&I	municipal and industrial
m/d	meters per day
MBTA	Migratory Bird Treaty Act
MCL	maximum contaminant level
MFP	Middle Fork Project
mg/L	milligrams per liter
MicroFEM	finite-element program for multiple-aquifer steady-state and transient groundwater flow modeling
MIG	Minnesota Implan Group
MSCS	Multi-Species Conservation Strategy
MT/yr	metric tons per year
$MTCO_2e$/yr	metric tons carbon dioxide equivalent per year
MUD	Municipal Utility District
MW	megawatts
MWC	Mutual Water Company
n.d.	no date
N_2O	nitrous oxide
NAAQS	National Ambient Air Quality Standards

NAGPRA	Native American Graves Protection and Repatriation Act
NASS	National Agricultural Statistics Service
NBHCP	Natomas Basin Habitat Conservation Plan
NCAR	National Center for Atmospheric Research
NCCP	Natural Community Conservation Plan
NCCPA	Natural Community Conservation Planning Act
NEPA	National Environmental Policy Act
NF	National Forest
NFIP	National Flood Insurance Program
NHPA	National Historic Preservation Act
NO_2	nitrogen dioxide
NOAA Fisheries	National Oceanic and Atmospheric Administration Fisheries Service
NOx	nitrogen oxides
NPS	National Park Service
NRA	National Recreation Area
NRCS	Natural Resources Conservation Service
NRDC	Natural Resources Defense Council
NRHP	National Register of Historic Places
NRP	Natural Resources Policy
NSV IRWMP	Northern Sacramento Valley Integrated Regional Water Management Plan
NWR	national wildlife refuge
NWSRA	National Wild and Scenic Rivers Act
NWSRS	National Wild and Scenic Rivers System
O_3	ozone
OAIT	Office of American Indian Trust
OPR	Office of Planning and Research
Pb	lead
PCBs	polychlorinated biphenyls
PCCP	Placer County Conservation Plan
PCM	Parallel Climate Model
PEIS/EIR	Programmatic Environmental Impact Statement/Environmental Impact Report
PG&E	Pacific Gas and Electric Company
PM_{10}	inhalable particulate matter with an aerodynamic diameter less than or equal to 10 microns
$PM_{2.5}$	fine particulate matter with an aerodynamic diameter less than or equal to 2.5 microns

ppb	parts per billion
ppm	parts per million
PRBO	Point Reyes Bird Observatory
PRC	Public Resources Code
PRISM	Parameter-elevation Relationships on Independent Slopes Model
PSD	prevention of significant deterioration
RD	Reclamation District
Reclamation	U.S. Department of the Interior, Bureau of Reclamation
ROD	Record of Decision
ROG	reactive organic gas
RPA	Reasonable and Prudent Alternative
RPR	Rare Plant Rank
RWA	Regional Water Authority
RWQCB	Regional Water Quality Control Board
RWQCBCV	Regional Water Quality Control Board, Central Valley
SACFEM	Sacramento Valley Groundwater Model
SACFEM2013	Sacramento Valley Finite Element Groundwater Model
SacIGSM	Sacramento County Integrated Groundwater and Surface Water Model
SB	Senate Bill
SCV	Santa Clara Valley
SDWA	Safe Drinking Water Act
SGA	Sacramento Groundwater Authority
SIP	state implementation plan
SJMSCP	San Joaquin County Multi-Species Habitat Conservation and Open Space Plan
SJRRP	San Joaquin River Restoration Program
SLDMWA	San Luis & Delta-Mendota Water Authority
SMS	Scenery Management System
SMSHCP	Solano Multispecies Habitat Conservation Plan
SO_2	sulfur dioxide
SOI	sphere of influence
SOx	sulfur oxides
SR	State Route
SRA	State Recreation Area
SSC	Species of Special Concern
SSHCP	South Sacramento Habitat Conservation Plan
SVRR	Sacramento Valley Railroad

SWP	State Water Project
SWRCB	State Water Resources Control Board
TAF	thousand acre-feet
TCR	The Climate Registry
TDS	total dissolved solids
TMDL	Total Maximum Daily Load
TOM	Transfer Operations Model
tpy	tons per year
UCCE	University of California Cooperative Extension
UGB	urban growth boundary
USACE	U.S. Army Corps of Engineers
USC	U.S. Code
USDA	U.S. Department of Agriculture
USEPA	U.S. Environmental Protection Agency
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
UWMP	Urban Water Management Plan
VOC	volatile organic compound
WaterSMART	Sustain and Manage America's Resources for Tomorrow
WC	Water Code
WD	Water District
WFA	Water Forum Agreement
WQCP	Water Quality Control Plan
WSP	Water Shortage Policy
WUE	water use efficiency
WY	water year
YNHP	Yolo Natural Heritage Program
μS/cm	microsiemen per centimeter

Chapter 1
Introduction

Hydrologic conditions, climatic variability, consumptive use within the watershed, and regulatory requirements for operation of water projects commonly affect water supply availability in California. This variability strains water supplies, making advance planning for water shortages necessary and routine. In the past decades, water entities have been implementing water transfers to supplement available water supplies to serve existing demands and transfers have become a common tool in water resource planning.

The United States Department of the Interior, Bureau of Reclamation manages the Central Valley Project (CVP), which includes storage in reservoirs (such as Shasta, Folsom, and Trinity reservoirs) and diversion pumps in the Sacramento-San Joaquin Delta (Delta) to deliver water to users in the San Joaquin Valley and San Francisco Bay area. When these users experience water shortages, they may look to water transfers to help reduce potential impacts of those shortages.

Transfers are allowed under California State law and under Federal law. Water users have been encouraged to seek alternative sources of water through willing buyers/willing seller agreements. The purpose of this EIS/EIR is to analyze the effects of transfers between listed buyers and sellers which will streamline the environmental review process and make transfers more implementable relative to NEPA and CEQA requirements, especially when hydrologic conditions and available pumping capacity are unknown until right before the transfer season.

A water transfer involves an agreement between a willing seller and a willing buyer, and available infrastructure capacity to convey water between the two parties. To make water available for transfer, the willing seller must take an action to reduce the consumptive use of water (such as idle cropland or pump groundwater in lieu of using surface water) or release additional water from reservoir storage. This water would be conveyed to the buyers' service area for beneficial use. Water transfers would only be used to help meet existing demands and would not serve any new demands in the buyers' service areas.

Reclamation and the San Luis & Delta-Mendota Water Authority (SLDMWA) are completing a joint Environmental Impact Statement/Environmental Impact Report (EIS/EIR), in compliance with the National Environmental Policy Act (NEPA) and California Environmental Quality Act (CEQA), for water transfers from 2015 through 2024. Reclamation is serving as the Lead Agency under NEPA and SLDWMA is the Lead Agency under CEQA. Reclamation would facilitate transfers proposed by buyers and sellers. The SLDMWA, consisting of federal and exchange water service contractors in western San Joaquin

Valley, San Benito, and Santa Clara counties, helps negotiate transfers in years when the member agencies could experience shortages.

This EIS/EIR evaluates the transfer of water transfers ~~that would be~~ purchased by CVP contractors in areas south of the Delta or in the San Francisco Bay Area. The ~~transfers~~ water would be conveyed through the Delta using CVP or State Water Project (SWP) pumps, or facilities owned by other agencies in the San Francisco Bay Area.

This EIS/EIR addresses the transfer of water ~~transfers~~ to CVP contractors from CVP and non-CVP sources of supply that must be conveyed through the Delta using CVP, SWP, and local facilities. These transfers require approval from Reclamation and/or Department of Water Resources (DWR), which necessitates compliance with NEPA and CEQA. Other transfers not included in this EIS/EIR could occur during the same time period, subject to their own environmental review (as necessary). Non-CVP transfers are analyzed in combination with the potential alternatives in the cumulative analysis.

1.1 Purpose and Need/Project Objectives

The purpose and need statement (under NEPA) and project objectives (under CEQA) describe the underlying need for and purpose of a proposed project. The purpose and need statement and objectives are a critical part of the environmental review process because they are used to identify the range of reasonable alternatives and focus the scope of analysis.

1.1.1 Purpose and Need

The purpose of the Proposed Action is to facilitate and approve voluntary water transfers from willing sellers upstream of the Delta to water users south of the Delta and in the San Francisco Bay Area. Water users have the need for immediately implementable and flexible supplemental water supplies to alleviate shortages.

1.1.2 Project Objectives

SLDMWA has developed the following objectives for long-term water transfers through 2024:

- Develop supplemental water supply for member agencies during times of CVP shortages to meet existing demands.
- Meet the need of member agencies for a water supply that is immediately implementable and flexible and can respond to changes in hydrologic conditions and CVP allocations.

Because shortages are expected due to hydrologic conditions, climatic variability, and regulatory requirements, transfers are needed to meet water demands.

1.2 Project Background

1.2.1 Reclamation and the CVP

Reclamation's Mid-Pacific Region is responsible for managing the CVP, which stores and delivers irrigation water to the Sacramento and San Joaquin valleys, water to cities and industries in Sacramento, the San Joaquin Valley, and the east and south Bay Areas. The CVP also delivers water to fish hatcheries and wildlife refuges throughout the Central Valley, and for protection, restoration and enhancement of fish, wildlife, and associated habitats in the Central Valley. Figure 1-1 shows major CVP facilities and the CVP service area.

The CVP has approximately 270 water service contracts. CVP water allocations for agricultural, environmental, municipal and industrial (M&I) users vary based on factors such as hydrology, water rights, reservoir storage, environmental considerations, and operational limitations. Each year Reclamation determines the amount of water that can be delivered to each district and municipality based on conditions for that year. These allocations are expressed as a percentage of the maximum contract volumes of water according to the contracts, or historical use for M&I contractors in a water short year, held between Reclamation and the various water districts, municipalities, and other entities. Reclamation and the CVP contractors recognize that delivery of full contract quantities is not likely to occur every year (in most years). Table 1-1 summarizes CVP allocations, as percentages of C~~c~~ontract ~~amount~~Total, delivered to agricultural and M&I water contractors north and south of the Delta from 2000 through 2014. Water shortages lead to severe water constraints especially in the southern portion of the CVP.

Figure 1-1. Major CVP Facilities and CVP Service Areas

Table 1-1. CVP Water Supply Allocation Percentages 2000 through 2014

Year	Year Type[1]	Irrigation[2]		M&I	
		North of Delta (%)	South of Delta (%)	North of Delta (%)	South of Delta (%)
2000	AN	100	65	100	90
2001	D	60	49	85	77
2002	D	100	70	100	95
2003	AN	100	75	100	100
2004	BN	100	70	100	95
2005	AN	100	90	100	100
2006	W	100	100	100	100
2007	D	100	50	100	75
2008	C	40	40	75	75
2009	D	40	10	100	60
2010	BN	100	45	100	75
2011	W	100	80	100	100
2012	BN	100	40	100	75
2013	D	75	20	100[3]	70
2014	C	0	0	50	50

Source: Reclamation 2014a

Notes:

[1] Based on the Sacramento Valley Water Year Index

[2] Includes water service contracts, does not include Sacramento River Settlement and San Joaquin River Exchange Contractors

[3] In 2013, American River M&I users received 75 percent of contract amount.

Key:

M&I = municipal and industrial

C = Critical

D = Dry

BN = Below Normal

AN = Above Normal

W = Wet

1.2.2 Water Agencies Requesting Transfers

~~Several~~ A number of CVP contractors have identified interest in purchasing transfer water to reduce potential water shortages and have requested to be included in the EIS/EIR. Table 1-2 summarizes all purchasing agencies, further referred to as buyers.

Table 1-2. Potential Buyers

San Luis & Delta-Mendota Water Authority Participating Members
Byron-Bethany Irrigation District
Del Puerto Water District
Eagle Field Water District
Mercy Springs Water District
Pacheco Water District
Panoche Water District
San Benito County Water District
San Luis Water District
Santa Clara Valley Water District
Westlands Water District
Contra Costa Water District
East Bay Municipal Utility District

1.2.2.1 SLDMWA

SLDMWA consists of 28 member agencies representing water service contractors and San Joaquin River Exchange Contractors. Figure 1-2 shows the SLDMWA service area and identifies participating members included in Table 1-2. Not all of SLDMWA member agencies are participating in this EIS/EIR.

Reclamation has an operation~~s~~ and maintenance agreement with SLDMWA to operate and maintain the physical works and appurtenances associated with the Jones Pumping Plant, the Delta-Mendota Canal, the O'Neill Pump/Generating Plant, the San Luis Drain, and associated works. One function SLDMWA serves is to help negotiate water transfers with and on behalf of its member agencies when CVP allocations have been reduced and there is a need for supplemental water.

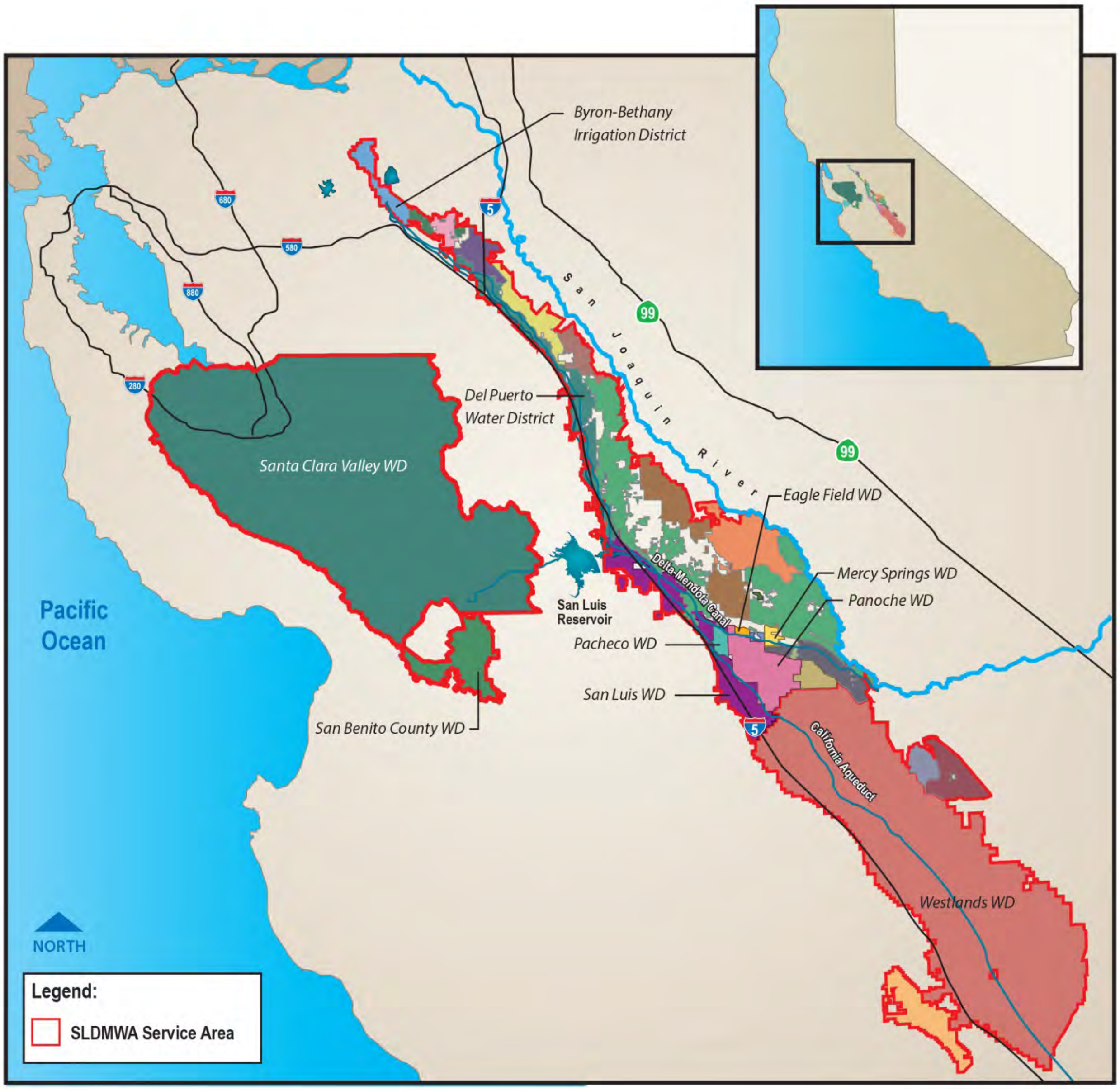

Figure 1-2. SLDWMA Service Area and Participating Member Agencies

The SLDMWA service area consists primarily of agricultural lands on the west side of the San Joaquin Valley. Agricultural water use occurs on approximately 850,000 irrigated acres. Water for habitat management occurs on approximately 120,000 acres of refuge lands, which receive approximately 250,000 to 300,000 acre-feet (AF) of water per year. Relative to agricultural uses, there is limited M&I water use in the San Joaquin Valley area. The majority of the M&I use in the SLDMWA service area occurs in the San Felipe Division, primarily the Santa Clara Valley Water District (WD). From 2001 to 2010, average annual M&I water use in the San Joaquin Valley area was about 22,000 AF and approximately 86,000 AF in the San Felipe Division.

As shown in Table 1-1, south-of-Delta agricultural contractors, many of which are members of the SLDMWA, experience severe cutbacks in CVP allocations in most years. In 2009, deliveries were cut back to ten percent of ~~CVP contract amounts~~Contract Total for agricultural water service contracts. In 2014, agricultural water service contractors received a zero percent allocation. Note that the Exchange Contractors are not included in these allocations. SLDMWA member agencies use water transfers as a method to supplement water supplies in years when CVP allocations are reduced.

1.2.2.2 Contra Costa WD

The Contra Costa WD was formed in 1936 to purchase and distribute CVP water for irrigation and industrial uses. Today, the Contra Costa WD encompasses more than 214 square miles, serves a population of approximately 500,000 people in Central and East Contra Costa County, and is Reclamation's largest urban CVP contractor in terms of ~~contract amount~~Contract Total. Figure 1-3 shows the Contra Costa WD service area.

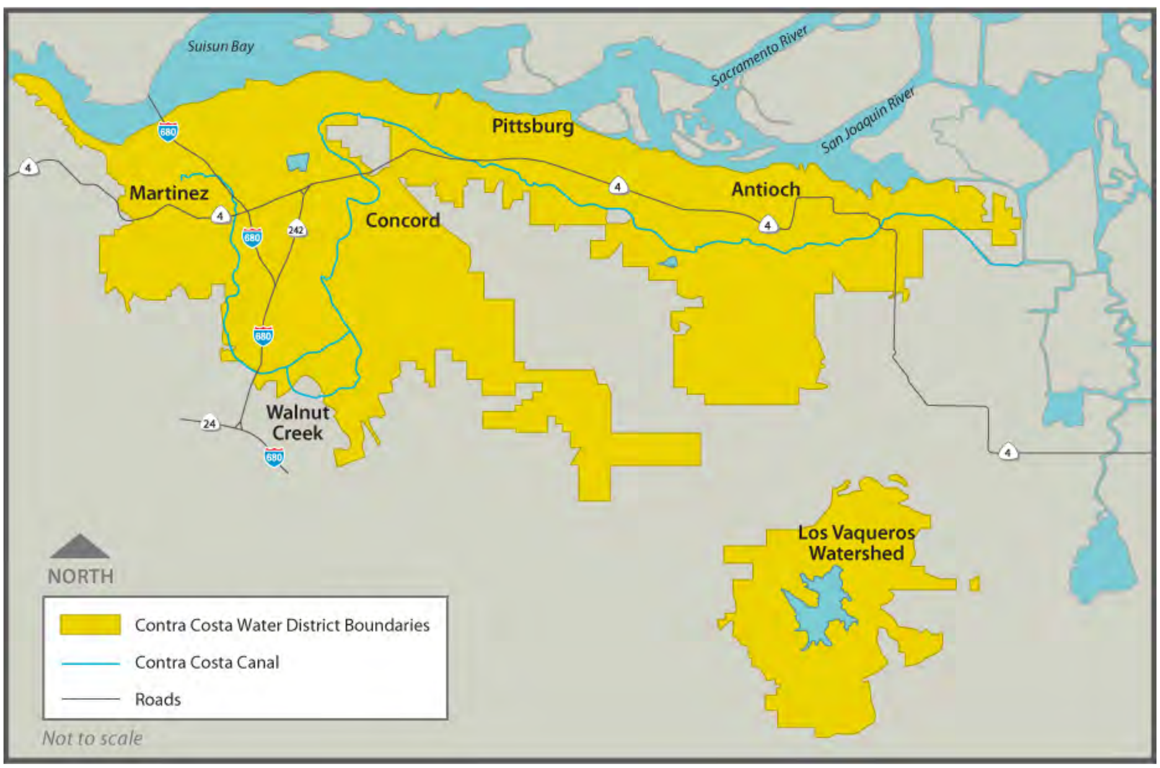

Figure 1-3. Contra Costa WD Service Area

Contra Costa WD is almost entirely dependent on ~~CVP~~ diversions from the Delta. Pursuant to its water service contract with Reclamation, for its water supply. The 48-mile Contra Costa Canal conveys water throughout the service area. Contra Costa WD's long-term CVP contract with Reclamation was renewed in May 2005 and has a term of 40 years. The contract with

Reclamation provides for a ~~maximum delivery~~Contract Total of 195,000 AF per year from the CVP for M&I purposes, with a reduction ~~in deliveries~~ during water shortages including regulatory restrictions and drought. Contra Costa WD also has limited water supply from groundwater, recycled water, and some long-term water purchase agreements.

Figure 1-4 shows ~~historic CVP water deliveries~~Water Delivered to Contra Costa WD for the contract years 2001 through 2010. The figure shows that deliveries are typically well below the ~~contract amount~~Contract Total of 195,000 AF.

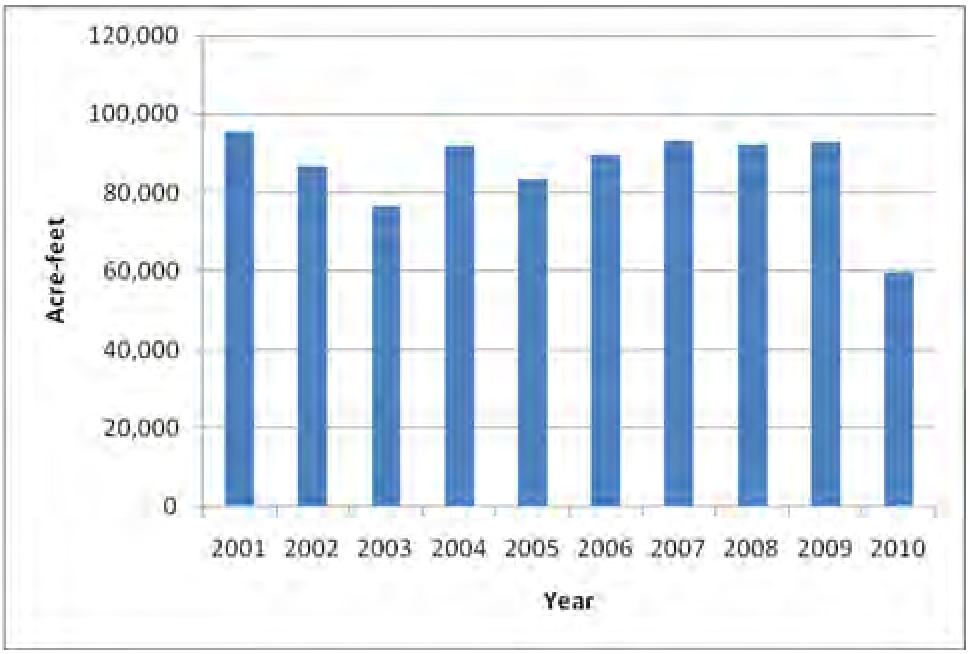

Figure 1-4. ~~Past CVP Deliveries~~Water Delivered to Contra Costa WD, Contract Years 2001-2010

State Water Resources Control Board (SWRCB) Decision 1629 provides that Contra Costa WD may divert water under Permit No. 20749 from Old River to Los Vaqueros Reservoir from November through June during excess conditions in the Delta. Decision 1629 also specifies the maximum diversion rates at 250 cfs and annual diversion to storage (95,800 AF annually at a rate of 200 cfs) by Contra Costa WD to Los Vaqueros Reservoir. These water rights are in addition to Contra Costa WD's CVP (195,000 AF) supply.

In the July 2011 Urban Water Management Plan (UWMP), Contra Costa WD estimates that CVP water supplies in the near term could be reduced from 170,000 AF in a normal year to 127,500 AF in a single year drought and 110,500 AF in the third year of a multi-year drought (Contra Costa WD 2011). The UWMP identifies use of water transfers to bridge the gap between supply and demand. Transfers would assist in meeting demands of existing customers during a drought and compensating them for possible reductions in the availability of CVP supplies (Contra Costa WD 2011).

1.2.2.3 East Bay Municipal Utility District (MUD)

East Bay MUD was ~~created~~ organized in 1923 to provide water service to the east San Francisco Bay Area. Today, East Bay MUD provides water and wastewater services to approximately 1.3 million people over a 332 square mile area in Alameda and parts of Contra Costa counties. Figure 1-5 shows the East Bay MUD service area.

Figure 1-5. East Bay MUD Service Area

Ninety percent of East Bay MUD's water supply comes from the Mokelumne River watershed in the Sierra Nevada. East Bay MUD has a CVP water service contract with Reclamation to divert water from the Sacramento River for M&I purposes. East Bay MUD's long-term CVP contract with Reclamation was renewed in April 2006 and has a term of 40 years. The contract provides up to 133,000 AF in a single dry year, not to exceed a total of 165,000 AF in three consecutive dry years. CVP water is available to East Bay MUD only in dry years when certain storage conditions within the East Bay MUD system are met (East Bay MUD 2011). As a result East Bay MUD does not forecast frequent use of CVP water.

East Bay MUD's 2010 UWMP identifies short-term water transfers originating from northern California as a potential water supply source to meet dry year water supply needs in the future (East Bay MUD 2011).

1.3 Federal and State Regulations Governing Water Transfers

This section discusses federal and state regulations relevant to water transfers. Local ordinances have been adopted in the sellers' service areas that address groundwater-related transfers. These local ordinances are discussed in Section 3.3, Groundwater Resources.

1.3.1 Federal Regulations

1.3.1.1 Central Valley Project Improvement Act (CVPIA) of 1992

The CVPIA[1] is a federal statute passed in 1992 with the following purposes:

> *"To protect, restore, and enhance fish, wildlife, and associated habitats in the Central Valley and Trinity River basins of California; To address impacts of the Central Valley Project on fish, wildlife and associated habitats; To improve the operational flexibility of the Central Valley Project; To increase water-related benefits provided by the Central Valley Project to the State of California through expanded use of voluntary water transfers and improved water conservation; To contribute to the State of California's interim and long-term efforts to protect the San Francisco Bay/Sacramento-San Joaquin Delta Estuary; To achieve a reasonable balance among competing demands for use of Central Valley Project water, including the requirements of fish and wildlife, agricultural, municipal and industrial and power contractors."*

[1] Title 34 of Public Law 102-575, the Reclamation Projects Authorization and Adjustment Act of 1992, signed October 30, 1992.

The CVPIA granted the right to all individuals who receive CVP water (through contracts for water service, repayment contracts, water rights settlements, or exchange contracts) to sell this water to other parties for reasonable and beneficial purposes. According to the CVPIA Section 3405(a), the following principles must be satisfied for any transfer.

- Transfer may not violate the provisions of Federal or state law.
- Transfer may not cause significant adverse effects on Reclamation's ability to deliver CVP water to its contractors.
- Transfer will be limited to water that would be consumptively used or irretrievably lost to beneficial use.
- Transfer will not significantly adversely affect water supplies for fish and wildlife purposes.
- Transfers cannot exceed the average annual quantity of water under contract actually delivered to the contracting district or agency during the last three years of normal water delivery prior to the enactment of the CVPIA.

Reclamation must approve each transfer and will not approve a transfer if it will violate CVPIA principles and other state and federal laws. Reclamation issues its decision regarding potential CVP transfers in coordination with the U.S. Fish and Wildlife Service (USFWS), contingent upon the evaluation of impacts on fish and wildlife. A CVP transfer approval must be accompanied by appropriate documentation under NEPA.

1.3.1.2 Biological Opinions on the Coordinated Operations of the CVP and SWP

On December 15, 2008, USFWS released a biological opinion ~~describing delta smelt protections for the coordinated~~on the effects of coordinated long-term operations of the CVP and SWP on Delta smelt (USFWS 2008). The biological opinion concluded that continued long term operations of the CVP and SWP, as proposed, were "likely to jeopardize" the continued existence of delta smelt without further flow conditions in the Delta for their protection and the protection of designated delta smelt critical habitat. The USFWS developed a Reasonable and Prudent Alternative (RPA) aimed at protecting delta smelt, improving and restoring habitat, and monitoring and reporting results.

Similar to the USFWS biological opinion on delta smelt, National Oceanic Atmospheric Administration Fisheries Service (NOAA Fisheries) released a biological opinion on June 4, 2009 ~~describing the anadromous fish protections for the~~on the effects of continued long term coordinated operations of the CVP and SWP on listed andromous fish (NOAA Fisheries 2009). This biological opinion concluded that continued long term operations of the CVP and SWP, as proposed, were "likely to jeopardize" the continued existence of Sacramento River winter run Chinook salmon, Central Valley spring run Chinook salmon, Central Valley steelhead, and the southern Distinct Population Segment of North American green sturgeon and were "likely to destroy or adversely modify" designated or proposed critical habitat of these species. NOAA Fisheries also concluded that CVP and SWP operation both "directly altered the hydrodynamics of the Sacramento-San Joaquin River basins and have interacted with other activities affecting the Delta to create an altered environment that adversely influences salmonid and green sturgeon population dynamics." The biological opinion identified an RPA to address these issues and protect anadromous fish species.

The Opinions included the following operational parameters applicable to water transfers:

- A maximum amount of water transfers is 600,000 AF per year in ~~dry and~~ critical ~~dry~~ years and dry years (following dry or critical years). For all other year types, the maximum transfer amount is up to 360,000 AF.

- Transfer water will be conveyed through DWR's Harvey O. Banks (Banks) Pumping Plant or Jones Pumping Plant during July through September ~~unless Reclamation and/or DWR consult with the fisheries agencies~~.

Several lawsuits were filed challenging the validity of the 2008 USFWS and 2009 NOAA Fisheries Biological Opinions and Reclamation's acceptance of the RPA included with each (Consolidated Salmonid Cases, Delta Smelt Consolidated Cases). The District Court issued findings that concluded Reclamation had violated NEPA by failing to perform any NEPA analysis before provisionally adopting the 2008 USFWS RPA and 2009 NOAA Fisheries RPA. On December 14, 2010, the District Court found the 2008 USFWS Biological Opinion to be unlawful and remanded the Biological Opinion to USFWS. The District Court issued a similar ruling for the 2009 NOAA Fisheries Biological Opinion on September 20, 2011. On March 13, 2014, the United States Court of Appeals for the Ninth Circuit affirmed in part and reversed in part the finding from the District Court on the USFWS Biological Opinion. The Court of Appeals upheld the determination that Reclamation must complete NEPA analysis, but it reversed ~~the finding that the scientific basis for the Biological Opinion was arbitrary and capricious~~on all arguments related to the adequacy of the Biological Opinion. ~~The NOAA Fisheries Biological Opinion is the subject of a future review from the Court of Appeals~~. On December 22, 2014, the United States Court of Appeals for the Ninth Circuit released similar findings related to the Consolidated Salmonid Cases and reversed the arguments about the adequacy of the Biological Opinion. Reclamation is working to complete NEPA analysis on the Biological Opinions, but ~~Until the legal issues are resolved and new biological opinions are~~

~~completed (if necessary),~~ the 2008 USFWS and 2009 NOAA Fisheries biological opinions will guide operations of potential water transfers.

1.3.2 State Regulations

Several sections of the California Water Code provide the SWRCB with the authority to approve transfers of water involving post-1914 water rights. The Water Code defines processes for short- and long-term water transfers. The SWRCB is responsible for reviewing transfer proposals and issuing petitions for temporary transfers related to post-1914 water rights. The SWRCB generally considers transfers of water under CVP water service or repayment contracts, water rights settlement contracts, or exchange contracts within the CVP place of use authorized in Reclamation's water rights to be internal actions and not subject to SWRCB review. Transfers of CVP water outside of the CVP place of use require SWRCB review and approval. The Water Code includes protections for impacts related to water transfers for other legal users of water, as well as fish, wildlife, and other instream beneficial uses.

Pre-1914 water rights are not subject to SWRCB jurisdiction, but transfers of water involving pre-1914 water rights are subject to review under CEQA and accordingly are analyzed in this EIS/EIR. Transfers involving pre-1914 water rights are also subject to the same "no injury rule" as set forth in Water Code Section 1706. Pre-1914 water rights are not subject to the provisions of the Water Code discussed below unless specifically mentioned.

1.3.2.1 Short-Term Transfers

Short-term (i.e., temporary) transfers are those that take place over a period of one year or less. Water Code Section 1725 allows a permittee or licensee to temporarily change a point of diversion, place of use, or purpose of use of water due to a transfer of water. Short-term transfers under Section 1725 are limited to water that would have been used consumptively or stored absent the water transfer. Section 1725 defines consumptively used water as "the amount of water which has been consumed through use by evapotranspiration, has percolated underground, or has been otherwise removed from use in the downstream water supply as a result of direct diversion." Return flows (water that returns to a stream or a useable underground aquifer after being applied to land) are typically used by other users; therefore, they are generally not available for transfer because the transfer of this water could injure these downstream users. The most common ways to reduce consumptive use are to idle land, shift to less water-intensive crops, or substitute groundwater in-lieu of surface water.

Section 1725 allows expedited processing of short-term transfers of post-1914 water rights. Short-term transfers qualify for this expedited process because the action is limited to one year, minimizing the risk of potential impacts. Transfers qualified under Section 1725 are exempt from CEQA pursuant to Section 1729 of the Water Code; the Water Code relies on notice to the affected parties and findings made by the SWRCB rather than the development of environmental documents under CEQA.

Short-term transfers must not injure any legal user of water or unreasonably affect fish, wildlife, or instream uses. Petitions for transfer must document the identifying permit or license as the basis for the transfer and support the claims of no injury to any legal user of the water and no unreasonable effects to fish and wildlife or other instream beneficial uses. The petition is publicly noticed and persons may file with the SWRCB objections or comments to the petition. The SWRCB is required to act upon the petition in accordance with the procedures set forth in Water Code Section 1726.

Water Code Section 1728 specifies that the one-year transfer period does not include any time required for monitoring, reporting, or mitigation before or after the temporary change is carried out. If, within a period of one year or less, the water is transferred to off-stream storage outside of the watershed where it was originated, the water may be put to beneficial use in the place of use during or after that period.

1.3.2.2 Long-Term Transfers

Long-term transfers are those that take place over a period of more than one year. Long-term transfers of water under post-1914 water rights are governed under Section 1735 of the Water Code. Long-term transfers need not necessarily involve the amount of water consumptively used or stored, but the transfers are evaluated to assure that they will not cause substantial injury to any legal user of water and will not unreasonably affect fish, wildlife, or other instream beneficial uses. The Water Code does not provide for the expedited processing of long-term transfer petitions that is provided for short-term transfer petitions. Long-term transfers under Section 1735 are subject to the requirements of CEQA and must also comply with the standard SWRCB public noticing and protest process. If valid protests to the proposed change cannot be resolved through negotiation between the parties, a hearing must be held prior to the SWRCB's decision on the requested transfer. Section 1745.07 specifically indicates that transfers approved pursuant to provisions of law are deemed to be a beneficial use of water and protect the water rights of the seller during the transfer period.

1.3.2.3 No Injury Rule

A change in water rights involving a transfer is subject to the no injury rule. The no injury rule requires that a transfer may not injure other legal users of water. This rule applies to modern water rights through sections 1725 and 1736 of the Water Code and applies to pre-1914 appropriative water rights through Section 1706 of the Water Code. The SWRCB has jurisdiction over changes to post-1914 water rights, and the courts have jurisdiction over any claimed violations of Section 1706.

1.3.2.4 Effects on Fish and Wildlife

Water Code Sections 1725 and 1736 require that the SWRCB make a finding that proposed transfers not result in unreasonable effects on fish and wildlife or other instream beneficial uses prior to approving a change in post-1914 water rights. California Code of Regulations Title 23 section 794 requires the petitioner to 1) provide information identifying any effects of the proposed changes on fish, wildlife, and other instream beneficial uses, and 2) request consultation with CDFW and the Regional Water Quality Control Board regarding potential effects of the proposed changes on water quality, fish, wildlife, and other instream beneficial uses. The petition for change will not be accepted by the SWRCB unless it contains the required information and consultation request. Early communication with CDFW would streamline the consultation process through "up front" coordination regarding assessment of the potential impact to fish and wildlife resources. The SWRCB will use this information in making their finding that proposed transfers do not result in unreasonable impacts on fish and wildlife or other instream beneficial uses.

1.3.2.5 Local Economic Effects

Cropland idling/crop shifting transfers have the potential to affect the overall economy of the county from which the water is being transferred. Parties that depend on farming-related activities can experience decreases in business if land idling becomes extensive. To minimize the socioeconomic effects on local areas, State agencies evaluate transfer proposals to ensure that the provisions of Water Code Section 1745.05(b) are implemented. Water Code Section 1745.05 (b) provides that if the amount of water made available by land fallowing (idling) exceeds 20 percent of the water that would have been applied absent the proposed water transfer, a public hearing by the water supply agency is required. Water supply agencies interested in participating in cropland idling/crop shifting transfers need to be aware of this Water Code section and conduct a public hearing if they propose a transfer in which cropland idling would exceed the 20 percent threshold.

1.4 History of Water Transfers

Water transfers have been a common water resources planning practice in the past decades. The Lead Agencies have participated in transfers through previous programs or agreements. Transfers have included both in-basin and out-of-basin transfers. Out-of-basin transfers often involve movement of water through the Delta. The following sections briefly describe past water transfer programs and their associated environmental documentation.

The water transfers history highlights the complexities of the water transfer approval process. Reclamation, buyers, and sellers spend significant resources to complete environmental documents that cover water transfers for a single year or a few years. Completing this EIS/EIR to cover ten years of transfers will streamline the environmental review process and make transfers more implementable relative to NEPA and CEQA requirements, especially when hydrologic conditions and available pumping capacity are unknown until right before the transfer season. A ten-year document will also help address requests from USFWS for a more comprehensive evaluation of water transfers on biological resources and listed species.

1.4.1 In-Basin Transfers and NEPA/CEQA

In-basin transfers are a routine practice for water agencies that are within the same region. In-basin transfers occur among agencies within both the Sacramento Valley and the San Joaquin Valley. In-basin transfers are generally one-year transfers used to meet irrigation requirements or existing M&I water needs. Water agencies have also transferred water to nearby refuges to meet refuge habitat requirements.

In-basin transfers among CVP contractors require NEPA documentation. Reclamation typically completes Environmental Assessments (EAs) to cover these transfers. In accordance with the CVPIA, Reclamation has evaluated in-basin transfers over a multi-year period to accelerate approval. Most recently in 2010, Reclamation signed two Finding of No Significant Impact (FONSI) statements for accelerated water transfers and exchanges from 2011 through 2015. One FONSI covered transfers between CVP South of Delta Contractors and the other covered transfers between Friant Division and Cross Valley CVP Contractors. Reclamation also issued a FONSI for accelerated water transfers among CVP contractors and wildlife refuges within the Sacramento Valley from April 2010 through February 2015.

Reclamation also worked with the Exchange Contractors to complete an EIS/EIR to examine the environmental impacts of the transfer and exchange of the Exchange Contractors' CVP water (up to 130,000 AF per year for ten years) from 2005 through 2014 (Reclamation 2004). In 2013, Reclamation released a Final EIS/EIR for the transfer of up to 150,000 AF of substitute water from the Exchange Contractors to potential water users over a 25-year timeframe, from 2014-2038 (Reclamation 2013a).

1.4.2 Out-of-Basin Transfers and NEPA/CEQA

Since the late-1980s, use of out-of-basin water transfers to meet water needs during dry years increased on a statewide level. In response to the drought in the early 1990s, Reclamation and DWR sponsored drought-related programs, including the DWR-run Drought Water Bank initiated in 1991 and 1992, to negotiate and facilitate the exchange of water. A series of wet years in the late 1990s reduced the need for transfers.

In 2000, CALFED Record of Decision (ROD) established the Environmental Water Account (EWA) as a management tool to protect Delta fisheries and maintain water supply reliability for the CVP and SWP. The EWA included purchase of water to help meet these objectives. The CALFED ROD defined the EWA as a four-year program. However, with efficient water purchase practices, the program was able to acquire all the required assets for the EWA each year and extend the allocated funding into a seven-year program implemented from 2001 through 2007. During this time, over two million AF of water assets were acquired for the EWA environmental purposes. To meet NEPA/CEQA requirements, Reclamation and DWR developed the 2004 EWA EIS/EIR, which was a comprehensive evaluation of environmental impacts of the EWA through 2007.

In responses to dry conditions in 2009, Reclamation and DWR cooperatively implemented the 2009 Drought Water Bank to support through-Delta transfers. Reclamation completed the 2009 Drought Water Bank EA and FONSI that evaluated CVP-related transfers that occurred under the 2009 Drought Water Bank. Total CVP-related transfers under the program totaled approximately 390,000 AF.

In 2010, Reclamation completed a 2010-2011 Water Transfer Program EA and FONSI that evaluated out-of-basin transfers for 2010 and 2011 contract years (Reclamation 2010). However, because of wetter hydrologic conditions, no CVP-related transfers occurred in 2010 and 2011.

In 2013, Reclamation developed an EA for one-year transfers from sellers in the Sacramento River basin to SLDMWA (Reclamation 2013b). The EA analyzed up to 37,715 AF of groundwater substitution transfers. Approximately 29,217 AF were transferred under actions and approvals addressed and cleared by this environmental document. As a separate action, Contra Costa WD purchased 2,000 AF from Woodbridge Irrigation District (ID) that was conveyed through East Bay MUD's Mokelumne Aqueduct to Contra Costa WD (Woodbridge ID 2013). Reclamation was not involved in this transfer because it did not involve CVP supplies or CVP facilities.

In 2014, Reclamation and SLDMWA completed an EA/Initial Study for one-year transfers from sellers in the Sacramento River Basin (Reclamation 2014b). The document analyzed transfers up to 175,226 AF made available from groundwater substitution or cropland idling. Transfers up to ~~55,000~~74,030 AF ~~have been~~was negotiated, but all of these transfers ~~may~~ were not ~~be~~ moved based on operational limitations. Reclamation also completed environmental documentation on transfers from Contra Costa WD to Alameda County WD (5,000 AF) and Byron-Bethany ID (4,000 AF) (Reclamation 2014c and Reclamation 2014d). Also in 2014, Reclamation completed NEPA documentation on a transfer Placer County Water Agency to East Bay MUD of about 5,000 AF (Reclamation 2014e).

SLDMWA is a common participant in most water transfers and has negotiated water transfers in past years on behalf of the member agencies. SLDMWA member agencies have been identified as a potential buyer in Reclamation's past transfer programs and many have purchased water in previous years. Table 1-3 shows previous quantities of water transfers purchased by SLDMWA member agencies from 2000 through 2014. Most recently, in 2009, SLDMWA member agencies purchased about 170,000 AF of water originating north of the Delta.

Table 1-3. North of Delta Water Transferred to SLDMWA Member Agencies (2000-2014)

Year	Water Transfer Quantity (AF)
2000	No Transfers
2001	No Transfers
2002	8,685
2003	No Transfers
2004	15,600
2005	3,100
2006	No Transfers
2007	3,100
2008	12,195
2009	106,322
2010	No Transfers
2011	No Transfers
2012	No Transfers
2013	66,500
2014	74,030[1]

Source: SLDMWA 2014
[1]SLDMWA 2015

~~Notes:~~
~~[1] 2014 information from SLDMWA 2014. This amount of transfers was negotiated, but all transfers may not be moved through the Delta because of operational restrictions.~~

1.5 Water Transfers Included in the EIS/EIR and Roles of Participating Agencies

The EIS/EIR evaluates out-of-basin water transfers from willing sellers upstream from the Delta to buyers south of the Delta and in the San Francisco Bay Area. Alternatives considered in this EIS/EIR only analyze transfers ~~of~~ to CVP contractors that require use of CVP or SWP facilities. SWP contractors located south of the Delta may also purchase transfer water originating north of the Delta ~~to areas south of the Delta~~. The cumulative analysis evaluates potential SWP transfers, but they are not part of the action alternatives for this EIS/EIR.

Transfers included in this EIS/EIR are not part of a “program.” More specifically, Reclamation is not initiating transfers or managing a bank or program to solicit or connect sellers and buyers. Buyers and sellers are responsible for identifying one another, initiating discussions, and negotiating the terms of the transfers, including amount of water for transfer, method to make water available, and price. Buyers and sellers must prepare transfer proposals for submission to Reclamation. The transfer proposals must identify whether the transfers are included in the selected alternative, as well as other required transfer information as defined by Reclamation and appropriate mitigation measures. Proposals must also be submitted to DWR if the transfers require use of DWR facilities or the transfers involve a seller with a settlement agreement with DWR.

Reclamation reviews transfer proposals to ensure they are in accordance with NEPA, CVPIA, and California State law. Reclamation also determines if a Warren Act Contract is appropriate (if non-CVP water would be stored or conveyed through CVP facilities). If a transfer is approved, Reclamation moves the water through CVP facilities at the specified time of transfer to the buyer's service area. DWR may also be involved in conveying water for transfers and is interested in verifying that water made available for transfers does not compromise SWP water supplies. For water conveyed through the SWP system, DWR must also determine if the transfer can be made without injuring any legal user of water and without unreasonably affecting fish, wildlife, or other instream beneficial uses and without unreasonably affecting the overall economy or environment of the county from which the water is being transferred. Because of DWR's role in water transfers, DWR is a Responsible Agency under CEQA for this EIS/EIR.

1.6 Decision to be Made and Uses of this Document

SLDMWA will use this document as the environmental analysis for a decision on whether to implement water transfers through 2024 that must be conveyed through the Delta using CVP or SWP facilities. Reclamation will use this document to decide whether to approve and facilitate water transfers of CVP water supplies or non-CVP supplies that require use of CVP facilities and ensure that water transfers are implemented with measures incorporated to minimize environmental effects. Appendix K provides the Mitigation Monitoring and Reporting Program for the proposed long-term water transfers. Appendix N contains an Index of key terms.

When proposing or approving a specific water transfer in the future, the Lead Agencies will consider whether it was analyzed in this document. If so, the Lead Agencies can rely on the analysis in this document. If it is not covered or there have been significant changes, the Lead Agencies may need to supplement this document.

1.7 Issues of Known Controversy

Federal, State, and local agencies, and other parties have participated in the NEPA and CEQA process leading to the development of the water transfer alternatives presented in this EIS/EIR. During January 2011, public scoping sessions on the development of the Long-Term Water Transfers EIS/EIR were held in Chico, Los Banos, and Sacramento. Key issues raised during the public scoping process that are applicable for inclusion in the EIS/EIR are listed below. The public in the Seller Service Area and not in the Buyer Service Area provided these comments.

- Water transfers could result in long-term impacts to groundwater, by decreasing groundwater levels and adversely affecting groundwater users that are not participating in transfers. The EIS/EIR must evaluate groundwater impacts over the ten-year transfer period.
- The cumulative effects analysis must include all water transfers and programs that result in additional groundwater pumping in the Sacramento Valley region.
- Water transfers could result in impacts to adjacent water users, local economies, and fish and wildlife. The EIS/EIR must evaluate and mitigate water transfer effects to non-transferring parties.

1.8 References

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Chapter 2 Proposed Action and Description of the Alternatives

This chapter includes an overview of the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA) requirements for development of project alternatives. It also includes a description of the alternatives formulation process to select a reasonable range of alternatives and a description of the Proposed Action/Proposed Project (Proposed Action) and its alternatives.

2.1 NEPA and CEQA Requirements

2.1.1 NEPA Requirements

Federal law outlines the required components of the "alternatives" section of an Environmental Impact Statement (EIS) (40 Code of Federal Regulations [CFR] Part 1502.14), which include the following:

(a) Rigorous exploration and objective evaluation of all reasonable alternatives, and for alternatives which were eliminated from study, a brief discussion of the reasons for their having been eliminated.

(b) Substantial treatment of each alternative considered in detail, including the proposed action, so that reviewers may evaluate their comparative merits.

(c) Inclusion of reasonable alternatives that are not within the jurisdiction of the lead agency.

(d) Inclusion of the alternative of no action.

(e) Identification of the agency's preferred alternative or alternatives, if one or more exists, in the draft statement and identification of such an alternative in the final statement unless another law prohibits the expression of such a preference.

(f) Inclusion of appropriate mitigation measures that are not already included in the proposed action or alternatives.

2.1.2 CEQA Requirements

The CEQA Guidelines[1] developed by the California Natural Resources Agency include prescriptive requirements for the components of the "project description" section of an Environmental Impact Report (EIR). The required components from Section 15124 of the CEQA Guidelines are listed below.

(a) The precise location and boundaries of the proposed project shall be shown on a detailed map, preferably topographic. The location of the project shall also appear on a regional map.

(b) The document will include a statement of objectives sought by the proposed project. A clearly written statement of objectives will help the lead agency develop a reasonable range of alternatives to evaluate in the EIR and will aid the decision-makers in preparing findings or a statement of overriding considerations, if necessary. The statement of objectives should include the underlying purpose of the project.

(c) A general description of the project's technical, economic, and environmental characteristics, considering the principal engineering proposals, if any, and supporting public service facilities.

(d) A statement briefly describing the intended uses of the EIR.

(1) This statement shall include the following, to the extent that the information is known to the lead agency:

- A list of the agencies that are expected to use the EIR in their decision-making.
- A list of permits and other approvals required to implement the project.
- A list of related environmental review and consultation requirements required by federal, state, or local laws, regulations, or policies. To the fullest extent possible, the lead agency should integrate CEQA review with these related environmental review and consultation requirements.

(2) If a public agency must make more than one decision on a project, all its decisions subject to CEQA should be listed, preferably in the order in which they occur.

[1] Title 14, California Code of Regulations, §§ 15000–15387.

2.2 Alternatives Development

NEPA and CEQA require an EIS and EIR, respectively, to identify a reasonable range of alternatives and provide guidance on the identification and screening of such alternatives. Both NEPA and CEQA include provisions that alternatives reasonably meet the purpose and need/project objectives, and be potentially feasible. For this EIS/EIR, the Lead Agencies followed a structured, documented process to identify and screen alternatives for inclusion in the EIS/EIR. Figure 2-1 illustrates the process that the Lead Agencies conducted to identify and screen alternatives.

Figure 2-1. Alternatives Development and Screening Process

2.2.1 Public Scoping and Screening Criteria Results

During public scoping, the public provided input regarding potential alternatives to the Proposed Action. The Lead Agencies reviewed the purpose and need/project objectives statement, public scoping comments, and previous studies in their initial effort to develop conceptual alternatives. This process identified an initial list of measures described in more detail in Appendix A, Alternatives Development Report and summarized in Table 2-1. The initial list included more than 27 measures. The Lead Agencies then developed and applied a set of screening considerations to determine which measures should move forward for further analysis and be considered as project alternatives.

The Lead Agencies determined that they would screen the alternatives based on their ability to meet key elements of the purpose and need/basic project objectives:

- Immediate: the term proposed for this EIS/EIR is 2015 through 2024. This period is relatively short, and measures need to be able to provide some measurable benefit within this time period.

- Flexible: project participants need water in some years, but not in others. They need measures that have the flexibility to be used only when needed.

- Provide Water: project participants need measures that have the capability of providing additional water to regions that are experiencing shortages.

Measures had to satisfy these key elements in order to move forward to the alternatives formulation phase. Table 2-1 provides an overview of the original measures developed during scoping and their screening results. Appendix A includes a detailed discussion of the screening process and results.

Table 2-1. Measures Screening Evaluation Results

Measures	Description	Immediate	Flexible	Provides Water
Agricultural conservation (Buyer Service Area)	Increase agricultural conservation in buyer service area to reduce agricultural water use, and improve agricultural systems to increase recapture and reuse of irrigation water	-	X	-
Agricultural conservation (Seller Service Area)	Increase agricultural conservation in seller service area to reduce agricultural water use, and improve agricultural systems to increase recapture and reuse of irrigation water	X	X	X
Conservation – municipal & industrial	Increase water conservation for municipal and industrial uses in Buyer Service Area to reduce water demands	X	X	-
Desalination - brackish	Desalinate brackish groundwater supplies and distribute to Buyer Service Area to develop new supply	-	X	X
Desalination - seawater	Desalinate seawater and distribute to the Buyer Service Area to develop new water supply	-	X	X
Reclamation - nonpotable reuse	Treat wastewater for agricultural water use in the buyer service area	-	X	X
Reclamation - indirect potable reuse	Advance treat wastewater and store in groundwater basins for future potable reuse	-	X	X
Cropland idling transfers- rice, field crops, grains	Idle croplands and transfer irrigation water to buyers	X	X	X
Cropland idling transfers-and alfalfa	Idle alfalfa fields and transfer irrigation water to buyers	X	X	X
Land retirement in San Joaquin Valley	Permanently retire lands in San Joaquin Valley and transfer irrigation water to other croplands	-	-	-
Groundwater substitution	Pump groundwater for irrigation rather than use of surface water supplies and transfer surface water to the buyers service area	X	X	X
New surface storage	Build new surface storage facilities to store water for the buyers	-	X	X
Groundwater storage	Build new facilities to recharge and extract groundwater for use in buyer service area or expand existing groundwater storage programs by increases recharge and extraction facilities	X	X	-
Water rights purchase	Purchase water rights for permanent transfer of water	-	X	-

Measures	Description	Immediate	Flexible	Provides Water
Delta conveyance	Build canal to increase CVP water deliveries south of Delta	-	X	X
Crop shifting in Seller Service Area	Shift from a higher water use crop to a lower water use crop and transfer incremental decrease in water to buyers	X	X	X
Rice decomposition water	Use alternate method to decompose rice straw and transfer rice decomposition water to the buyers	X	X	-
Reservoir release	Transfer available water stored in existing, non-CVP or -SWP reservoirs	X	X	X
Transfers within Buyer Service Area	Implement water transfers from buyers and sellers within the Buyer Service Area	X	X	-
Groundwater development	Develop new groundwater supplies by constructing new wells and pumps in the buyer service area	-	X	-
Modify CVP and SWP contracts	Change CVP and SWP contracts to limit water use in the buyer service area	-	-	-
Change cropping patterns in San Joaquin Valley	Plant lower water use crops or increase fallowed land in the Buyer Service Area	X	X	-
Limit dairies in San Joaquin Valley	Limit dairies in San Joaquin Valley to decrease water use	-	X	-
Enforce seniority system to manage deliveries	Deliver water supplies based on seniority of water rights	-	-	-
Implement policy of no net increase in water availability for urban or agricultural expansion	Prohibit use of CVP supplies for newly developed urban or agricultural lands	-	-	-
Pipe water from Canada and northern states	Purchase water and build distribution system to deliver water from northern states to the buyers	-	X	X
Fix Owens Valley	Increase water supply available from Owens Valley	-	-	-

Key:
CVP – Central Valley Project, SWP – State Water Project

2.2.2 Selected Alternatives

The measures that moved forward for more detailed analysis in this EIS/EIR are those that best meet the NEPA purpose and need and CEQA objectives, minimize negative effects, are potentially feasible, and represent a range of reasonable alternatives. Some alternatives do not fully meet the purpose and need/project objectives, but they have potential to minimize some types of environmental effects or help provide a reasonable range of alternatives for consideration by decision-makers.

Measures that were carried forward from scoping and the screening process for alternatives formulation include:

- Agricultural Conservation (Seller Service Area)
- Cropland Idling Transfers - rice, field crops, grains
- Cropland Idling Transfers - alfalfa

- Groundwater Substitution
- Crop Shifting
- Reservoir Release

The measures remaining after the initial screening were combined into three action alternatives that were selected to move forward for analysis in the EIS/EIR (in addition to the No Action/No Project Alternative). Table 2-2 presents the alternatives carried forward for analysis in the EIS/EIR. Analysis of these alternatives will provide the information needed to make a decision, and potentially to mix and match elements of the alternatives, if needed, to create an alternative that would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any significant environmental effects.

Table 2-2. Alternatives Selected for Analysis in the EIS/EIR

Alternative Number	Alternative Name	Description
Alternative 1	No Action/ No Project	The No Action/No Project Alternative represents the state of the environment without the Proposed Action or any of the alternatives. In the No Action/No Project Alternative, the Buyer Service Area would experience shortages and could increase groundwater pumping, idle cropland, or retire land to address those shortages.
Alternative 2	Full Range of Transfers (Proposed Action)	This alternative combines all potential transfer measures that met the purpose and need and were carried forward through the screening process.
Alternative 3	No Cropland Modifications	The No Cropland Modifications Alternative includes the following measures: • Agricultural conservation (Seller Service Area) • Groundwater substitution • Reservoir release
Alternative 4	No Groundwater Substitution	The No Groundwater Substitution Alternative includes the following measures: • Agricultural conservation (Seller Service Area) • Cropland idling transfers– rice, field, grains, alfalfa • Crop shifting • Reservoir release

2.3 Proposed Action and Alternatives

The following sections describe the alternatives under evaluation in this EIS/EIR.

2.3.1 Alternative 1: No Action/No Project Alternative

The Council on Environmental Quality regulations require an EIS to include a No Action Alternative (40 CFR Section 1502.14). The No Action Alternative may be described as the future circumstances without the proposed action and can also include predictable actions by persons or entities, other than the federal agency involved in a project action, acting in accordance with current management direction or level of management intensity.

CEQA requires an EIR to include a No Project Alternative. The No Project Alternative allows for a comparison between the impacts of the proposed project with future conditions of not approving the proposed project. The No Project Alternative may include some reasonably foreseeable changes in existing conditions and changes that would be reasonably expected to occur in the foreseeable future if the project were not approved.

Under the No Action/No Project Alternative, Central Valley Project (CVP) related water transfers through the Delta would not occur during the period 2015-2024. However, other transfers that do not involve CVP water or facilities could occur under the No Action/No Project Alternative. Additionally, CVP transfers within basins could continue and would still require Reclamation's approval. Some CVP entities may decide that they are interested in selling water to buyers in export areas under the No Action/No Project Alternative; however, they would need to complete individual environmental compliance for each transfer to allow Reclamation to complete the evaluation of the transfers for approval.

Under the No Action/No Project Alternative, some agricultural and urban water users may face potential shortages in the absence of water transfers. To the extent transfer water is not available, there would be demand that would be unmet by surface water. Demand may be met by increasing groundwater pumping, idling cropland, reducing landscape irrigation, land retirement, or rationing water.

2.3.2 Alternative 2: Full Range of Transfer Measures (Proposed Action)

This section describes potential transfer participants, potential transfer methods and operations for Alternative 2. Alternative 2 would involve transfers from potential sellers upstream from the Delta to buyers in the Central Valley or Bay Area (see Figure 2-2) when the Delta is in balanced conditions.

Figure 2-2. Potential sellers would transfer water to buyers in the Central Valley or Bay Area

2.3.2.1 Potential Water Transfer Methods

A water transfer temporarily moves water from a willing seller to a willing buyer. To make water available, the seller must take an action to reduce consumptive use or use water in storage. Water transfers must be consistent with State and Federal law, as discussed in Chapter 1. Transfers involving water diverted through the Delta are governed by existing water rights, applicable Delta pumping limitations, reservoir storage capacity and regulatory requirements.

The biological opinions on the Coordinated Operations of the CVP and State Water Project (SWP) (U.S. Fish and Wildlife Service [USFWS] 2008; National Oceanic and Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze transfers through the Delta from July to September that are up to 600,000 acre-feet (AF) in critical years and dry ~~and critically dry~~ years (following dry or critical years). For all other year types, the maximum transfer amount is up to 360,000 AF. Through Delta transfers would be limited to the period when USFWS and NOAA Fisheries find transfers to be acceptable, typically July through September, unless a change is made in a particular water year based on concurrence from USFWS and NOAA Fisheries. Because this document only analyzes the environmental effects associated with a July through September transfer window, supplemental environmental documentation will be prepared to address the effects of moving the transfer window if such a shift were to occur.

In May 2011 and September 2011, U.S. District Judge Wanger ruled that USFWS and NOAA Fisheries, respectively, must submit new biological opinions on smelt and salmonids. Additionally, he found that Reclamation must complete NEPA before accepting the Reasonable and Prudent Alternatives within the biological opinions. In March 2013, the Ninth Circuit Court of Appeals upheld that Reclamation must complete NEPA, but reversed ~~the previous decision that the scientific basis for the USFWS was arbitrary and capricious. A similar case regarding the NOAA Fisheries biological opinion is before the court~~on all arguments related to the adequacy of the Biological Opinion. On December 22, 2014, the United States Court of Appeals for the Ninth Circuit released similar findings related to the Consolidated Salmonid Cases and reversed the arguments about the adequacy of the Biological Opinion. Reclamation is working to complete NEPA analysis on the Biological Opinions, but the 2008 USFWS and 2009 NOAA Fisheries biological opinions will guide operations of potential water transfers. ~~If new biological opinions are completed, the new biological opinions or the findings of the NEPA analysis could change the quantity or timing of transfers. If the biological opinions alter the timing and quantity of transfers, the Lead Agencies will determine if supplemental environmental documentation is necessary to address any changes in potential impacts.~~

This EIS/EIR analyzes transfers to CVP contractors. These transfers could be conveyed through the Delta using either CVP or SWP facilities, depending on availability. CVP sellers could transfer either Base Supply or Project Water under their CVP contracts. Some transfers may not involve CVP contractors as sellers, but they may use CVP facilities. Any non-CVP water that would use CVP facilities would need a Warren Act contract, which is subject to NEPA compliance. This document analyzes the impacts of conveying or storing non-CVP water in CVP facilities to address compliance needs for transfers facilitated by execution of a contract pursuant to the Warren Act of February 21, 1911 (36 Stat. 925).

Some transfers may be accomplished through forbearance agreements rather than transfers that involve the State Water Resources Control Board (SWRCB). Under such agreements, a CVP seller would forbear (i.e., temporarily suspend) the diversion of some of their Base Supply, which in the absence of forbearance, would have been diverted for use on lands within the CVP sellers' service areas. This forbearance would be undertaken in a manner that allows Reclamation to deliver the forborne water supply as Project water to a purchasing CVP water agency. A forbearance agreement would not change the way that water is made available for transfer, conveyed to buyers, or used by the buyers; therefore, it would not change the environmental effects of the transfer.

Groundwater Substitution

Groundwater substitution transfers occur when sellers choose to pump groundwater in lieu of diverting surface water supplies, thereby making the surface water available for transfer. Sellers making water available through groundwater substitution actions are agricultural and municipal and industrial users. Water could be made available for transfer by the agricultural users during the irrigation season of April through September. If there are issues related to water supply availability or conveyance capacity at the Delta, sellers could shorten the window when transfer water is available by switching between surface water sources and groundwater pumping for irrigation or municipal and industrial use.

Groundwater substitution would temporarily decrease levels in groundwater basins near the participating wells. Water produced from wells initially comes from groundwater storage. Groundwater storage would refill (or "recharge") over time, which affects surface water sources. Groundwater pumping captures some groundwater that would otherwise discharge to streams as baseflow and can also induce recharge from streams. Once pumping ceases, this stream depletion continues, replacing the pumped groundwater slowly over time until the depleted storage fully recharges.

Reservoir Release

Buyers could acquire water by purchasing surface water stored in reservoirs owned by non-Project entities (not part of the CVP or SWP). To ensure that purchasing this water would not affect downstream users, Reclamation would limit transferred water to what would not have otherwise been released downstream absent the transfer.

When the willing seller releases stored reservoir water for transfer, these reservoirs are drawn down to levels lower than without the water transfer (see Figure 2-3). To refill the reservoir, a seller must capture some flow that would otherwise have gone downstream. Sellers must refill the storage at a time when downstream users would not have otherwise captured the water, either in downstream reservoirs or at the CVP and SWP (collectively "the Projects") or non-Project pumps in the Delta. Typically, refill can only occur during Delta excess conditions as defined by the Coordinated Operations Agreement (COA) as "periods when it is agreed that releases from upstream reservoirs plus unregulated flow exceed Sacramento Valley in basin uses, plus exports," or when any downstream reservoirs are in flood control operations. Additionally, refill cannot occur at times when the water would have been used to meet downstream flow or water quality standards. Refill of the storage vacated for a transfer may take more than one season to refill if the above conditions are not met in the wet season following the transfer. Each reservoir release transfer would include a refill agreement between the seller and Reclamation (developed in coordination with Department of Water Resources [DWR]) to prevent impacts to downstream users following a transfer.

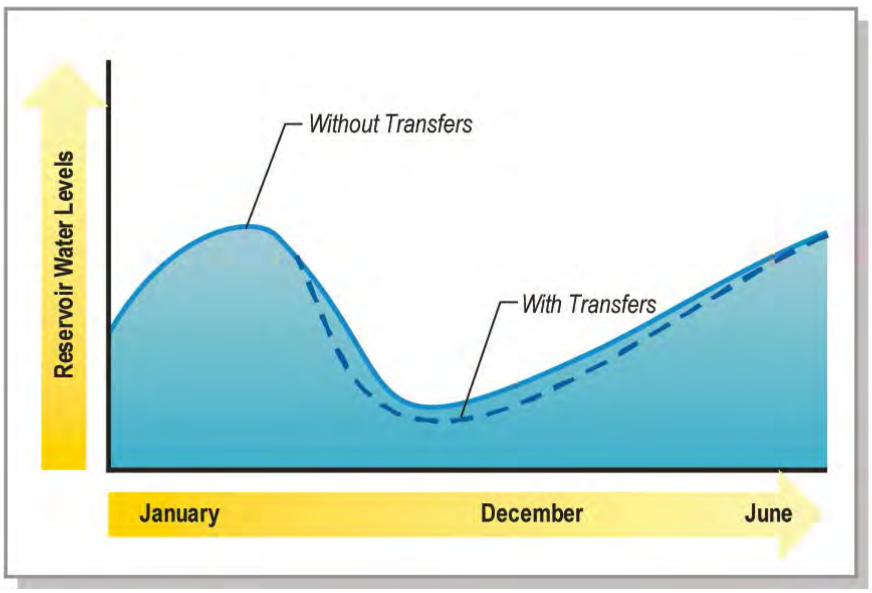

Figure 2-3. Reservoir levels would change because of reservoir release transfers

Some entities that could transfer water through reservoir release are upstream of CVP reservoirs and could request to store water temporarily in the CVP reservoirs. These entities may have restrictions on the patterns that they could release water from their reservoirs, and the patterns may not match the availability of export capacity in the Delta. The seller could request that Reclamation store the non-CVP water in the CVP reservoir until Delta capacity is available, which would require contractual approval in accordance with the Warren Act of 1911. Temporary storage would increase reservoir levels temporarily while water was stored. Reclamation would not release water for transfer from CVP reservoirs before the non-CVP water was available.

Cropland Idling

Cropland idling makes water available for transfer that would have been used for agricultural production. Water would be availab~~water~~le on the same pattern throughout the growing season as it would have been consumed had a crop been planted. The irrigation season generally lasts from April or May through September for most crops in the Sacramento Valley.

The quantity of water made available for transfer through cropland idling would be calculated based on the evapotranspiration of applied water (ETAW). ETAW is the portion of applied surface water that is used by the crop and evaporated from the soil and plant surfaces. Not all crops would be considered for participation in a transfer. Mixed grasses, orchard and vineyard, and alfalfa in the Delta region would not be considered due to factors that make it difficult to determine water savings, such as a lack of authoritative ETAW values and variability in cultural practices. Table 2-3 shows the ETAW of crops currently accepted by Reclamation and DWR that would be potentially involved in transfers. These values were developed using the conceptual model and data in DWR Bulletin 113-3 (DWR 1975).

Table 2-3. Estimated ETAW Values for Various Crops Suitable for Idling or Shifting Transfers

Crop	ETAW (AF/acre)
Alfalfa[1]	1.7 (July – Sept)
Bean	1.5
Corn	1.8
Cotton	2.3
Melon	1.1
Milo	1.6
Onion	1.1
Pumpkin	1.1
Rice	3.3
Sudan Grass	3.0
Sugar Beets	2.5
Sunflower	1.4
Tomato	1.8
Vine Seed/ Cucurbits	1.1
Wild Rice	2.0

Source: Department of Water Resources and Reclamation 2013
Notes:
[1] Only alfalfa grown in the Sacramento Valley floor north of the American River will be allowed for transfers. Fields must be disced on, or prior to, the start of the transfer period. Alfalfa acreage in the foothills or mountain areas is not eligible for transfer.

Consistent with the provisions contained in Water Code Section 1018, potential sellers are encouraged to incorporate measures into their cropland idling transfer to protect habitat value in the area to be idled. Idled land cannot be irrigated during the transfer season, but vegetation that is supported only through precipitation or that has begun to senesce may remain on the idled fields. Excessive vegetation supported by seepage from irrigation supplies or shallow groundwater would result in a decrease in the amount of water available for cropland idling transfer.

Crop Shifting

For crop shifting transfers, water is made available when farmers shift from growing a higher water use crop to a lower water use crop. The difference in the accepted ETAW values between the two crops would be the amount of water that can be transferred. Transfer water generated by crop shifting is difficult to account for. Farmers generally rotate between several crops to maintain soil quality, so water agencies may not know what type of crop would have been planted in a given year absent a transfer. To calculate water available from crop shifting, agencies would estimate what would have happened absent a transfer using an average water use over a consecutive five-year baseline period. The change in consumptive use between this baseline water use and the lower water use crop determines the amount of water available for transfer.

Conservation

Conservation transfers must include actions to reduce the diversion of surface water by the transferring entity by reducing irrecoverable water losses. The amount of reduction in irrecoverable losses determines the amount of transferrable water. Conservation measures may be implemented on the water-district and individual user scale. These measures must reduce the irrecoverable losses at a site without reducing the amount of water that otherwise would have been available for downstream beneficial uses. Irrecoverable losses include water that would not be usable because it currently flows to a salt sink, to an inaccessible or degraded aquifer, or escapes to the atmosphere.

2.3.2.2 Potential Transfer Participants

The sections below identify potential transfer sellers and buyers that are analyzed in this EIS/EIR. Figure 2-4 shows the locations of sellers.

Sellers

Table 2-4 lists the agencies that have expressed interest in being a seller in the Long-Term Water Transfers EIS/EIR and the potential maximum quantities available for sale. Table 2-5 shows the potential upper limit of available water for transfer by each agency for each transfer type; however, actual purchases could be less, depending on hydrology, the amount of water the seller is interesting in selling in any particular year, the interest of buyers, and compliance with Central Valley Project Improvement Act transfer requirements, among other possible factors. Additionally, these transfers would not occur every year, but only years when there is demand from buyers and pumping capacity available to convey the transfers (generally dry and critical years). Modeling analysis indicates that using hydrology from 1970-2003, transfers could occur in 12 of the 33 years.

Because of the uncertainty of hydrologic and operating conditions in the future, it is likely that only a portion of the potential transfers identified in Table 2-4 would occur. Additionally, many agencies are uncertain about whether they would participate through groundwater substitution or cropland idling/crop shifting transfers. They have included their potential upper limit for both types of transfers, but they would not sell the maximum amount of both types in the same year. The maximum amount for each agency would not exceed the amount shown in Table 2-4. Table 2-5 shows the potential quantities of water that could be made available from April through June and July through September; the quantities available in April, May, and June would be able to be transferred if storage is available (see Section 2.3.2.3.1). Entities requiring Reclamation approval that are not listed in this table may decide that they are interested in selling water, but those transfers may require supplemental NEPA and Endangered Species Act analysis to allow Reclamation to complete the evaluation of the transfers.

Sellers that are not specifically listed in this document may be able to sell water to the buyers as long as: the water that is made available occurs in the same water shed or ground water basin analyzed in this EIS/EIR, the total quantity of water proposed for sale does not exceed the maximums listed for each region or type of transfer in any given transfer year, the transfer does not exceed the magnitude of the impacts assessed, and any potential mitigation required can be effectively implemented. On a case-by-case basis, Reclamation would evaluate proposals from sellers not included in this document to determine whether or not the impacts have been adequately assessed in this EIS/EIR.

Table 2-4. Alternative 2 Potential Sellers (Upper Limits)

Water Agency	Maximum Potential Transfer (acre-feet per year)
Sacramento River Area of Analysis	
Anderson-Cottonwood Irrigation District	5,225
Conaway Preservation Group	35,000
Cranmore Farms	8,000
Eastside Mutual Water Company	2,230
Glenn-Colusa Irrigation District	91,000
Natomas Central Mutual Water Company	30,000
Pelger Mutual Water Company	3,750
Pleasant Grove-Verona Mutual Water Company	18,000
Reclamation District 108	35,000
Reclamation District 1004	17,175
River Garden Farms	9,000
Sycamore Mutual Water Company	20,000
Te Velde Revocable Family Trust	7,094
American River Area of Analysis	
City of Sacramento	5,000

Water Agency	**Maximum Potential Transfer (acre-feet per year)**
Placer County Water Agency	47,000
Sacramento County Water Agency	15,000
Sacramento Suburban Water District	30,000
Yuba River Area of Analysis	
Browns Valley Irrigation District	8,100
Cordua Irrigation District	12,000
Feather River Area of Analysis	
Butte Water District	17,000
Garden Highway Mutual Water Company	14,000
Gilsizer Slough Ranch	3,900
Goose Club Farms and Teichert Aggregates	10,000
South Sutter Water District	15,000
Tule Basin Farms	7,320
Merced River Area of Analysis	
Merced Irrigation District	30,000
Delta Region Area of Analysis	
Reclamation District 2068	7,500
Pope Ranch	2,800
Total	**511,094**

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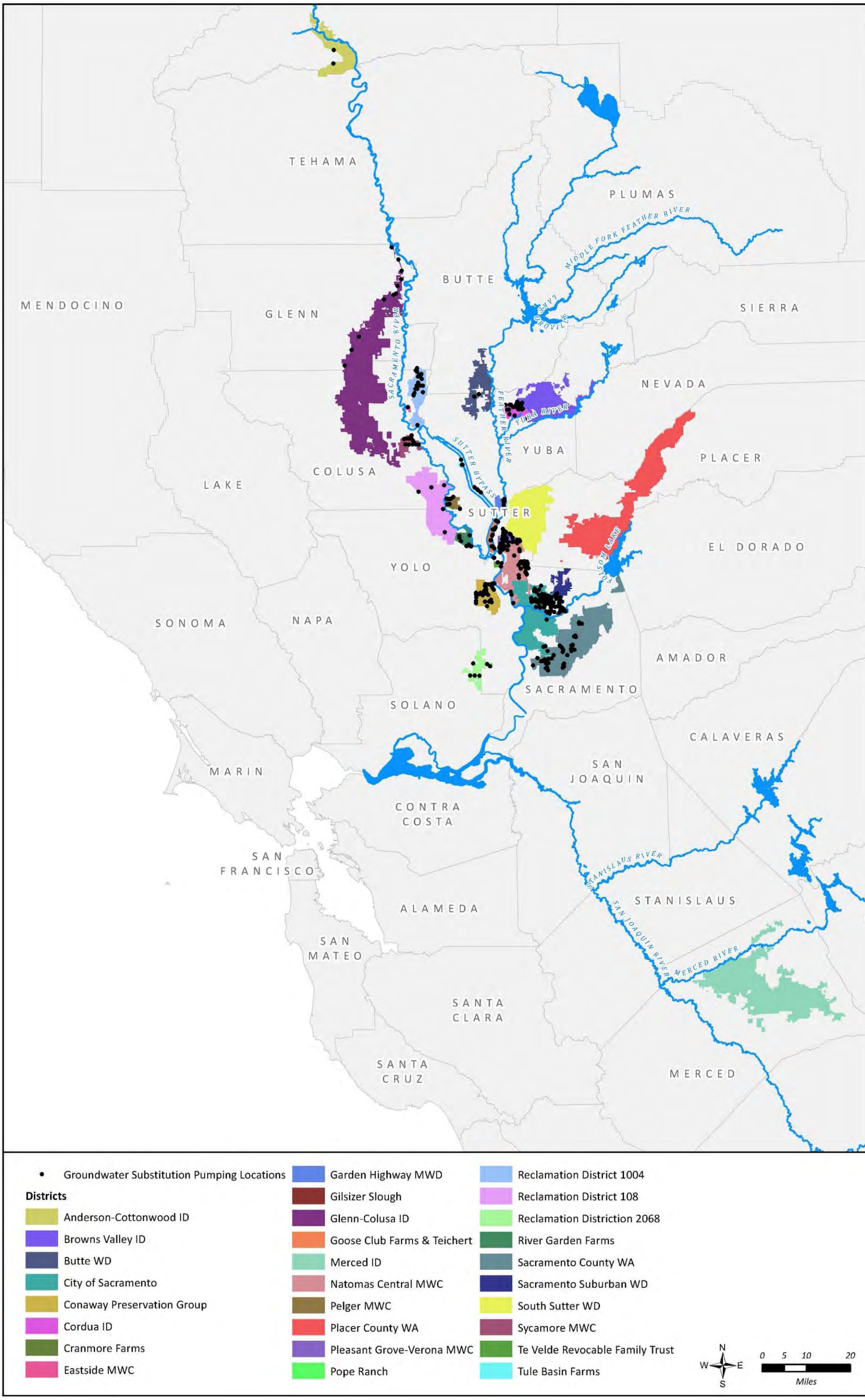

Figure 2-4. Locations of Potential Sellers

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Table 2-5. Alternative 2 Transfers Types (Upper Limits)

Water Agency	April-June Groundwater Substitution (acre-feet)	April-June Cropland Idling/ Crop Shifting (acre-feet)	April-June Stored Reservoir Release (acre-feet)	April-June Conservation (acre-feet)	July-Sep Groundwater Substitution (acre-feet)	July-Sep Cropland Idling/Crop Shifting (acre-feet)	July-Sep Stored Reservoir Release (acre-feet)	July-Sep Conservation (acre-feet)
Sacramento River Area of Analysis								
Anderson-Cottonwood Irrigation District	2,613				2,613			
Conaway Preservation Group	21,550	7,899			13,450	13,450		
Cranmore Farms	5,140	925			2,860	1,575		
Eastside Mutual Water Company	1,067				1,163			
Glenn-Colusa Irrigation District	12,500	24,420			12,500	41,580		
Natomas Central Mutual Water Company	15,000				15,000			
Pelger Mutual Water Company	2,151	939			1,599	1,599		
Pleasant Grove-Verona Mutual Water Company	8,000	3,330			10,000	5,670		
Reclamation District 108	7,500	7,400			7,500	12,600		
Reclamation District 1004		3,700			7,175	6,300		
River Garden Farms	4,000				5,000			
Sycamore Mutual Water Company	7,500	3,700			7,500	6,300		
Te Velde Revocable Family Trust	2,700	2,581			4,394	4,394		
American River Area of Analysis								
City of Sacramento					5,000			
Placer County Water Agency							47,000	
Sacramento County Water Agency					15,000			
Sacramento Suburban Water District	15,000				15,000			

Water Agency	April-June Groundwater Substitution (acre-feet)	April-June Cropland Idling/ Crop Shifting (acre-feet)	April-June Stored Reservoir Release (acre-feet)	April-June Conservation (acre-feet)	July-Sep Groundwater Substitution (acre-feet)	July-Sep Cropland Idling/Crop Shifting (acre-feet)	July-Sep Stored Reservoir Release (acre-feet)	July-Sep Conservation (acre-feet)
Yuba River Area of Analysis								
Browns Valley Irrigation District							5,000	3,100
Cordua Irrigation District					12,000			
Feather River Area of Analysis								
Butte Water District	2,750	5,750			2,750	5,750		
Garden Highway Mutual Water Company	6,500				7,500			
Gilsizer Slough Ranch	1,500				2,400			
Goose Club Farms and Teichert Aggregates	4,000	3,700			6,000	6,300		
South Sutter Water District							15,000	
Tule Basin Farms	3,800				3,520			
Merced River Area of Analysis								
Merced Irrigation District							30,000	
Delta Region Area of Analysis								
Reclamation District 2068	2,250	2,775			2,250	4,725		
Pope Ranch	1,400				1,400			
Total[1]	126,921	67,119	0	0	163,574	110,243	97,000	3,100

Note:

[1] These totals cannot be added together. Agencies could make water available through groundwater substitution, cropland idling, or a combination of the two; however, they will not make the full quantity available through both methods. Table 2-4 reflects the total upper limit for each agency.

Buyers

Table 2-6 identifies potential buyers who may be interested in participating in water transfers (similar to Table 1-2). Not all of these potential buyers may end up actually purchasing water. For some potential buyers, purchase decisions would depend on the ability to move the purchased water through the Delta to the buyer's service area.

Table 2-6. Alternative 2 Potential Buyers

San Luis & Delta-Mendota Water Authority Participating Members
Byron-Bethany Irrigation District
Del Puerto Water District
Eagle Field Water District
Mercy Springs Water District
Pacheco Water District
Panoche Water District
San Benito County Water District
San Luis Water District
Santa Clara Valley Water District
Westlands Water District
Contra Costa Water District
East Bay Municipal Utility District

2.3.2.3 Water Transfer Operations

Water transfer operations are discussed by geographic region. Transfer operations could affect river flows and timing of flows upstream or downstream from the point of diversion. The following sections describe how potential transfers would operate on rivers.

Sellers Service Area

As shown in Figure 2-2, both the Sacramento and San Joaquin Rivers flow into the Delta. The Sacramento River enters the Delta from the northeast and flows are regulated through releases from CVP-owned Shasta Reservoir and Folsom Reservoir, as well as the SWP-owned Lake Oroville. Major tributaries to the Sacramento River include the Yuba, Feather, and American Rivers. The South, North and Middle forks of the American River converge at the Folsom Reservoir. The San Joaquin River enters the Delta from the southeast; major tributaries include the Merced and Stanislaus Rivers.

Transfers that must be conveyed through the Delta are limited to periods when capacity at C.W. "Bill" Jones Pumping Plant (Jones Pumping Plant) and Harvey O. Banks Pumping Plant (Banks Pumping Plant) is available typically from July through September, and only after Project needs are met. Reclamation and DWR must also declare that the Delta is in "balanced conditions" under the terms of the COA (USFWS 2008). CVP transfer water conveyed at Banks Pumping Plant could occur upon the SWRCB's approval of Joint Points of

Diversion. The Delta pumping restrictions do not apply to East Bay Municipal Utility District (MUD) diversions at Freeport.

The timing of transfers from potential agricultural sellers upstream from the Delta by groundwater substitution, cropland idling, and crop shifting would be dictated by the irrigation season. While land owners may be able to postpone groundwater substitution until the adequate capacity is available at the Delta pumps, water from crop idling/shifting would be made available on the same pattern as it would have otherwise been used for irrigation. At the start of the irrigation season, the Delta pumps cannot pump water for transfer because the current biological opinions on CVP and SWP operations typically only allow for transfers from July through September. Transfer water made available prior to July would either bypass the pumps, or may be stored in upstream reservoirs if Project operations can account for the storage. However, as described in subsequent sections, Shasta Reservoir is operated to meet mandated temperature and flow requirements in the Sacramento River, which limits its ability to store water to support transfers.

Sacramento River

Potential sellers on the Sacramento River include Conaway Preservation Group, LLC, Cranmore Farms, LLC, Glenn-Colusa Irrigation District (ID), Pelger Mutual Water Company (MWC), Pleasant Grove-Verona MWC, Reclamation District 108, Reclamation District 1004, Sycamore MWC, and Te Velde Revocable Family Trust, which may provide water made available through groundwater substitution or crop idling/shifting actions. Anderson-Cottonwood ID, Eastside MWC, Natomas MWC, and River Garden Farms plan to transfer water made available through groundwater substitution only.

Potential sellers receive CVP water that is stored upstream from their service areas in Shasta Reservoir, a CVP facility. Releases from Shasta Reservoir may be routed through or around the Shasta Power Plant to the Sacramento River, where flows are re-regulated by Keswick Dam.

Delta conveyance capacity would be available when conditions for sensitive species are acceptable to NOAA Fisheries and USFWS, typically from July through September, but groundwater substitution and cropland idling/crop shifting transfers would be available from April through September. Storing water in Shasta Reservoir from April through June would help facilitate these types of transfers; however, Shasta Reservoir has a very limited capacity to store transfer water from April through June because of downstream temperature requirements. Reclamation is required by SWRCB Water Rights Orders 90-05/91-01 to meet average daily temperature requirements as far downstream as practical when temperatures could affect fish. To meet requirements, Reclamation must carefully manage the cold water pool in Shasta Reservoir by releasing larger quantities of water earlier in the season; larger flows maintain cooler temperatures for a longer distance downstream. Reducing releases to hold transfer water in storage could affect Reclamation's ability to meet these downstream temperature requirements. Reclamation would only consider storing water for transfers if it would not affect releases for temperature, or if it could be "backed up" into another reservoir (by reducing releases from that reservoir). Backing up water may be possible if the Delta is in balanced conditions and instream standards are met. The decision to back up transfer water would be made on a case-by-case basis, but storage is analyzed in this EIS/EIR so that the analysis is complete in the event Reclamation determines that storage is possible in a specific year.

Because of the limitations associated with storing transfer water, crop idling transfers would be more difficult to implement. Cropland idling cannot be started partway through the irrigation season, so the water made available from April through June would bypass the pumps and become Delta outflow if it cannot be stored. Sacramento River sellers and buyers would generally prefer water transfer options that are more flexible, such as starting groundwater substitution pumping when Delta pumping capacity for transfers is available.

Proposed sellers divert water from various locations along the Sacramento River or the Sutter Bypass. If a seller shifts from using surface water to groundwater when a transfer is implemented, river flows would not decrease from Shasta Reservoir to the point of diversion absent transfers. River flow would then increase from the seller's usual diversion point downstream to the buyer's point of diversion because water is not diverted for use until it reaches the Delta.

If Reclamation determines that it can store water in Shasta Reservoir, the flows in the Sacramento River between Shasta Reservoir and the point of diversion absent transfers would decrease from April through June. Flows downstream of the point of diversion would not change during this period.

American River

The City of Sacramento, Sacramento County Water Agency and Sacramento Suburban Water District (WD) could sell water on the American River system through groundwater substitution. Placer County Water Agency could generate additional transfer water through the release of stored water from Hell Hole and French Meadows Reservoirs (see Figure 2-5). Folsom Reservoir is the primary storage and flood control reservoir on the American River. Releases from Folsom Reservoir are re-regulated at Nimbus Dam, which is about seven miles downstream from Folsom Dam.

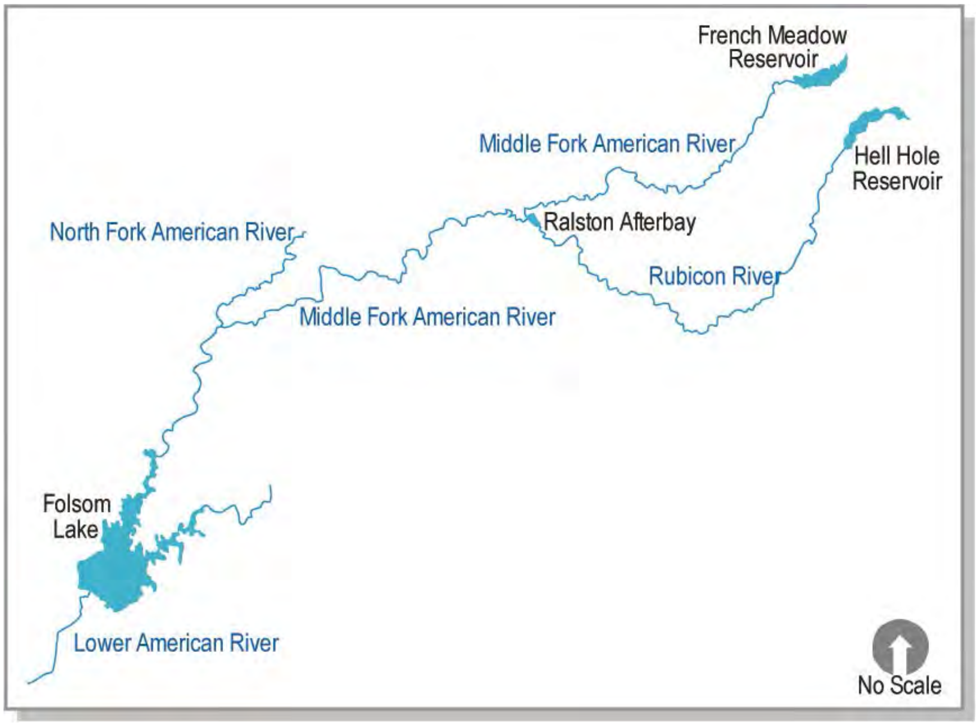

Figure 2-5. American River Facilities

Storage in Folsom Reservoir is not as restricted as Shasta Reservoir, but Reclamation generally cannot guarantee storage in Folsom Reservoir prior to the transfer season because operational complexities may require water releases.

The Sacramento Suburban WD would use groundwater to offset surface water supplies from the American River. The Sacramento Suburban WD receives surface water from the City of Sacramento or Placer County Water Agency out of Folsom Reservoir. When transferring water through groundwater substitution, the Sacramento Suburban WD would take less surface water, leaving the water in storage in Folsom Reservoir. This water may be able to be stored in Folsom Reservoir before being conveyed south-of-Delta, depending on year-to-year operational restrictions on the export pumps. Storing water in Folsom Reservoir would likely be possible because this water would not otherwise have been released to the river absent the transfer.

Placer County Water Agency would release stored surface water from Hell Hole and French Meadows Reservoirs. It would time release of water to coincide with the availability of Delta export capacity, generally starting in July. Placer County Water Agency's release schedule would be influenced by power generation, so it may wish to release water before July continuing through September to generate power and reregulate that water in Folsom Reservoir until the water can be conveyed through the Delta export pumps. Non-Project water in Folsom Reservoir for greater than 30 days requires a Warren Act

Contract[2] for storage. Placer County Water Agency would release water that would otherwise have remained in storage; therefore, this water would increase flows downstream along the Middle Fork of the American River to Folsom Reservoir, and downstream of Folsom Reservoir from July through September. The water releases would leave additional storage capacity in the reservoirs that would be refilled during the following wet seasons (at times that it would not affect downstream users, see Section 2.1.1.3 for more information). Refilling the empty storage would decrease flows downstream of the reservoirs; therefore, a refill agreement would be required as part of any transfer.

Yuba River

Browns Valley ID and Cordua ID are the potential sellers on the Yuba River. Browns Valley ID generates water for transfer through conservation efforts or stored reservoir release. Browns Valley ID water for transfer from conservation may be generated through the Upper Main Water Conservation Project. This project was initiated in 1990 to terminate use of the Upper Main Canal, a Gold Rush Era water conveyance facility that served facilities downstream of Collins Lake. The Canal experienced substantial losses during conveyance to vegetation along the Canal system. The conservation project replaced the Canal with a pipeline and reduced associated losses to vegetation, thereby creating water for transfers.

Browns Valley ID could also make water available by releasing water from Merle Collins Reservoir that otherwise would have remained in storage. Release of this water would increase flows downstream in Dry Creek and in the Yuba River downstream of the confluence with Dry Creek. Similar to stored reservoir release transfers from Placer County Water Agency, refilling the reservoir would decrease flows downstream of the reservoir; therefore, a refill agreement would be required for the transfer.

Cordua ID would transfer water made available through groundwater substitution actions. This transfer would increase flows on the Yuba River downstream of Cordua ID's point of diversion (absent the transfer) during the transfer period.

Feather River

Potential sellers on the Feather River include Butte WD (groundwater substitution and crop idling/shifting), Garden Highway MWC (groundwater substitution), Gilsizer Slough Ranch (groundwater substitution), Goose Club Farms and Teichert Aggregates (groundwater substitution and crop idling/shifting), South Sutter WD (stored reservoir release), and Tule Basin Farms (groundwater substitution).

[2] The Warren Act of February 21, 1911 authorized the United States to execute contracts for the conveyance and storage of non-project water in Federal facilities when excess capacity exists.

Butte WD is a member agency of the Joint Water Districts Board (Joint Board). The Joint Board has a settlement agreement with DWR and the water supply under that agreement is distributed among the four member agencies of the Joint Board. DWR approval would be required for a transfer from Butte WD. DWR makes releases from Lake Oroville to Thermalito Afterbay for diversion by Butte WD. Changes in diversion from Thermalito Afterbay would result in changes in DWR's releases to the Afterbay but would not change Feather River flows. An increase in flows in the Feather River would result when the transfer water was released by DWR to the Feather River. The timing of releases could change from the timing of diversions by Butte WD from Thermalito Afterbay absent the transfer.

Garden Highway MWC has a settlement agreement with DWR to divert water from the Feather River for irrigation use. A transfer from Garden Highway MWC must be approved by DWR. A reduction in diversions from Garden Highway MWC would result in higher flows in the Feather River downstream of the existing point of diversion.

Goose Club Farms and Teichert Aggregates divert water from the Feather River and Sacramento Slough for irrigation. For a transfer from either of these entities, surface water would not be diverted, which would result in higher flows in the Feather River downstream of the points of diversion during the transfer period.

Gilsizer Slough Ranch diverts water from the East Canal of the Sutter Bypass, Gilsizer Slough, and a drainage canal. Tule Basin Farms diverts water from the West Canal of the Sutter Bypass. Transfers from these entities would increase flows downstream of their points of diversion absent the transfer, which would increase flows in the Sutter Bypass canals and downstream in the Sacramento River.

DWR operates Lake Oroville on the Feather River, which is upstream from the diversion locations for these entities. At times, DWR has the ability to retain water in Lake Oroville that would have been released for diversion by Butte WD and Garden Highway MWC during April through June until the Delta export pumps have capacity to convey the water. Any transfer agreement with DWR for Butte WD or Garden Highway MWC would need to include approval to store water in Lake Oroville before DWR could provide storage for the transfer. DWR cannot approve storage in Lake Oroville if it would affect SWP operations. The transfer water would be the first water to be spilled if Lake Oroville reaches flood capacity. River flows would increase downstream of the sellers' points of diversion (absent the transfer) when the stored transfer water is released.

South Sutter WD could provide water through stored reservoir release. Stored reservoir releases would be from Camp Far West Reservoir (see Figure 2-6). During the transfer period, Camp Far West Reservoir would be slightly lower than conditions without the transfer until the reservoir is refilled. River flows downstream of the reservoir on the Bear River, Feather River, and Sacramento River would increase during the release period. Camp Far West Reservoir would refill as water was available in the Bear River and when the Delta is in excess conditions, which would decrease flows downstream from the reservoir relative to non-transfer conditions. A refill agreement would be required for this transfer to avoid affects to downstream water users.

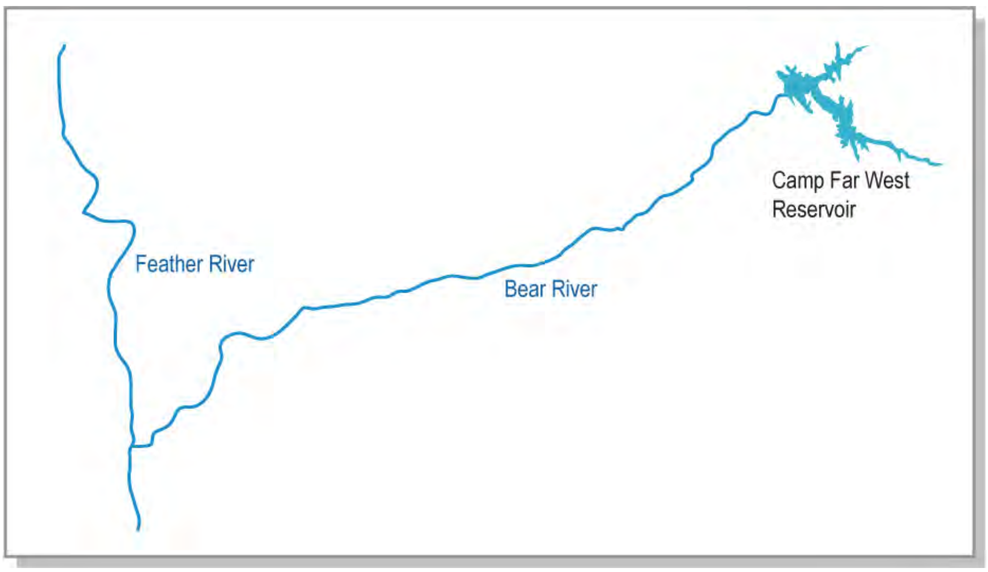

Figure 2-6. Bear River Facilities

Merced River

Merced ID could provide water through stored reservoir release. Stored reservoir releases would be from Lake McClure (see Figure 2-7). During the transfer period, water elevations in Lake McClure would be slightly lower than conditions without the transfer until the reservoir is refilled. Lake McClure would refill as water was available in the Merced River and when the Delta is in excess conditions, which would decrease flows downstream from the reservoir relative to non-transfer conditions.

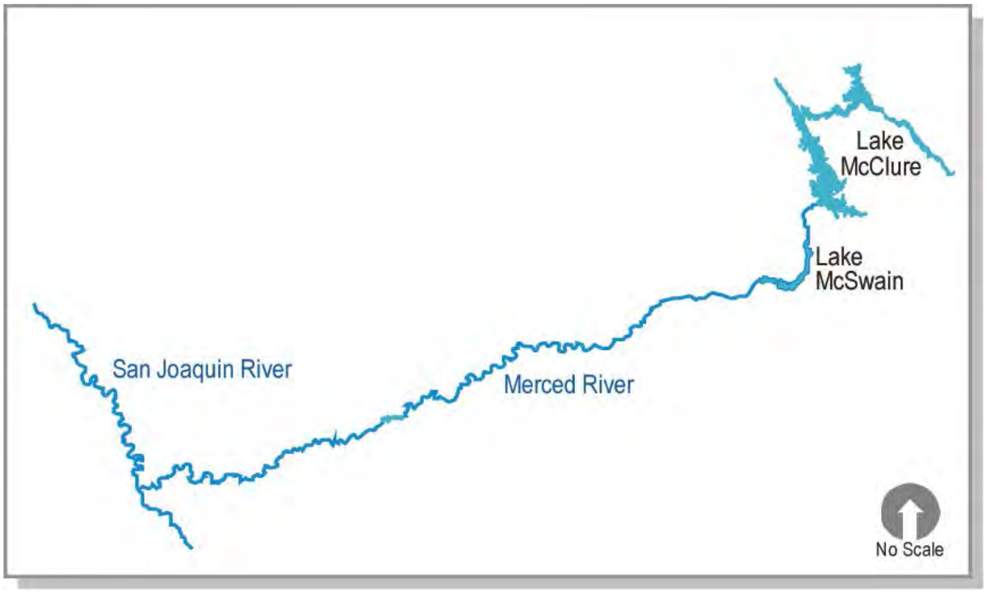

Figure 2-7. Merced River Facilities

Merced ID's transferred water could be conveyed to the Buyers Service Area in several ways:

- Water could flow down the Merced River, through the San Joaquin River, and be diverted through the Jones or Banks Pumping Plants in the Delta.
- Water could flow down the Merced River into the San Joaquin River and be diverted through existing facilities within Banta Carbona ID, West Stanislaus ID, or Patterson ID (see Figure 2-8). These agencies would either convey the water through their districts to the Delta-Mendota Canal, or they would use the water diverted from the San Joaquin River in exchange for their CVP water from the Delta-Mendota Canal.
- Water would enter the Merced River and be diverted into the Eastside Canal before reaching the San Joaquin River confluence. Water could be delivered for exchange to San Luis Canal Company, which would reduce its use of water from the Delta-Mendota Canal.
- Water would be diverted from Lake McClure for delivery through Merced ID's internal conveyance facilities to one of the refuges in the San Luis unit for exchange. The refuge would reduce its use of water from the Delta-Mendota Canal. This delivery mechanism would not change flows in any surface water body and could therefore be used year-round.

The timing of these transfers would depend on the limitations at the diversion point. Transfers through Jones and Banks Pumping Plants would be during periods acceptable to NOAA Fisheries and USFWS, typically from July through September, but the remaining delivery methods could be used throughout the irrigation season (April through September). A stored reservoir release transfer from Merced ID would require a refill agreement to clarify how the reservoir would be refilled after the transfer. Additionally, buyers would require a Warren Act Contract with Reclamation to provide for conveyance of non-CVP water through CVP facilities.

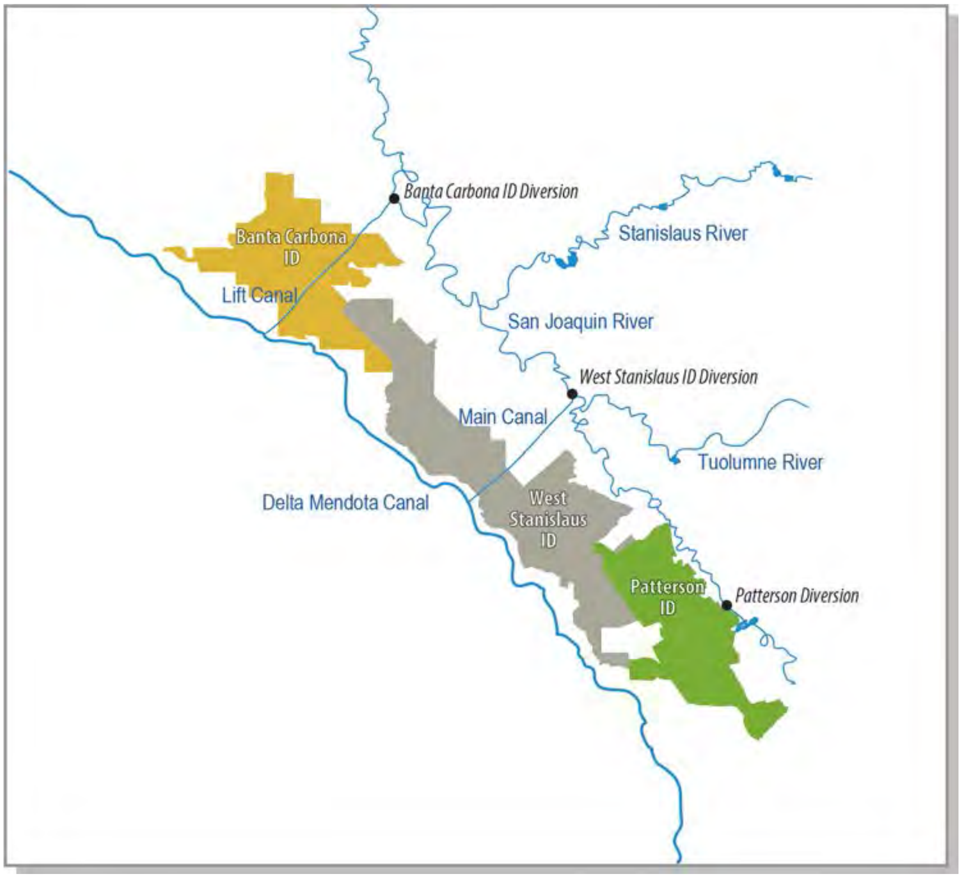

Figure 2-8. Diversion Facilities for Banta Carbona ID, West Stanislaus ID, and Patterson ID

Delta Region

The Sacramento and San Joaquin rivers join at the Sacramento-San Joaquin Delta. Pope Ranch could transfer water through groundwater substitution, and Reclamation District 2068 could transfer water through groundwater substitution and crop idling/shifting.

Transfers from potential sellers in the Delta have several challenges, including:

- Variability in ETAW values make calculating water savings from crop idling/shifting difficult;
- High groundwater table results in high evapotranspiration rates and excessive weed growth in idle fields;
- Hydraulic connectivity must be maintained at all times during the transfer period;
- The locations used in determining compliance with the Delta outflow-based objectives in D-1641 are upstream from the majority of the Delta diversions;
- Water made available outside the transfer window cannot be exported or stored in Delta; and,
- The status of many underlying water rights can be difficult to verify.

These challenges make it difficult to determine consumptive use and export transfer water. More extensive monitoring may be required throughout the transfer season compared to transfers from other locations to account for potential weed growth and evaporation from bare fields, which affects the amount of transfer water made available. Additionally, transfer proponents must obtain concurrence from the SWRCB that the estimated reduction in consumptive use can be accounted for separately in meeting flow related compliance objectives.

Buyers Service Area

Multiple buyers could purchase water made available for transfer; this EIS/EIR addresses transfers to the San Luis & Delta-Mendota Water Authority (SLDMWA), Contra Costa WD, and East Bay MUD. These entities receive water diverted in the Delta or its tributaries. The points of diversion in the Delta are shown on Figure 2-9. Diversions could also be made along the San Joaquin River (as shown in Figure 2-8), from the Merced River, or from Lake McClure.

SLDMWA

As discussed in Section 1, SLDMWA consists of ~~29~~ 28 member agencies representing water service contractors and San Joaquin River Exchange Contractors. The SLDMWA operates some CVP facilities and represents its member agencies' interests related to water supply issues. The SLDMWA does not directly supply water, but it would participate in negotiations to assist its participating members to secure transfers when needed and would assist with scheduling and managing the transferred water. Transfers to agencies within the SLDMWA would be pumped through the Jones or Banks pumping plants, or would be delivered through local facilities as described above. This water would then be conveyed through SWP or CVP canals and aqueducts and local irrigation canals to the purchasing agencies.

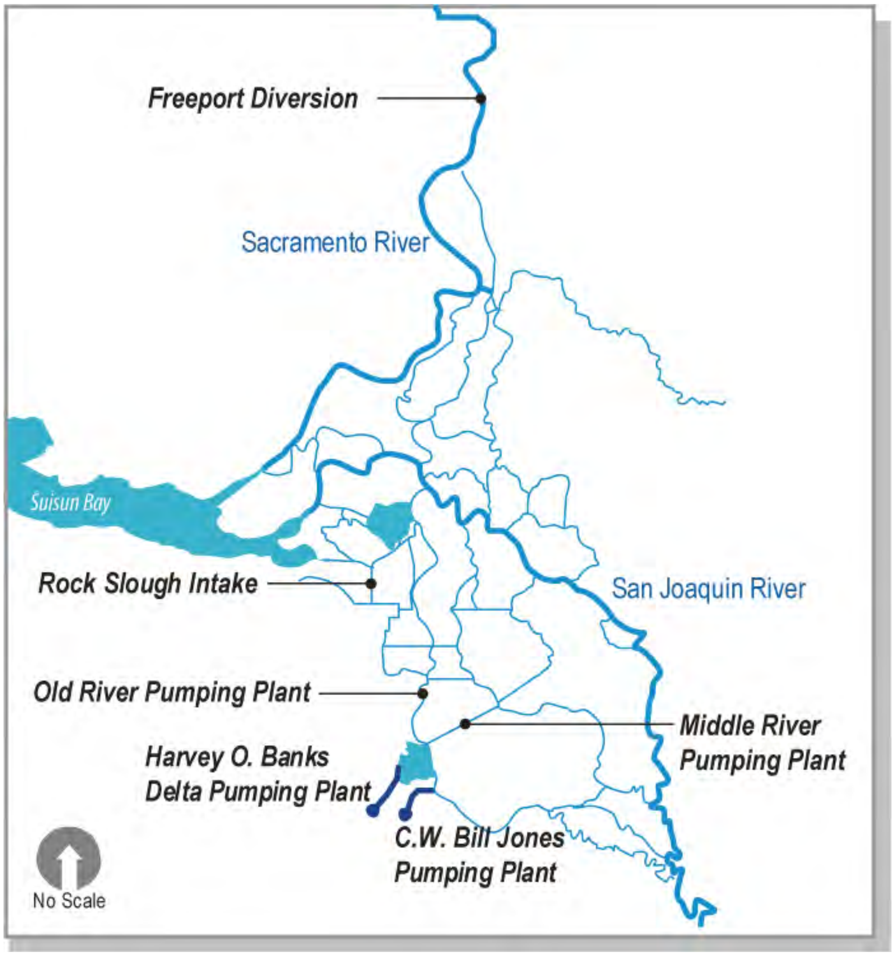

Figure 2-9. Delta Transfer Diversion Locations

Contra Costa WD

Contra Costa WD is an in-Delta water user and diverts both CVP water and water under its own water rights from Delta drinking water intakes located at Rock Slough, Old River near Highway 4, Middle River at Victoria Canal, and Mallard Slough. Contra Costa WD is interested in purchasing transfer water to augment dry year supplies.

East Bay MUD

Water transfers to the East Bay MUD would be diverted at the Freeport Regional Water Authority's intake on the Sacramento River near Freeport, at the northern end of the Delta. These transfers would not pass through the Delta and therefore would not be subject to constraints on through Delta pumping. Once diverted from the Sacramento River, water transferred to East Bay MUD would travel eastward through 16 miles of underground pipeline to the Folsom

South Canal. After flowing 14 miles to the southern end of the canal, the water would be pumped via 18 miles of pipeline to East Bay MUD's Mokelumne Aqueducts, which cross the Delta and deliver the water to East Bay MUD's service district in the East Bay.

2.3.2.4 Environmental Commitments

Several environmental commitments are included in the Proposed Action to avoid potential environmental impacts from water transfers.

Groundwater Substitution Transfers

- In groundwater basins where sellers are in the same groundwater subbasin as protected aquatic habitats, such as giant garter snake preserves and conservation banks, groundwater substitution will be allowed as part of the long term water transfers if the seller can demonstrate that any impacts to water resources needed for special-status species protection have been addressed. In these areas, sellers will be required to address these impacts as part of their mitigation plan.

All Transfer Methods

- Carriage water (a portion of the transfer that is not diverted in the Delta and becomes Delta outflow) will be used to maintain water quality in the Delta. Carriage water calculations will also reflect conveyance losses as the water moves from its source to the Delta export pumps, and is conveyed from the Delta to buyers. Carriage water is represented as a percent of the transfer that does not reach the buyer, and this percent is calculated during the transfer based on real-time monitoring information in the Delta. Typical carriage water amounts range from 20 to 30 percent for transfers from the Sacramento Valley, and about 10 percent for transfers from the San Joaquin Valley.

Cropland Idling Transfers

- As part of the approval process for long-term water transfers, Reclamation will have access to the land to verify how the water transfer is being made available and to verify that actions to protect the giant garter snake are being implemented. At the end of each water transfer year, Reclamation will prepare a monitoring report that contains the following:

  - Maps of all cropland idling actions that occurred within the range of potential transfer activities analyzed in this EIS/EIR,
  - Results of any newly available scientific research and monitoring results pertinent to water transfer actions, and
  - A discussion of conservation measure effectiveness.

The report will be submitted to USFWS and shared with California Department of Fish and Wildlife (CDFW) in February, prior to the next year of potential transfers. Reclamation will coordinate with USFWS and CDFW on the contents and findings of the annual report prior to additional transfers.

- Reclamation will establish annual meetings with the USFWS to discuss the contents and findings of the annual report. These meetings will be scheduled following the distribution of the monitoring report and prior to the next transfer season.

- Reclamation will provide a map(s) to the USFWS in June of each year showing the parcels of riceland that are ~~idled~~ proposed for the purpose of transferring water for that year. These maps will be prepared to comport to Reclamation's geographic information system (GIS) standards.

- Movement corridors for aquatic species (including pond turtle and giant garter snake) include major irrigation and drainage canals. The water seller will keep adequate water in major irrigation and drainage canals. Canal water depths should be similar to years when transfers do not occur or, where information on existing water depths is limited, at least two feet of water will be considered sufficient.

- Districts proposing water transfers made available from idled rice fields will ensure that adequate water is available for priority habitat with a high likelihood of giant garter snake occurrence. The determination of priority habitat will be made through coordination with giant garter snake experts, GIS analysis of proximity to historic tule marsh, and GIS analysis of suitable habitat. The priority habitat areas are indicated on the priority habitat maps for participating water agencies and will be maintained by Reclamation. As new information becomes available, these maps will be updated in coordination with USFWS and CDFW. In addition to mapped priority habitat, fields abutting or immediately adjacent to federal wildlife refuges will be considered priority habitat.

- Maintaining water in smaller drains and conveyance infrastructure supports key habitat attributes such as emergent vegetation for giant garter snake for escape cover and foraging habitat. If crop idling/shifting occurs in priority habitat areas, Reclamation will work with contractors to document that adequate water remains in drains and canals in those priority areas. Documentation may include flow records, photo documentation, or other means of documentation agreed to by Reclamation and USFWS.

- Mapped priority habitat known to be occupied by giant garter snake and priority habitats with a high likelihood for giant garter snake occurrence (60 percent or greater probability) ~~Areas with known priority giant garter snake populations~~ will not be permitted to participate in cropland idling/shifting transfers. Water sellers can request a case-by-case evaluation of whether a specific field would be precluded from participating in long-term water transfers. These areas include lands adjacent to naturalized lands and refuges and corridors between these areas, such as:

  - Fields abutting or immediately adjacent to Little Butte Creek between Llano Seco and Upper Butte Basin Wildlife Area, Butte Creek between Upper Butte Basin and Gray Lodge Wildlife areas, Colusa Basin drainage canal between Delevan and Colusa National Wildlife Refuges, Gilsizer Slough, Colusa Drainage Canal, the land side of the Toe Drain along the Sutter Bypass, Willow Slough and Willow Slough Bypass in Yolo County, Hunters and Logan Creeks between Sacramento and Delevan National Wildlife Refuges; and

  - Lands in the Natomas Basin.

- Sellers will ~~continue to voluntarily~~ perform giant garter snake best management practices, including educating maintenance personnel to recognize and avoid contact with giant garter snake, dredging~~cleaning~~ only one side of a conveyance channel per year, and implementing other measures to enhance habitat for giant garter snake. Implementation of best management practices will be documented by the sellers and verified by Reclamation and will be included in the annual monitoring report.

- In order to limit reduction in the amount of over-winter forage for migratory birds, including greater sandhill crane, cropland idling transfers will be minimized near known wintering areas that support high concentrations of waterfowl and shorebirds, such as wildlife refuges and established wildlife areas. ~~in the Butte Sink.~~

2.3.2.5 Transfer Quantities

Table 2-4 provides a list of entities that could potentially sell water for transfers in the future. The table also includes maximum quantities that each agency could make available through different transfer mechanisms. Adding these maximum quantities produces a total of a little over 500,000 AF, but multiple other factors may limit the transfers to a number that is likely less than this total. Transfers to East Bay MUD and Contra Costa WD are limited by available pumping capacity at the Freeport intake and Contra Costa WD's Delta intakes, respectively, as well as other system constraints such as service area demand and available storage. Transfers to south-of-Delta water districts, which account for the majority of proposed transfers, are typically pumped through the

CVP and SWP south Delta export facilities. The capacity to pump the water at Banks and Jones Pumping Plants would limit the overall volume of transfers to south-of-Delta water districts. Factors that affect capacity available for transfers to south-of-Delta water districts include:

- Water availability: many potential sellers are listed for both cropland idling and groundwater substitution; however, they would not transfer the full amount under both mechanisms or the same amount in all years. The decision to transfer water is often a complex business decision made by individual landowners in a district. Each landowner weighs the economic value of irrigating land with surface water, selling the surface water and idling a field, or selling the surface water and irrigating with pumped groundwater. The economic value of any of these decisions is highly variable and depends on unpredictable trends in agricultural and water markets.

- Biological opinions: the biological opinions on the long-term operations of the CVP and SWP ~~restrict~~ may reduce exports from December through June and potentially in some fall seasons for the protection of special-status species. Historically, the CVP and SWP pumped significant amounts of water during these months for Project purposes because flows are usually high. Project water pumped during this period is typically stored in San Luis Reservoir or DWR's southern California reservoirs for use during the following summer. With current Delta pumping restrictions, the CVP and SWP pump more water during the late summer period for Project purposes than they did historically, which is the same period when the biological opinions allow transfer water to be pumped (typically July through September). The increased CVP and SWP pumping leaves less remaining pumping capacity for transfer water.

- September: During certain years, much of the capacity to pump transfer water from the Delta is available in September. In some years, the Delta pumps have no capacity available until September. September capacity would be more challenging to use because increasing streamflows in the Sacramento, Feather, American, and San Joaquin rivers downstream of Project reservoirs during September could create a requirement for higher flows in October so that fish do not experience a dramatic flow change. Higher flows in October would correspond to higher reservoir releases at a time when the Delta pumping would be restricted. Reclamation and DWR may not be able to capture the additional releases at the Delta pumps.

- SWRCB's Water Rights Decision 1641: The decision requires Response Plans for water quality and water levels to protect diverters in the south Delta that may affect the opportunity to export transfers.

- Outages: Any planned or unplanned outages could reduce available capacity for transfers.

- Competition: Most of the pumping capacity available would be at the Banks Pumping Plant except for very dry years. Banks is an SWP facility, so SWP-related transfers would have priority. Agreements with DWR would be required for any transfers using SWP facilities.

Figure 2-10 shows an exceedance plot of the available export pumping capacity in the Projects' south Delta pumping facilities during periods when buyers may want to transfer water (when SWP allocations are less than 60 percent). An exceedance plot shows how often capacities are exceeded. For example, the July and August capacity curve shows that the capacity is above zero only about 35 percent of the time. In other words, the pumps have no capacity for transfer water in 65 percent of years studied. The figure includes July and August capacity separately from the capacity of all three months (July through September) because September pumping capacity may be more difficult to use and including that capacity makes the available capacity look much larger. This figure is from the CalSim modeling of the future conditions without transfers. Figure 2-10 shows that available capacity will limit the amount of transfers in most years to less than the quantities shown in Table 2-4.

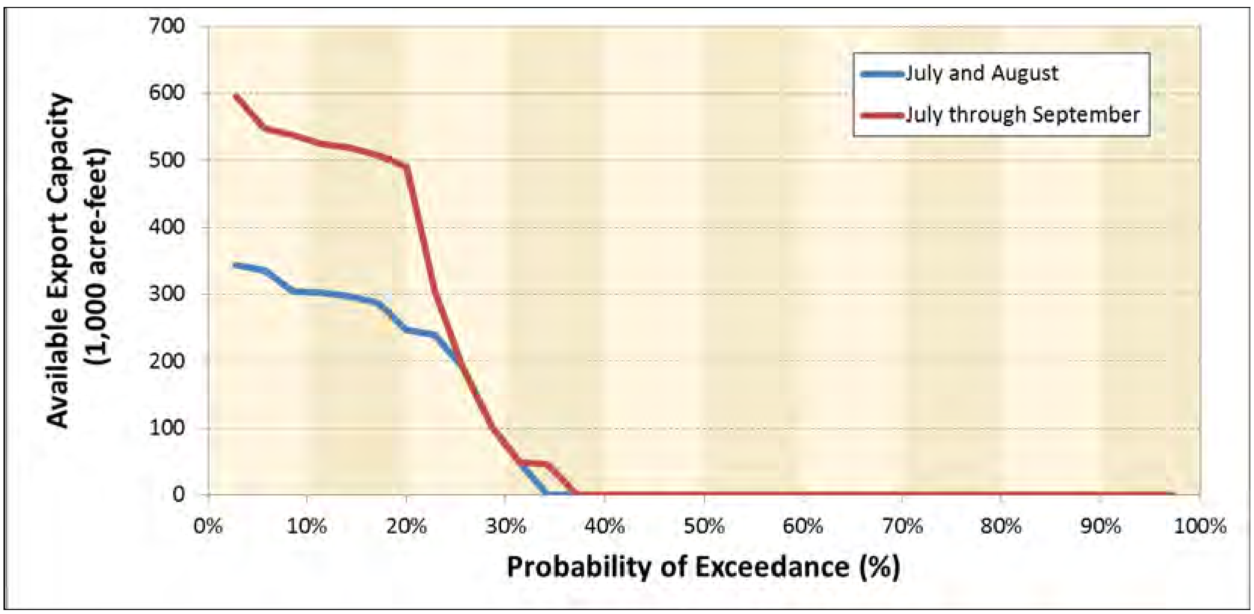

Figure 2-10. Available Delta Pumping Capacity for Transfers

2.3.2.6 Risk and Uncertainty

Transferring water from north of the Delta to south of the Delta would involve uncertainty and risk. The CVP and SWP would convey this water using the Jones and Banks Pumping Plants, but the CVP and SWP must first meet regulatory requirements and the needs of their users. CVP and SWP operations are governed by the criteria contained in SWRCB Decision 1641 (D-1641), the 2008 USFWS and 2009 NOAA Fisheries biological opinions, and all other regulatory restrictions governing operations.

Buyers and sellers often negotiate transfers during the wet season before hydrologic conditions are clear. Late season precipitation could increase the amount of available water for the CVP and SWP and reduce or eliminate available capacity for transfers. The CVP and SWP may not know the capacity in advance and would not guarantee available capacity; any uncertainty regarding capacity would rest with the buyers and sellers.

Transfers, particularly cropland idling, could be heavily affected by this uncertainty. Growers would need to idle crops at the beginning of the growing season, which typically occurs in April or May. The possibility exists that buyers and sellers would negotiate a crop idling transfer at the beginning of April, the seller would leave fields idle, and late-season rains could reduce excess capacity at the Delta pumps and prevent this water from being exported. This risk would typically fall on the buyers after the water purchase agreements are negotiated.

2.3.2.7 Transfer Length

Buyers and sellers may negotiate transfers that last one year or multiple years. Sellers and buyers would typically negotiate the terms of a single year transfer during the wet season and could finalize an agreement after the hydrologic conditions are understood well enough to establish available pumping capacity.

Sellers and buyers could also negotiate multi-year transfers. In this type of transfer, a long-term agreement would generally give the buyer the first right of refusal for water that a seller makes available. The buyer could pay the seller a fee every year to reserve the water, whether the buyer purchases it or not in any one year. In years where adequate capacity exists to convey water through the Delta, the buyer would have priority to buy the water at an established price. If the buyer does not want the water in a year when capacity is available, the seller could potentially negotiate a one-year transfer with another buyer.

2.3.2.8 CEQA Coverage Under Alternative 2

All transfers in this document are analyzed under NEPA, but not all transfers are included in the CEQA Proposed Project. Several transfers already have CEQA coverage, are obtaining CEQA coverage through a parallel effort or CEQA coverage will be prepared at the time a specific transfer is planned. These transfers include transfers from Browns Valley ID, transfers to East Bay MUD, and transfers to Contra Costa WD.

The Browns Valley ID, East Bay MUD, and Contra Costa WD transfers are not part of the Proposed Project (CEQA) but are part of the Proposed Action (NEPA). As a result, the effects of the Proposed Project are considered in context with these transfers, but these transfers are part of the Proposed Action and their effects are included in the analysis.

2.3.3 Alternative 3: No Cropland Modifications

Alternative 3 would include transfers through groundwater substitution, stored reservoir release, and conservation. It would not include any cropland idling or crop shifting transfers. Table 2-7 shows the potential sellers under Alternative 3. Buyers would be the same as those shown in Table 2-6, and transfers not included in the Proposed Project for CEQA would be the same as those described for Alternative 2. Environmental commitments would be the same as those described in Section 2.3.2.4 for the relevant transfer types.

2.3.4 Alternative 4: No Groundwater Substitution

Alternative 4 would include transfers through cropland idling, crop shifting, stored reservoir release, and conservation. It would not include any groundwater substitution transfers. Table 2-8 shows the potential sellers under Alternative 4. Buyers would be the same as those shown in Table 2-6, and transfers not included in the Proposed Project for CEQA would be the same as those described for Alternative 2. Environmental commitments would be the same as those described in Section 2.3.2.4 for the relevant transfer types.

Table 2-7. Alternative 3 Transfers Types (Upper Limits)

Water Agency	April – June Groundwater Substitution (acre-feet)	April – June Stored Reservoir Release (acre-feet)	April – June Conservation (acre-feet)	July - September Groundwater Substitution (acre-feet)	July - September Stored Reservoir Release (acre-feet)	July - September Conservation (acre-feet)
Sacramento River Area of Analysis						
Anderson-Cottonwood Irrigation District	2,613			2,613		
Conaway Preservation Group	21,550			13,450		
Cranmore Farms	5,140			2,860		
Eastside Mutual Water Company	1,067			1,163		
Glenn-Colusa Irrigation District	12,500			12,500		
Natomas Central Mutual Water Company	15,000			15,000		
Pelger Mutual Water Company	2,151			1,599		
Pleasant Grove-Verona Mutual Water Company	8,000			10,000		
Reclamation District 108	7,500			7,500		
Reclamation District 1004				7,175		
River Garden Farms	4,000			5,000		
Sycamore Mutual Water Company	7,500			7,500		
Te Velde Revocable Family Trust	2,700			4,394		
American River Area of Analysis						
City of Sacramento				5,000		
Placer County Water Agency					47,000	
Sacramento County Water Agency				15,000		
Sacramento Suburban Water District	15,000			15,000		
Yuba River Area of Analysis						
Browns Valley Irrigation District					5,000	3,100
Cordua Irrigation District				12,000		
Feather River Area of Analysis						
Butte Water District	2,750			2,750		
Garden Highway Mutual Water Company	6,500			7,500		
Gilsizer Slough Ranch	1,500			2,400		

Water Agency	April – June Groundwater Substitution (acre-feet)	April – June Stored Reservoir Release (acre-feet)	April – June Conservation (acre-feet)	July - September Groundwater Substitution (acre-feet)	July - September Stored Reservoir Release (acre-feet)	July - September Conservation (acre-feet)
Goose Club Farms and Teichert Aggregates	4,000			6,000		
South Sutter Water District					15,000	
Tule Basin Farms	3,800			3,520		
Merced River Area of Analysis						
Merced Irrigation District					30,000	
Delta Region Area of Analysis						
Reclamation District 2068	2,250			2,250		
Pope Ranch	1,400			1,400		
Total	126,921	0	0	163,574	97,000	3,100

Table 2-8. Alternative 4 Transfers Types (Upper Limits)

Water Agency	April – June Cropland Idling/Crop Shifting (acre-feet)	April – June Stored Reservoir Release (acre-feet)	April – June Conservation (acre-feet)	July - September Cropland Idling/Crop Shifting (acre-feet)	July - September Stored Reservoir Release (acre-feet)	July - September Conservation (acre-feet)
Sacramento River Area of Analysis						
Anderson-Cottonwood Irrigation District						
Conaway Preservation Group	7,899			13,450		
Cranmore Farms	925			1,575		
Eastside Mutual Water Company						
Glenn-Colusa Irrigation District	24,420			41,580		
Natomas Central Mutual Water Company						
Pelger Mutual Water Company	939			1,599		
Pleasant Grove-Verona Mutual Water Company	3,330			5,670		
Reclamation District 108	7,400			12,600		
Reclamation District 1004	3,700			6,300		
River Garden Farms						
Sycamore Mutual Water Company	3,700			6,300		
Te Velde Revocable Family Trust	2,581			4,394		
American River Area of Analysis						
City of Sacramento						
Placer County Water Agency					47,000	
Sacramento County Water Agency						
Sacramento Suburban Water District						
Yuba River Area of Analysis						
Browns Valley Irrigation District					5,000	3,100
Cordua Irrigation District						
Feather River Area of Analysis						
Butte Water District	5,750			5,750		
Garden Highway Mutual Water Company						
Gilsizer Slough Ranch						
Goose Club Farms and Teichert Aggregates	3,700			6,300		

Water Agency	April – June Cropland Idling/Crop Shifting (acre-feet)	April – June Stored Reservoir Release (acre-feet)	April – June Conservation (acre-feet)	July - September Cropland Idling/Crop Shifting (acre-feet)	July - September Stored Reservoir Release (acre-feet)	July - September Conservation (acre-feet)
South Sutter Water District					15,000	
Tule Basin Farms						
Merced River Area of Analysis						
Merced Irrigation District					30,000	
Delta Region Area of Analysis						
Reclamation District 2068	2,775			4,725		
Pope Ranch						
Total	67,119	0	0	110,243	97,000	3,100

2.4 Summary Comparison of Alternative Impacts

Tables 2-9 and 2-10 summarize the potential environmental impacts associated with each action alternative. The No Action/No Project Alternative considers the potential for changed conditions during the 2015-2024 period when transfers could occur, but because this period is relatively short, the analysis did not identify changes from existing conditions. Alternative 1 is therefore not included in the tables.

2.5 Environmentally Superior Alternative

As shown in Tables 2-9 and 2-10, the Proposed Action would not have any significant, unavoidable adverse impacts. Similarly, none of the alternatives have unavoidable significant impacts, although some of the alternatives could have less of an impact on some resources, as follows:

- Alternative 3, No Cropland Modifications, would reduce the environmental effects associated with cropland idling. Alternative 3 would not have the potential to affect ~~terrestrial resources~~vegetation and wildlife, particularly the giant garter snake, by idling rice fields and reducing habitat. It would also reduce effects to agricultural land use and economic effects to non-transferring parties.

- Alternative 4, No Groundwater Substitution, would reduce the environmental effects associated with groundwater substitution transfers. Alternative 4 would reduce effects to groundwater levels, quality, and land subsidence. It would also reduce effects associated with streamflow depletion, including potential effects to ~~aquatic resources~~fisheries, ~~terrestrial resources~~vegetation and wildlife, and water supply.

While the alternatives would affect different resources in different ways, none of the alternatives are considered to be the environmentally superior alternative. There are no unavoidable significant impacts associated with the Proposed Action that would otherwise be avoided or substantially reduced by an alternative, and each of the alternatives has its own unique set of environmental impacts which, on balance, would be a “trade-off” of environmental impacts in selecting any one alternative over another.

Table 2-9. Potential Impacts Summary

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
3.1 Water Supply				
Groundwater substitution transfers could decrease flows in surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP reservoirs.	2, 3	S	WS-1: Streamflow Depletion Factor	LTS
Water supplies on the rivers downstream of reservoirs could decrease following stored reservoir water transfers, but would be limited by the refill agreements	2, 3, 4	LTS	None	LTS
Changes in Delta diversions could affect Delta water levels ~~and cause local users' diversion pumps to be above the water surface.~~	2, 3, 4	LTS	None	LTS
Transfers would increase water supplies in the Buyers Service Area	2, 3, 4	B	None	B
3.2 Water Quality				
Cropland idling transfers could result in increased deposition of sediment on water bodies.	2, 4	LTS	None	LTS
Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff.	2, 4	LTS	None	LTS
Cropland idling/shifting transfers could change the quantity of organic carbon in waterways.	2, 4	LTS	None	LTS
Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows.	2, 3	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change river flow rates in the Seller Service Area and could affect water quality.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta inflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta outflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta salinity and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal.	2, 3, 4	LTS	None	LTS
Use of transfer water in the Buyer Service Area could result in increased irrigation on drainage impaired lands in the Buyer Service Area which could affect water quality.	2, 3, 4	LTS	None	LTS
Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
3.3 Groundwater Resources				
Groundwater substitution transfers could cause a reduction in groundwater levels in the Seller Service Area.	2, 3	S	GW-1: Mitigation and Monitoring Plans	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Groundwater substitution transfers could cause subsidence in the Seller Service Area.	2, 3	S	GW-1: Mitigation and Monitoring Plans	LTS
Groundwater substitution transfers could cause changes to groundwater quality in the Seller Service Area.	2, 3	LTS	None	LTS
Cropland idling transfers could cause reduction in groundwater levels in the Seller Service Area due to decreased applied water recharge.	2, 4	LTS	None	LTS
Water transfers via cropland idling could cause groundwater level declines in the Seller Service Area that lead to permanent land subsidence or changes in groundwater quality.	2,4	LTS	None	LTS
Water transfers could reduce groundwater pumping during shortages in the Buyer Service Area, which could increase groundwater levels, decrease subsidence, and improve groundwater quality.	2, 3, 4	B	None	B
3.4 Geology and Soils				
Cropland idling transfers in the Seller Service Area that temporarily convert cropland to bare fields could increase soil erosion.	2, 4	LTS	None	LTS
Cropland idling water transfers could cause expansive soils in the Seller Service Area to shrink due to the reduction in applied irrigation water.	2, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil erosion.	2, 3, 4	LTS	None	LTS
Use of transfer water on agricultural fields in the Buyer Service Area could increase soil movement.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Changes in streamflows in the Sacramento and San Joaquin Rivers and their tributaries as a result of water transfers could result in increased soil erosion.	2, 3, 4	LTS	None	LTS
3.5 Air Quality				
Increased groundwater pumping for groundwater substitution transfers would increase emissions of air pollutants in the Sellers Service Area.	2, 3	S	AQ-1: Reducing pumping to reduce emissions, AQ-2: Operate electric engines	LTS
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the Sellers Service Area.	2, 4	B	None	B
Water transfers via cropland idling would increase fugitive dust emissions from wind erosion of bare fields and decrease fugitive dust emissions associated with land preparation and harvesting in the Sellers Service Area.	2, 4	B	None	B
Use of water from transfers on agricultural fields in the Buyer Service Area could reduce windblown dust.	2, 3, 4	B	None	B
Water transfers via groundwater substitution and cropland idling could exceed the general conformity de minimis thresholds.	2, 3, 4	LTS	None	LTS
3.6 Climate Change				
Increased groundwater pumping for groundwater substitution transfers could increase emissions of greenhouse gases.	2, 3	LTS	None	LTS
Water transfers via cropland idling could reduce vehicle exhaust emissions from reduced operations in the study area.	2, 4	LTS	None	LTS
Changes to the environment from climate change could affect the action alternatives.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Use of water from transfers on agricultural fields in the Buyer Service Area could affect emissions.	2, 3, 4	LTS	None	LTS
3.7 ~~Aquatic Resources~~Fisheries				
Transfer actions could affect reservoir storage and reservoir surface area in reservoirs supporting fisheries resources	2, 3, 4	LTS	None	LTS
Groundwater substitution could reduce stream flows supporting fisheries resources in small streams	2, 3	LTS	None	LTS
Transfer actions could ~~decrease~~ alter flows of rivers and creeks supporting fisheries resources in the Sacramento and San Joaquin river watersheds	2, 3, 4	LTS	None	LTS
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	None	LTS
Transfer actions could affect the habitat of special-status species associated with mainstem rivers, tributaries, and the Delta.	2, 3, 4	not applicable	LTS	LTS
3.8 Vegetation and Wildlife				
Groundwater substitution could reduce groundwater levels supporting natural communities	2, 3	LTS	None	LTS
Groundwater substitution could reduce stream flows supporting natural communities in small streams	2, 3	S	GW-1	LTS
Cropland Idling/Shifting could alter habitat availability and suitability for upland species	2, 4	LTS	None	LTS
Transfer actions could impact reservoir storage and reservoir surface area and alter habitat availability and suitability associated with those reservoirs	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Transfers could reduce flows in large rivers in the Sacramento and San Joaquin River watersheds, altering habitat availability and suitability associated with these rivers	2, 3, 4	LTS	None	LTS
Transfer actions could alter hydrologic conditions in the Delta, altering associated habitat availability and suitability	2, 3, 4	LTS	None	LTS
Transfer actions could impact San Luis Reservoir storage and surface area.	2, 3, 4	LTS	None	LTS
Cropland idling/shifting under could alter the amount of suitable habitat for natural communities ~~and~~ , special-status wildlife species, and migratory birds associated with seasonally flooded agriculture and associated irrigation waterways	2, 4	LTS	None	LTS
Transfer actions could alter planting patterns and urban water use in the Buyer Service Area	2, 3, 4	LTS	Non	LTS
Transfers could affect wetlands that provide habitat for special status plant species.	2, 3, 4	LTS	None	LTS
Transfers could affect giant garter snake and Pacific pond turtle by reducing aquatic habitat.	2, 3, 4	LTS	None	LTS
Transfers could affect the San Joaquin kit fox by reducing available habitat.	2, 3, 4	LTS	None	LTS
Transfers could impact special status bird species and migratory birds.	2, 3, 4	LTS	None	LTS
3.9 Agricultural Land Use				
Cropland idling water transfers could ~~permanently or substantially~~ decrease the amount of lands categorized as Prime Farmland, Farmland of Statewide Importance, or Unique Farmland under the FMMP.	2	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
	4	S	Mitigation Measure LU-1: Avoiding changes in FMMP land use classifications	LTS
Cropland idling water transfers could convert agricultural lands under the Williamson Act and other land resource programs to an incompatible use.	2, 4	LTS	None	LTS
Cropland idling water transfers could conflict with local land use policies.	2, 4	NI	None	NI
Water transfers could provide water to irrigators in the Buyer Service Area to irrigate existing crop fields and maintain agricultural land uses.	2, 3, 4	B	B	B
3.13 Cultural Resources				
Transfers that draw down reservoir surface elevations beyond historically low levels could result in a potentially significant effect on cultural resources.	2, 3, 4	LTS	None	LTS
Stored reservoir release transfers that draw down reservoir surface elevations at local reservoirs beyond historically low levels could affect cultural resources.	2, 3, 4	LTS	None	LTS
3.14 Visual Resources				
Water transfers could degrade the existing landscape character or scenic attractiveness of Class A and B visual resources at CVP and SWP reservoirs	2, 3, 4	LTS	None	LTS
Water transfers could degrade the existing landscape character or scenic quality of Class A and B visual resources along surface water bodies	2, 3, 4	LTS	None	LTS
Stored reservoir release transfers could substantially degrade the existing landscape character or scenic attractiveness of Class A and B visual resources participating reservoirs	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Cropland idling transfers could substantially degrade the existing landscape character and scenic attractiveness of Class A and B visual resources	2, 4	LTS	None	LTS
Water transfers could substantially degrade the existing landscape character and quality in the Buyer's Service Area	2, 3, 4	LTS	None	LTS
3.15 Recreation				
Changes in surface water elevation at Shasta, Folsom, Merle Collins, Oroville, Camp Far West, and Lake McClure reservoirs as a result of water transfers could affect reservoir-based recreation.	2, 3, 4	LTS	None	LTS
Changes in surface water elevations at Hell Hole and French Meadows Reservoirs as a result of water transfers could affect reservoir-based recreation.	2, 3, 4	LTS	None	LTS
Changes in river flows from water transfers could affect river-based recreation on the Sacramento, Yuba, Feather, American, San Joaquin, and Merced rivers.	2, 3, 4	LTS	None	LTS
Changes in average flow into the Delta from the San Joaquin River from water transfers could affect river-based recreation.	2, 3, 4	NI	None	NI
Changes in surface water elevation at San Luis Reservoir as a result of water transfers could affect reservoir-based recreation	2, 3, 4	NI	None	NI
3.16 Power				
Acquisition of water via groundwater substitution or crop idling may cause changes in power generation from CVP and SWP reservoirs	2, 3, 4	LTS	None	LTS

Potential Impact	Alternative	Significance to CEQA	Proposed Mitigation	Significance After Mitigation Pursuant to CEQA
Acquisition of water via stored reservoir water may cause changes in power generation from the facilities that ~~sell~~ provide water	2, 3, 4	LTS	None	LTS
3.17 Flood Control				
Water transfers would change storage levels in CVP and SWP reservoirs, potentially affecting flood control	2, 3, 4	LTS	None	LTS
Water transfers ~~could~~ would ~~decrease~~ change storage levels in non-Project reservoirs and potentially affecting flood control	2, 3, 4	B	None	B
Water transfers could ~~change~~ increase river flows, potentially affecting flood capacity or levee stability	2, 3, 4	LTS	None	LTS
Water transfers would change storage at San Luis Reservoir, potentially affecting flood control	2, 3, 4	LTS	None	LTS

Key:
B = beneficial
LTS = less than significant
NCFEC = no change from existing conditions
NI = no impact
None = no feasible mitigation identified and/or required
S = significant

Table 2-10. Impacts for NEPA-Only Resources

Potential Impact	Alternative	Impact
3.10 Regional Economics		
Seller Service Area		
Revenues from cropland idling water transfers could increase incomes for farmers or landowners selling water.	2, 4	Beneficial
Cropland idling transfers in Glenn, Colusa, and Yolo counties could reduce employment, labor income, and economic output for businesses and households linked to agricultural activities.	2, 4	Employment: -492 Labor Income: -$19.38 Million Output: -$90.43 Million
Cropland idling transfers in Sutter and Butte counties could reduce economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Employment: -163 Labor Income: -$5.50 Million Output: -$26.76 Million
Cropland idling transfers in Solano County could reduce economic output, labor income, and employment for businesses and households linked to agricultural activities.	2, 4	Employment: -32 Labor Income: -$1.13 Million Output: -$4.58 Million
Cropland idling transfers could have adverse local economic effects.	2, 4	Adverse
Water transfers from idling alfalfa could increase costs for dairy and other livestock feed.	2, 4	Adverse, but minimal
Cropland idling transfers could decrease net revenues to tenant farmers whose landowners choose to participate in transfers.	2, 4	Adverse
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Adverse, but minimal
Crop shifting transfers could change economic output, value added, and employment for businesses and households linked to agricultural activities.	2, 4	Adverse, but minimal
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	2, 4	Adverse
Economic effects associated with cropland idling could conflict with economic policies and objectives set forth in local plans.	2, 4	Adverse
Reductions in local sales associated with cropland idling transfer effects could reduce tax revenues and increase costs to county governments.	2, 4	Adverse, but minimal
Groundwater substitution transfers could increase groundwater pumping costs for water users in areas where groundwater levels decline as a result of the transfer.	2, 3	Adverse
Revenues from groundwater substitution water transfers could increase incomes for farmers or landowners selling water.	2, 3	Beneficial

Potential Impact	Alternative	Impact
Groundwater substitution water transfers could increase management costs for local water districts.	2, 3	Adverse
Revenues received from stored reservoir and conservation transfers could increase operating incomes for sellers.	2, 3, 4	Beneficial, but minimal
Buyer Service Area		
Water transfers would provide water for agricultural uses that could support revenues, economic output, and employment.	2, 3, 4	Beneficial
Water transfers would provide water for M&I uses that could support revenues, economic output, and employment.	2, 3, 4	Beneficial
3.11 Environmental Justice		
Cropland idling transfers could adversely and disproportionately affect minority and low-income farm workers in the Seller Service Area.	2, 4	No disproportionately high or adverse effect
Crop shifting transfers could adversely and disproportionately affect minority and low-income farm workers in the Seller Service Area.	2, 3	No disproportionately high or adverse effect
Use of cropland modification transfers could adversely and disproportionately affect minority and low-income farm workers in the Buyer Service Area.	2, 3, 4	Beneficial
3.12 Indian Trust Assets		
Groundwater substitution transfers could adversely affect ITAs by decreasing groundwater levels, which would potentially interfere with the exercise of a federally-reserved water right use, occupancy, and or character	2, 3	No effect
Groundwater substitution transfers could adversely affect ITAs by reducing the health of tribal members by decreasing water supplies	2, 3	No effect
Groundwater substitution transfers could affect ITAs by affecting fish and wildlife where there is a federally-reserved hunting, gathering, or fishing right.	2, 3	No effect
Groundwater substitution transfers could adversely affect ITAs by causing changes in stream flow temperatures or stream depletion, which would potentially interfere with the exercise of a federally-reserved Indian right	2, 3	No effect
Use of groundwater substitution transfers could affect reservations or Rancherias in the Buyer Service Area to reduce CVP shortages.	2, 3, 4	Beneficial

2.6 References

Department of Water Resources (DWR). 1975. Bulletin 113-3, Vegetative Water Use in California, 1974. Table 23. April 1975. Accessed: September 9, 2014. Available at: http://www.water.ca.gov/pubs/use/land_and_water_use/vegetative_water_use_in_california__bulletin_113-3__1974/bulletin_113-3.pdf

Department of Water Resources (DWR) and Bureau of Reclamation. 2013. DRAFT Technical Information for Preparing Water Transfer Proposals. October 2013. Accessed: April 21, 2014. Available at: http://www.water.ca.gov/watertransfers/docs/DTIWT_2014_Final_Draft.pdf

National Oceanic and Atmospheric Association Fisheries Service (NOAA Fisheries). 2009. Biological Opinion and Conference Opinion on the Long-Term Operations of the Central Valley Project and State Water Project. 4 June 2009.

U.S. Fish and Wildlife Service (USFWS). 2008. Formal Endangered Species Act Consultation on the Proposed Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). 15 December 2008. Accessed on January 2, 2014. Available from http://www.fws.gov/sfbaydelta/documents/swp-cvp_ops_bo_12-15_final_ocr.pdf

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Chapter 3
Affected Environment/Environmental Consequences

This chapter describes, for each resource area, the affected environment/environmental setting for the project area potentially affected by the action alternatives. This chapter also presents the analyses of the impacts that would result from the No Action/No Project Alternative or implementation of the action alternatives described in Chapter 2, and considers how the environmental commitments could reduce or eliminate these impacts. The sections of this chapter, by resource area, are as follows:

3.1 Water Supply
3.2 Water Quality
3.3 Groundwater Resources
3.4 Geology and Soils
3.5 Air Quality
3.6 Climate Change
3.7 Fisheries
3.8 Vegetation and Wildlife
3.9 Agricultural Land Use
3.10 Regional Economics
3.11 Environmental Justice
3.12 Indian Trust Assets
3.13 Cultural Resources
3.14 Visual Resources
3.15 Socioeconomics
3.16 Power
3.17 Flood Control

Resource areas that are not analyzed in this document include:

- Hazards & Hazardous Materials
- Mineral Resources
- Noise
- Public Services and Utilities
- Transportation/Traffic

The action alternatives would not require any construction activities; therefore, short- and long-term impacts to transportation/traffic, noise, and public services and utilities would not occur. Because water transfers would not result in the disturbance of land, there would be no impacts to hazardous materials and mineral resources.

Because this document addresses both the National Environmental Policy Act (NEPA) and the California Environmental Quality Act (CEQA), the terms used in this document reflect both NEPA and CEQA. Table 3-1 presents a list of

NEPA terms that are synonymous with CEQA terms and are used throughout this document.

Table 3-1. NEPA and CEQA Terms

NEPA	CEQA
Proposed Action	Proposed Project
No Action Alternative	No Project Alternative
Environmentally Preferred Alternative	Environmentally Superior Alternative
Purpose and Need	Project Objectives
Affected Environment	Environmental Setting
Environmental Consequences	Environmental Impacts
Environmental Commitments	Mitigation Measures
Environmental Impact Statement (EIS)	Environmental Impact Report (EIR)

The impacts of each alternative are discussed by resource area and alternative. Each resource area section is structured so that an *italicized* impact statement introduces potential changes that could occur from implementation of each alternative. A discussion of how the resource area would be affected by the impact then follows this initial statement. The impact discussion is concluded with a determination that indicates if there is no impact to a resource area or if the impact to a resource area is beneficial, less than significant, or significant. Pursuant to NEPA, significance is used to determine whether an EIS or some other level of documentation is required, and once the decision to prepare an EIS is made, the magnitude of the impact is evaluated and no further judgment of significance is required. Therefore, any determinations of significance are for CEQA purposes only.

Section 3.1
Water Supply

This section discusses how and when surface water supplies are delivered to water users, the management of surface water, and how long-term water transfers could benefit or adversely affect water supplies.

3.1.1 Affected Environment/Environmental Setting

This section describes existing water supplies, including source and management, for agencies that could take part in the transfers.

3.1.1.1 Area of Analysis

The evaluation of potential effects on surface water supply and management from the implementation of long-term transfers includes the waterways that provide water to the buyers or sellers. Sellers include water rights holders on the Sacramento and San Joaquin rivers or their tributaries, including the Feather, Yuba, American, and Merced rivers. Some sellers are also within the Delta, and most transfers would need to move through the Delta to be delivered to buyers.

Potential buyers are located south and west of the Delta, and include the Contra Costa Water District (WD), the East Bay Municipal Utility District (MUD), and ten member agencies of the San Luis & Delta-Mendota Water Authority (SLDMWA). Not all potential buyers will purchase water from transfers. For some potential buyers, the ability to purchase water would depend on whether purchased water could be moved to the buyer’s service area. Contra Costa WD would divert water from one of its diversion facilities in the Delta, East Bay MUD would divert water at the Freeport facility on the Sacramento River, and SLDMWA would receive water from Jones or Banks Pumping Plants in the Delta. SLDMWA could also receive water from Merced Irrigation District (ID) through San Joaquin River diversion facilities belonging to Banta Carbona ID, West Stanislaus ID, and Patterson ID.

Figure 3.1-1 shows the various potential sellers and buyers and key waterways in the area of analysis.

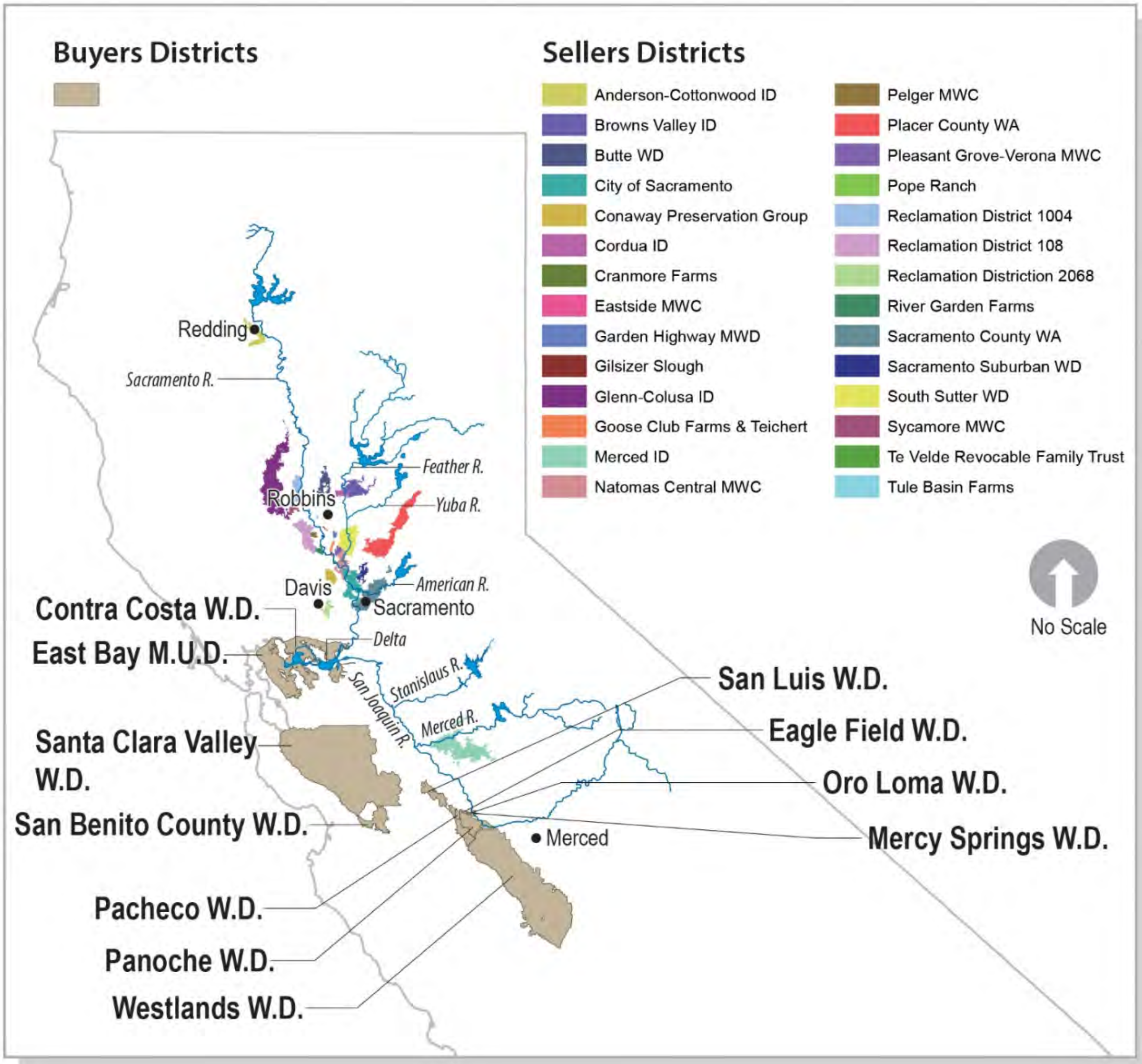

Figure 3.1-1. Location of Potential Buyer and Sellers

3.1.1.2 Regulatory Setting

The following section describes the applicable laws, rules, regulations and policies governing the transfer of surface and groundwater water in the area of analysis.

3.1.1.2.1 Federal

Reclamation approves water transfers consistent with provisions of the Central Valley Project Improvement Act (CVPIA) and State law that protect against injury to other legal users of water. According to the CVPIA Section 3405(a), the following principles must be satisfied for any transfer:

- Transfer may not violate the provisions of Federal or state law;
- Transfer may not cause significant adverse effects on Reclamation's ability to deliver Central Valley Project (CVP) water to its contractors or other legal user;
- Transfer will be limited to water that would be consumptively used or irretrievably lost to beneficial use;
- Transfer will not have significant long-term adverse impact on groundwater conditions; and
- Transfer will not adversely affect water supplies for fish and wildlife purposes.

Reclamation will not approve a water transfer if these basic principles are not satisfied and will issue its decision regarding potential CVP transfers in coordination with the U.S. Fish and Wildlife Service (USFWS), contingent upon the evaluation of impacts on fish and wildlife.

In addition, the biological opinions[1] on the Coordinated Operations of the CVP and State Water Project (SWP) (USFWS 2008; National Oceanic Atmospheric Administration Fisheries Service [NOAA Fisheries] 2009) analyze transfers through the SWP Banks and CVP Jones Pumping Plants from July to September that are up to 600,000 acre-feet (AF) in critical and dry years. For all other year types, the maximum transfer amount is up to 360,000 AF. For this Environmental Impact Statement/Environmental Impact Report (EIS/EIR), annual transfers would not exceed the above capacities and would be pumped through Banks or Jones Pumping Plants between July and September~~ unless it shifts based on consultation with USFWS and NOAA Fisheries~~.

3.1.1.2.2 State

The State Water Resources Control Board (SWRCB) is responsible for reviewing transfer proposals and issuing petitions for temporary and long-term transfers related to post-1914 water rights. Transfers of CVP water outside of the CVP service area require SWRCB review and approval. Several sections of the California Water Code (WC) provide authority to the SWRCB to carry out transfers as presented below.

[1] A written statement setting forth the opinion of the USFWS or the NOAA Fisheries as to whether a federal action is likely to jeopardize the continued existence of a listed species or result in the destruction or adverse modification of a critical habitat. See 16 USCA 1536(b).

- Short-Term Transfers: Section 1725 allows a water rights permittee or licensee to temporarily change a point of diversion, place, or purpose of use for short-term water transfers (limited to one year). Short-term transfers under Section 1725 are limited to water that would have been consumptively used or stored absent the water transfer. Petitioners for transfers must provide the SWRCB notification in writing of the proposed change, providing information outlining the buyer's consumptive use and documentation that no injury to other legal users and no unreasonable effects to fish, wildlife, or other instream beneficial uses would occur. The petition is publicly noticed, and parties can file objections to the transfer. The SWRCB must evaluate and respond to the notification within 55 days if objections are filed.

- Long-Term Transfers: Section 1735 addresses long-term transfers that take place over a period of more than one year. Long-term transfers of water under post-1914 water rights must not cause substantial injury to any legal user of water and must not unreasonably affect fish, wildlife, or other instream beneficial uses. Long-term transfers are subject to the requirements of California Environmental Quality Act (CEQA) and must also comply with the SWRCB public noticing and protest process.

- No Injury Rule: Numerous sections of the WC (including Sections 1702, 1706, 1725, 1735 and 1810, among others) protect legal users of water from impacts that might result due to transfers, referred to as the "no injury rule." The no injury rule applies to both Pre-1914 water rights (WC Section 1706) and post-1914 water rights. The SWRCB has jurisdiction over changes to post-1914 water rights, and the courts typically have jurisdiction over changes in pre-1914 water rights.

- Effects on Fish and Wildlife: Sections 1725 and 1736 require that the SWRCB make a finding that post-1914 water rights water transfers will not result in unreasonable effects on fish and wildlife or other instream beneficial uses.

- Third-Party Impacts: Sections 386 and 1810 require the proposed transfer not result in unreasonable effects to the overall economy of the area from which the water is being transferred where the use of a state, regional or local public agency's conveyance capacity is required.

3.1.1.2.3 Regional/Local

County governments also have requirements related to transferring water outside of the county, primarily related to groundwater extraction. Reclamation requires transfer participants to comply with local requirements (including ordinances relating to well drilling, well spacing, and groundwater extraction) and local groundwater management plans, as well as compliance with adjudications and with the overdraft protections in WC Section 1745 et seq.

Many of the counties in the Seller Service Area have ordinances addressing groundwater transfers to users outside of the particular county. Chapter 3.3, Groundwater Resources, has more information on these county ordinances.

3.1.1.3 Existing Conditions

Water supplies available for transfer come from either groundwater or surface water. This section will focus on the availability of surface water supplies to their users as a result of the alternatives. This section does not address potential groundwater impacts (see Section 3.3) or flood risk (see Section 3.17).

The following sections describe the existing water supply conditions within the area of analysis.

3.1.1.3.1 Sellers Service Area

Sellers making water available for transfer are generally north of the Delta, but also include Merced ID (Figure 3.1-1).

Sacramento River Area

The Sacramento River flows south for 447 miles through the northern Central Valley of California, between the Pacific Coast Range and the Sierra Nevada, and enters the Delta from the north. The major tributaries to the Sacramento River are the Feather and the American rivers.

Some of the potential sellers on the Sacramento River receive CVP water that is stored upstream from their service areas in Shasta Reservoir on the Sacramento River. Shasta Reservoir is managed for flood control, water supply, recreation, fish and wildlife enhancement, power, and salinity control in the lower Sacramento River and the Delta.

Several CVP sellers hold Sacramento River Settlement Contracts[2] (Settlement Contracts). Reclamation entered into settlement negotiations with water users on the Sacramento River beginning in 1944, and most contracts were completed by 1964. These contracts expired on March 31, 2004 and were renewed as the 2005 Executed Sacramento River Settlement Contracts. The negotiations focused on the natural flow of the Sacramento River, stored CVP water, diversions, and pre-CVP water rights held by the Sacramento River Settlement Contractors. The term of the Settlement Contracts for municipal and industrial (M&I) water is 40 years, and for irrigation water it is 40 years with an option to extend the contract for another 40 years (Reclamation 2004b).

As part of the original contract negotiations, a quantitative study of pre-CVP water use by the Sacramento River Settlement Contractors was conducted. This resulted in a determination of Base Supply and Project Water volumes. Base Supply is water that the Sacramento River Settlement Contractors divert,

[2] The Settlement Contracts are currently the subject of litigation. The court of appeals en banc panel remanded the matter to district court. The Sacramento River Settlement Contractors have petitioned the ~~supreme court~~Supreme Court and that petition is pending.

without payment, from April through October, based on their water rights. Project Water is water that the Sacramento River Settlement Contractors purchase from Reclamation, primarily in the months of July, August, and September. Project Water is subject to all federal regulations.

The Sacramento River Settlement Contractors can divert up to 1.8 million AF of Base Supply from the Sacramento River, and can purchase up to 380,000 AF of Project Water each year (Reclamation 2004a).

Anderson-Cottonwood ID

The Anderson-Cottonwood ID is located near Redding, California (Figure 3.1-1). Anderson-Cottonwood ID has a Sacramento River Settlement Contract for 121,000 AF of Base Supply and 4,000 AF of Project Water per year.

Anderson-Cottonwood ID, through either multiple year or single year agreements, could transfer a maximum of 5,225 AF of water annually through groundwater substitution.

Conaway Preservation Group, LLC

The Conaway Preservation Group, LLC operates the 16,088 acre Conaway Ranch located east of the cities of Davis and Woodland in Yolo County (Figure 3.1-1). The Conaway Ranch is managed for agriculture, wildlife habitat, and flood control in the Yolo Bypass. Conaway Preservation Group has a Sacramento River Settlement Contract with Reclamation for up to 50,190 AF[3] of Base Supply and 672 AF of Project Water from the Sacramento River. Conaway Ranch uses groundwater resources to supplement surface water supplies.

Conaway Preservation Group, LLC, through either multiple year or single year agreements, could transfer a maximum of 35,000 AF annually through groundwater substitution~~,~~ and/or ~~9,239 AF per year~~ by cropland idling or crop shifting.

Cranmore Farms, LLC

Cranmore Farms, LLC (Pinnacle Land Ventures, LLC or Broomieside Farms) is on the east side of the Sacramento River. It diverts water for agricultural and habitat use from the Sacramento River through a Sacramento River Settlement Contract with Reclamation for 8,070 AF of Base Supply and 2,000 AF of Project Water annually.

[3] ~~After January, 2016, the contract amount will decrease to 40,290 AF. Conaway Preservation Group's water right was split, selling 10,000 AF to the Woodland-Davis Clean Water Agency.~~ Conway Preservation Group has assigned portions of its water rights and Sacramento River Settlement Contract to the Woodland Davis Clean Water Agency. Amendment No. 1 to the Conway Preservation Group's Settlement Contract, which identifies the assignment of 10,000 AF to the Woodland Davis Clean Water Agency, is effective upon the earlier of the Woodland Davis Clean Water Agency diverting water or January 15, 2016. After that time, Conway Preservation Group may receive surface water under the portion assigned to the Woodland Davis Clean Water Agency.

Cranmore Farms, LLC, through either multiple year or single year agreements, could transfer a maximum of 8,000 AF annually through groundwater substitution~~,~~ and/or ~~2,500 AF per year~~ by crop idling or crop shifting.

Eastside Mutual Water Company (MWC)

The Eastside MWC is in the northern part of the Sacramento Basin on the Sacramento River (Figure 3.1-1). The Eastside MWC has a Sacramento River Settlement Contract with Reclamation for 2,170 AF of Base Supply and 634 AF of Project Water.

Eastside MWC, through either single or multi-year agreements, could transfer up to 2,230 AF per year through groundwater substitution.

Glenn-Colusa ID

Glenn-Colusa ID holds pre- and post-1914 appropriative water rights to divert water from the Sacramento River, Stony Creek, and their tributaries which is used to irrigate 141,000 acres. Glenn-Colusa ID also conveys water to 20,000 acres of wildlife habitat comprising the Sacramento, Delevan, and Colusa National Wildlife refuges. Glenn-Colusa ID has a Sacramento River Settlement Contract for 720,000 AF of Base Supply and 105,000 AF of Project Water. In addition to surface water, Glenn-Colusa ID relies on groundwater for a portion of its supply.

Glenn-Colusa ID, through either single or multi-year transfers, agreements, could transfer up to 66,000 AF per year through crop idling and shifting and/or 25,000 AF per year through groundwater substitution.

Natomas Central MWC

The Natomas Central MWC is along the Sacramento River on the border of northern Sacramento County and southern Sutter County. The Natomas Central MWC has a Sacramento River Settlement Contract with Reclamation for 98,200 AF of Base Supply and 22,000 AF of Project Water.

Natomas Central MWC, through either multiple year or single year agreements, could transfer a maximum of 30,000 AF annually thorough groundwater substitution.

Pelger MWC

The Pelger MWC is located on the east side of the Sacramento River near Robbins (Figure 3.1-1). The Pelger MWC has a Sacramento River Settlement Contract with Reclamation for 7,110 AF of Base Supply and 1,750 AF of Project Water.

The Pelger MWC, through either multiple year or single year agreements, could transfer a maximum of 3,750 AF annually through groundwater substitution, and/or ~~2,538 AF per year~~ by crop idling or crop shifting.

Pleasant Grove-Verona MWC

The Pleasant Grove-Verona MWC is just northeast of the confluence with the Sacramento and Feather rivers (Figure 3.1-1). The Pleasant Grove-Verona MWC provides irrigation water to 6,857 acres of farmland through a Sacramento River Settlement Contract with Reclamation for 23,790 AF of Base Supply and 2,500 AF of Project Water.

Pleasant Grove-Verona MWC, through either multiple year or single year agreements, could transfer a maximum of ~~10~~18,000 AF annually through groundwater substitution~~,~~ and/or ~~10,000 AF per year~~ by crop idling or crop shifting.

Reclamation District (RD) 108

RD 108 is on the west side of the Sacramento River, just north of the confluence with the Feather River. RD 108 has a Sacramento River Settlement Contract for 199,000 AF of Base Supply and 33,000 AF of Project Water.

RD 108, through either multiple year or single year agreements, could transfer a maximum of 15,000 AF annually through groundwater substitution, and/or up to 20,000 AF per year by crop idling or crop shifting.

RD 1004

RD 1004 is in the northern portion of the Sacramento Valley, and has a Sacramento River Settlement Contract for 56,400 AF of Base Supply and 15,000 AF of Project Water.

RD 1004, through either single year or multiyear agreements, could transfer a maximum of 10,000 AF through crop idling and/or crop shifting, or up to 7,175 AF through groundwater substitution.

River Garden Farms

River Garden Farms is on the west side of the Sacramento River. River Garden Farms has a Sacramento River Settlement Contract with Reclamation for 29,300 AF of Base Supply and 500 AF of Project Water. River Garden Farms supplements its surface water supply with ~~three~~ groundwater wells.

River Garden Farms, through either multiple year or single year agreements, could transfer a maximum of 9,000 AF annually through groundwater substitution.

Sycamore MWC

The Sycamore MWC farm is in the northern Sacramento Valley (Figure 3.1-1). Most of the farm is located in Sutter County, with a small northern portion in Colusa County. The Glenn-Colusa Canal and the Colusa Trough run through the parcel on the south and east side, respectively. Sycamore MWC has a Sacramento River Settlement Contract for 22,000 AF of Base Supply and 9,800 AF of Project Water.

Sycamore MWC, through either multiple year or single year agreements, could transfer up to ~~15~~20,000 AF through crop idling or crop shifting~~,~~ and/or ~~up to 10,000 AF~~ through groundwater substitution.

Te Velde Revocable Family Trust

The Te Velde Revocable Family Trust is on the west side of the Sacramento River in unincorporated Yolo County, just downstream of the confluence of the Feather and Sacramento rivers. Te Velde has a Sacramento River Settlement Contract of a Base Supply of 4,000 AF and its own water right of 7,094 AF diverting water out of the Sacramento River.

Te Velde, through multiple year agreements, could transfer a maximum of 7,094 AF annually through groundwater substitution~~,~~ and/or ~~7,094 AF per year~~ by crop idling or crop shifting.

Feather River Area

Lake Oroville is on the Feather River. Operated by the California Department of Water Resources (DWR), it is the largest reservoir in the SWP and provides water to downstream contractors. Water from Lake Oroville is released to meet export demands, generate power at the Hyatt Powerplant beneath Oroville Dam and at the Thermalito Powerplant and to support downstream fisheries and water quality objectives.

Butte WD

Butte WD is in southern Butte County and northern Sutter County (Figure 3.1-1). The Butte WD receives water from the Thermalito Afterbay through a Feather River Settlement Contract between the Joint Water District Board (Joint Board), of which Butte WD is a member and DWR. Butte WD's share of the Feather River Settlement supply is for 133,200 AF per year under an agreement allocating the Settlement supply among all the member units of the Joint Board.

The Butte WD, through either single or multiple year agreements, could transfer a maximum of 11,500 AF per year by crop idling or crop shifting, and/or 5,500 AF per year from groundwater substitution. An agreement with DWR would be required for Butte WD to implement a transfer.

Garden Highway MWC

The Garden Highway MWC is on the west side of the Feather River approximately midway between its confluence with the Yuba River and the confluence with the Sacramento River (Figure 3.1-1). The Garden Highway MWC may divert up to 18,000 AF per year from the Feather River for agriculture under its water rights permit and Feather River Settlement Agreement with DWR.

Garden Highway MWC, through either multiple year or single year agreements, could transfer a maximum of 1~~2,287~~4,000 AF annually through groundwater substitution. An agreement with DWR would be required for Garden Highway to implement a transfer.

Gilsizer Slough Ranch

The Gilsizer Slough Ranch is between the Feather and Sacramento rivers. Gilsizer Slough Ranch has a water right to the Feather River for 5,386 AF per year from the Sacramento River.

Gilsizer Slough Ranch, through either multiple year or single year agreements, could transfer a maximum amount of 3,900 AF through groundwater substitution.

Goose Club Farms and Teichert Aggregates

Goose Club Farms and Teichert Aggregates are on the west bank of the Feather River, just north of the confluence with the Sacramento River (Figure 3.1-1). Goose Club Farms and Teichert Aggregates have a water right on the Feather River for 15,000 AF per year.

Goose Club Farms and Teichert Aggregates, through either multiple year or single year agreements, could transfer a maximum of 10,000 AF annually through groundwater substitution~~,~~ or ~~10,000 AF per year~~ by crop idling or crop shifting.

South Sutter WD

South Sutter WD is just northeast of the confluence of the Feather and Sacramento rivers (Figure 3.1-1). South Sutter WD owns and operates Camp Far West Reservoir on the Bear River approximately 6.5 miles northeast of Wheatland. South Sutter WD holds water right Licenses 11118 and 11120 (Applications 14804 and 10221, respectively) for diversions from the Bear River. The maximum combined direct diversion plus collection to storage under these licenses is 180,550 AF per year; and the maximum combined direct diversion plus withdrawal from storage under these licenses is 138,300 AF per year.

South Sutter WD, through either multiple year or single year agreements, could transfer a maximum of 15,000 AF annually through stored reservoir release from Camp Far West Reservoir.

Tule Basin Farms

Tule Basin Farms is on the east side of the Sacramento River in the center of the Sacramento Valley (Figure 3.1-1). The Farm has a water right to 8,980 AF per year for agriculture and habitat needs out of the ~~Feather River.~~ West Borrow Pit of the Sutter Bypass.

Tule Basin Farms, through either multiple year or single year agreements, could transfer up to 7,320 AF per year through groundwater substitution.

Yuba River Area

Browns Valley ID

The Browns Valley ID is on the Yuba River, just upstream of the confluence with the Feather River. Browns Valley ID has pre-1914 water rights for 34,171 AF per year on the Yuba River. Browns Valley ID completed an EIR for water transfers to willing buyers in 2009 based on water conservation measures that reduced consumptive use in the conveyance system.

Browns Valley ID, through either multiple year or single year agreements, could transfer a maximum amount of 3,100 AF through conservation measures, and/or 5,000 AF per year by stored reservoir release from Merle Collins Reservoir.

Cordua ID

Cordua ID is in Yuba County, near the confluence of the Yuba and Feather rivers. Cordua ID may divert up to 60,000 AF per year from the Yuba River under its water rights and an agreement with the Yuba County Water Agency.

Cordua ID, through either multiple year or single year agreements, could transfer a maximum amount of 12,000 AF per year through groundwater substitution.

American River

On the American River, Reclamation's Folsom Reservoir captures and holds up to 1,010,000 AF of CVP water. The reservoir provides flood control for downstream areas, water supply, hydropower, flows for American River fisheries and helps to meet water quality needs in the Delta.

City of Sacramento

The City of Sacramento is on both sides of the American River at its confluence with the Sacramento River (Figure 3.1-1), and has water rights to the American River for 245,000 AF per year and to the Sacramento River for 81,000 AF per year[4]. The City also has a network of groundwater supply wells in its service area. The City provides water for M&I purposes.

City of Sacramento, through either multiple year or single year agreements, could transfer a maximum of 5,000 AF annually through groundwater substitution.

Placer County Water Agency

The Placer County Water Agency is in the upper reaches of the American River, upstream of the Folsom Reservoir. Placer County Water Agency operates the Middle Fork Project reservoir on the American River, diverting up to 120,000 AF of water under its own water rights.

[4] The full amount of this contract will not be made available until 2030.

Placer County Water Agency could make up to 47,000 AF of water available each year for transfer through reoperation of the Middle Fork Project Reservoir, from Hell Hole and French Meadows reservoirs. Placer County Water Agency would prefer to use long term agreements to transfer water rather than individual single year contracts.

Sacramento County Water Agency

The Sacramento County Water Agency, located south of the City of Sacramento service area, provides M&I water to residents outside of the City of Sacramento boundaries (Figure 3.1-1). The Sacramento County Water Agency has a water right to 71,000 AF per year of surface water from the Sacramento River and 52,000 AF per year through two contracts with Reclamation. They also obtain up to 8,900 AF per year from groundwater.

The Sacramento County Water Agency, through either multiple year or single year agreements, could transfer a maximum of 15,000 AF annually through groundwater substitution.

Sacramento Suburban WD

Sacramento Suburban WD is downstream of the Folsom Reservoir on the American River (Figure 3.1-1). Through water rights and agreements with the Placer County Water Agency, Sacramento Suburban WD provides water to approximately 172,000 people in the greater Sacramento region. Sacramento Suburban WD also has a network of groundwater supply wells in its service area.

The Sacramento Suburban WD, through either multiple year or single year agreements, could transfer a maximum of 30,000 AF annually through groundwater substitution.

Delta Region

Pope Ranch

Pope Ranch is just east of RD 2068, in the southern Sacramento Valley on the north side of the Delta (Figure 3.1-1). Pope Ranch can divert a total of 2,800 AF.

Pope Ranch, through either multiple year or single year agreements, could transfer a maximum amount of 2,800 AF through groundwater substitution.

RD 2068

RD 2068 is in the southern Sacramento River Valley on the north side of the Delta (Figure 3.1-1). RD 2068 has a water right for a total of 80,000 AF.

RD 2068, through either multiple year or single year agreements, could transfer a maximum amount of ~~4~~7,500 AF through groundwater substitution or ~~7,500 AF~~ through crop-idling and/or crop shifting.

Merced River

Merced ID

Merced ID is on the Merced River upstream of the confluence with the San Joaquin River. Merced ID has water rights on the Merced River and stores water in McClure and McSwain lakes. Merced ID supplies water primarily for agriculture~~, and M&I~~ purposes.

Merced ID, through either multiple year or single year agreements, could transfer a maximum of 30,000 AF annually through stored reservoir releases.

3.1.1.3.2 Buyers Service Area

Transfer buyers are in the Central Valley or the San Francisco Bay Area. These buyers include the participating members of the SLDMWA (Figure 3.1-1), the Contra Costa WD, and the East Bay MUD. These areas receive water from multiple sources, including the SWP, the CVP, local surface water sources, and groundwater. With the exception of East Bay MUD, these potential buyers would require any transferred water to be moved through the Delta.

SLDMWA

The SLDMWA is made up of ~~29~~ 28 federal and exchange water service contractors that manage approximately 2,100,000 acres in western San Joaquin Valley, and San Benito and Santa Clara counties. The SLDMWA was established in 1992 and entered into a cooperative agreement and subsequently in 1998 entered into a transfer agreement with Reclamation to operate and maintain CVP facilities in the San Joaquin Valley, including the Delta-Mendota Canal.

Of the ~~29~~ 28 members of the SLDMWA, there are ten that would receive water transfers through the program (see Table 2-6). Deliveries to these districts would be diverted through the Delta through the CVP's Jones Pumping Plant or the SWP's Banks Pumping Plant. After diversion, the transfers would be delivered via the Delta-Mendota Canal, California Aqueduct and San Luis Canal. Deliveries of transfers from Merced ID could also be routed from the San Joaquin River through Banta Carbona ID, West Stanislaus ID, or Patterson ID.

Contra Costa WD

The Contra Costa WD is in Contra Costa County and principally relies on four Delta intakes for its water supplies. Contra Costa WD is a potential buyer of water. Contra Costa WD receives CVP water and has its own water rights to Delta water supplies.

East Bay MUD

East Bay MUD provides M&I water supplies to portions of Alameda and Contra Costa counties in the east San Francisco Bay area. East Bay MUD would receive transfer water through the Freeport Regional Water Authority's intake on the Sacramento River near Freeport. Due to the intake's northern location, the transfers would not be subject to the constraints on Delta pumping. East Bay MUD receives water from a variety of sources, including the Mokelumne River, a CVP contract with Reclamation for dry year supplies from the American River, and local supplies.

3.1.2 Environmental Consequences/Environmental Impacts

These sections describe the environmental consequences/environmental impacts associated with each alternative.

3.1.2.1 Assessment Methods

Impacts to surface water supplies are analyzed by comparing the conditions in water bodies and surface supplies without implementing transfers to the expected conditions of supplies with implementation. The No Action/No Project Alternative operations were simulated in CalSim, while water transfers and exports from the Delta were simulated using a post-processing tool (as described in Appendix B, Water Operations Assessment).

The post-processing tool also includes changes in flows in waterways caused by streamflow depletion from groundwater substitution. Data for the post-processing tool was provided by the SACFEM 2013 model, which includes highly variable hydrology (from very wet periods to very dry periods) that was used as a basis for simulating groundwater substitution pumping. The model simulated the potential to export groundwater substitution pumping transfers through the Delta during 12 of the 33 years from water year (WY) 1970 through WY 2003 (the SACFEM 2013 model simulation period). Each of the 12 annual transfer volumes was included in a single model simulation. Including each of the 12 years of transfer pumping in one simulation rather than 12 individual simulations allows for the potential cumulative effects from pumping from prior years. For example, transfer pumping in 1976 simulated pumping in a critical year followed by a critical year, while transfer pumping in 1987 simulated substitution pumping in a dry year followed by a critical year and a long term drought. Appendix D, Groundwater Model Documentation, includes more information about the use of SACFEM 2013 in this analysis.

3.1.2.2 Significance Criteria

Impacts on surface water supplies would be considered potentially significant if the long-term water transfers would:

- Result in substantial long-term adverse effects to water supply for beneficial uses.

The significance criteria described above apply to all surface water bodies that could be affected by transfers. Changes in surface water supplies are determined relative to existing conditions (for CEQA) and the No Action/No Project Alternative (for the National Environmental Policy Act [NEPA]).

3.1.2.3 Alternative 1: No Action/No Project

Surface water supplies would not change relative to existing conditions. Water users would continue to experience shortages under certain hydrologic conditions, requiring them to use supplemental water supplies. Under the No Action/No Project Alternative, some agricultural and urban water users may face potential shortages under dry and critical hydrologic conditions. These users may take alternative water supply actions in response to potential shortages, including increased groundwater pumping, cropland idling, reduction of landscape irrigation, water rationing, or pursuing supplemental water supplies. Impacts to surface water supplies would be the same as the existing conditions.

3.1.2.4 Alternative 2: Full Range of Transfers (Proposed Action)

3.1.2.4.1 Seller Service Area

Groundwater substitution transfers could decrease flows in neighboring surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP reservoirs. Groundwater substitution transfers make surface water available for transfer by reducing surface water diversions and replacing that water with groundwater pumping. The resulting increase in surface water supplies can then be transferred downstream to other users that do not have access to groundwater.

However, groundwater basins are naturally recharged after drawdown by both rainfall and through surface water and groundwater interactions. Streams that overlie an aquifer can lose water through the streambed to the aquifer (a “losing” stream), decreasing the amount of water available in the stream for other beneficial uses (Figure 3.1-2). Additional recharge to the groundwater basin can also intercept groundwater flow that would have entered a stream.

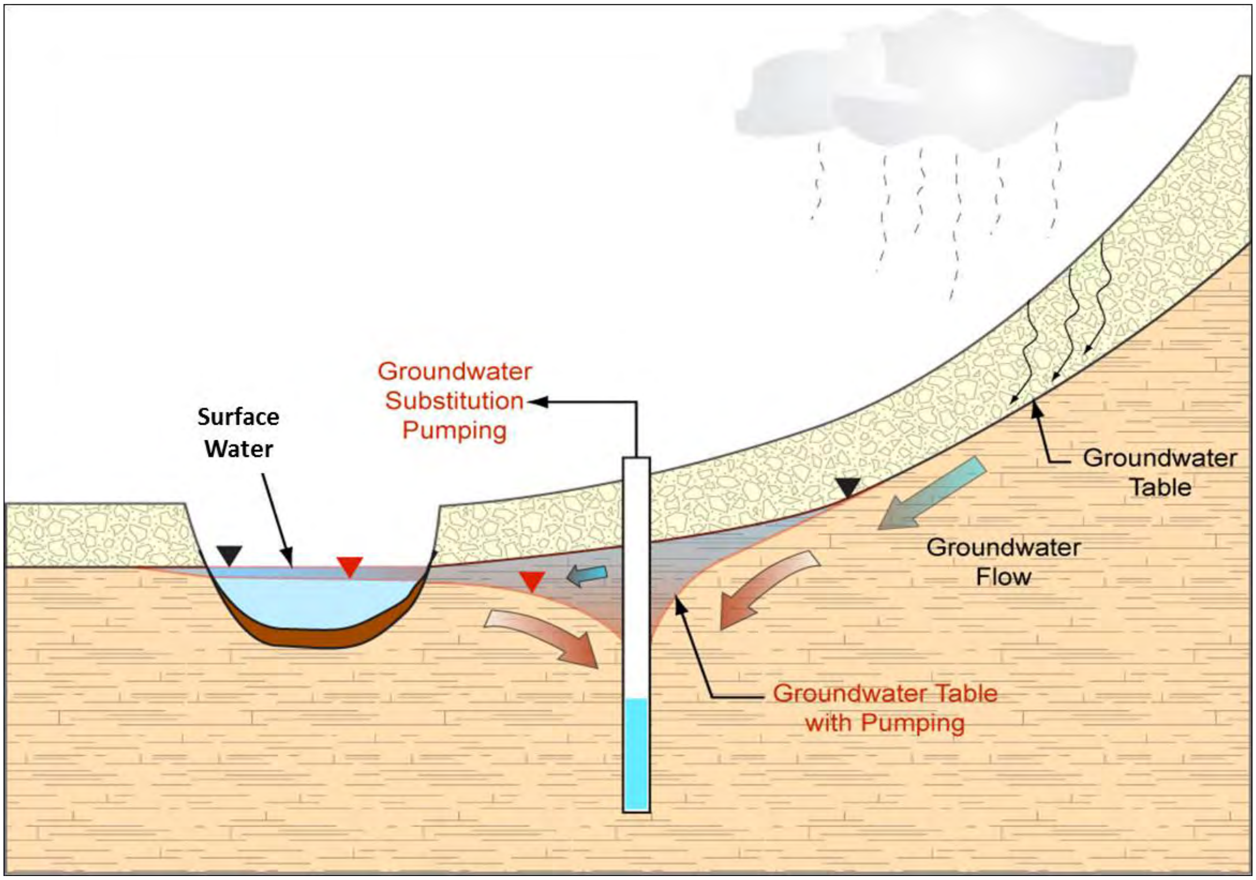

Figure 3.1-2. Groundwater and Surface Water Interactions Related to Groundwater Substitution Pumping

A portion of the groundwater recharge would occur during periods when there is higher flow in waterways. During these times, although the recharge would decrease flows in the waterways, the decreased flows would not affect water supplies or the ability to meet flow or quality standards. However, if the recharge occurs during dry periods, then the recharge would decrease river flows at times when it would affect Reclamation and DWR. Reclamation and DWR are responsible for meeting river flow and water quality standards on the Sacramento River, its tributaries, and within the Delta. If decreased river flows affect the ability to meet these standards, Reclamation and DWR would need to either decrease Delta exports or release additional flow from upstream reservoirs to meet flow or water quality standards. Transfers would not affect whether the water flow and quality standards are met, however, the actions taken by Reclamation and DWR to meet these standards because of instream flow reductions due to the groundwater recharge could affect CVP and SWP water supplies.

Decreased streamflows during dry periods could affect CVP and SWP supplies in the near term or longer term. Under dry or critical water years, streamflows are expected to decrease during the months of October through June. When faced with decreased streamflows, the CVP and SWP could choose to decrease Delta exports (affecting supplies to users south of the Delta) or increase releases from storage. Increased releases from storage would vacate storage that could be filled during wet periods, but would affect water supplies in subsequent years if the storage is not refilled.

Figure 3.1-3 shows the modeled potential changes (both in total volume and percent reductions) in total exports at both Jones and Banks pumping plants as a result of surface water and groundwater interactions over the modeled period of record. This figure only shows reductions to exports associated with streamflow depletion, and does not include increases in exports to convey water transfers to the buyers. The reductions in CVP and SWP supplies are not complete within one year, but can extend over multiple years as the groundwater aquifer refills. During periods where transfers occur in back-to-back years (such as 1987-1992), the water supply effects increase because effects compound over time.

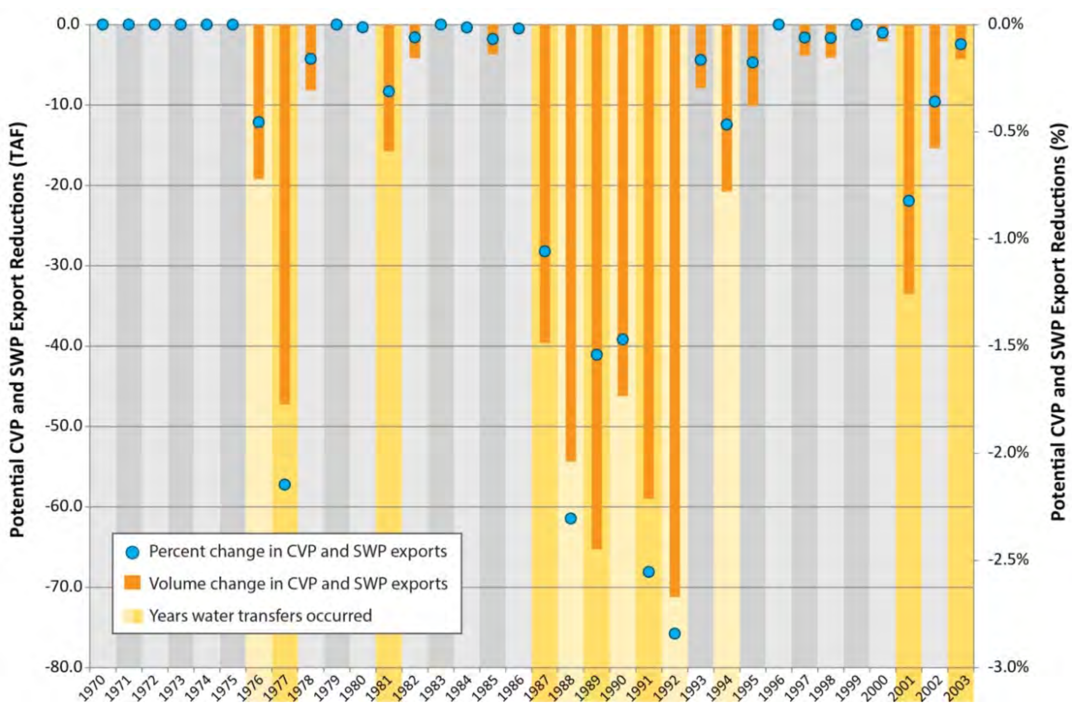

Figure 3.1-3. Potential Changes in Total Exports at the Delta Pumping Station as a Result of Surface Water and Groundwater Interaction

As a result of the groundwater and surface water interaction, the losses to surface flow from groundwater basin recharge shown in Figure 3.1-3, above, would reduce the water available to the CVP and SWP. Overall, the increased supplies delivered from water transfers would be greater than the decrease in supply because of streamflow depletion; however, the impacts from streamflow depletion may affect water users that are not parties to water transfers. On average[5], the losses due to groundwater and surface water interaction would result in approximately 15,800 AF of water annually compared to the No Action/No Project Alternative, or approximately a loss of 0.3 percent of the supply. This change in water supply is small, but the impacts in a single year could be greater. In a period of multiple dry years (such as 1987-1992), the streamflow depletion causes a 2.8 percent reduction in CVP and SWP supplies, or 71,200 AF. While the impacts to water supplies in the Buyer Service Area as a result of streamflow depletion would be small on average, the greater depletion in some years could have a potentially significant effect on water supply. To reduce these effects, Mitigation Measure WS-1 includes a streamflow depletion factor to be incorporated into transfers to account for the potential water supply impacts to the CVP and SWP. Mitigation Measure WS-1 would reduce the impacts to less than significant.

Water supplies available to users on the rivers downstream of reservoirs could decrease following stored reservoir release transfers. Stored reservoir release transfers would allow buyers to acquire transfer water from reservoirs owned by non-Project entities, such as Hell Hole and French Meadows reservoirs. Sellers would release water from these reservoirs, resulting in lower reservoir storage levels following the transfer. A reduction in downstream water supplies could occur when the reservoirs began to refill. In order to refill the reservoir storage vacated for the transfer, water would have to be held in the reservoirs that would otherwise have flowed downstream. To avoid impacting downstream users, the refill can only occur when all water needs downstream have been met and excess water remains in the system, referred to as Delta excess conditions. Additionally, this refill can only occur when downstream reservoirs cannot capture the water due to flood storage requirements. As demonstrated in Figure 3.1-4, reservoir levels are lower with the transfers than without until refilling to normal levels.

[5] The model used in the analysis assumes the maximum quantity of groundwater substitutions. In general, this maximum amount of water transferred is not likely in any given year, and therefore the impacts described here are the worst-case scenario. In practice, it is likely that the impacts will be less than what is modeled.

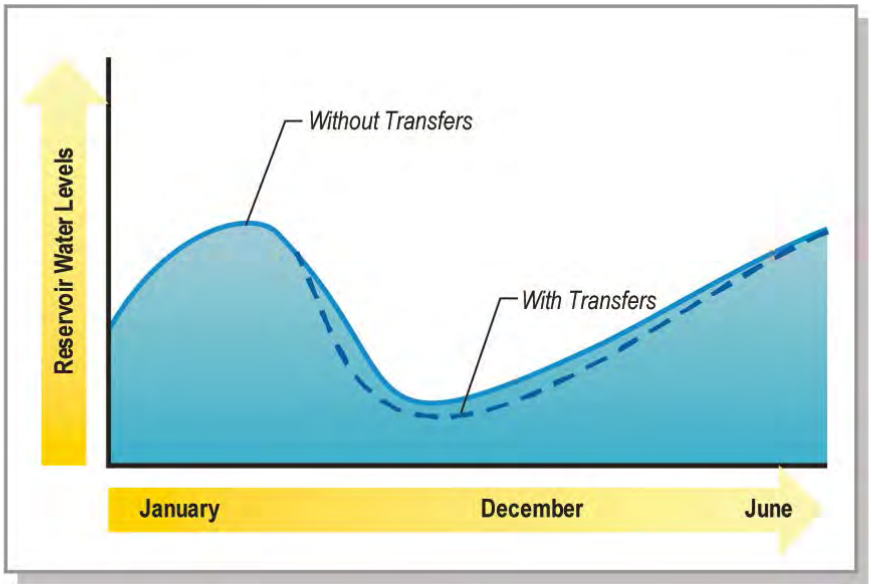

Figure 3.1-4. Reservoir Level Changes Under Stored Reservoir Release Transfers

Supplies in the seller's reservoirs would be decreased due to the transfer until the vacated storage was refilled during high flow periods. Figure 3.1-4 shows the refill occurring within one year, however, if one or more dry years follow the transfer year, or if a downstream reservoir does not enter flood control conditions for multiple years, the refill may not be able to occur for multiple years. As described in Chapter 2, each stored reservoir release transfer would include a refill agreement which specifies that the reservoir could only be refilled when it would not adversely affect downstream water users. Therefore, the impact of reservoir release transfers on downstream water users would be less than significant.

Changes in Delta diversions could affect Delta water levels. During July through September when transfer water can be pumped through the Delta, the Banks and Jones pumping plants would pump more water than they would under the No Action/No Project conditions. Increased pumping could affect water levels in the south Delta around the pumping facilities. Decreased Delta water levels could have the potential to affect water supplies in this area because the local users' diversion pumps may not remain underwater.

Reclamation and DWR operate a series of temporary barriers during this period to minimize potential water level impacts to south Delta water users. These barriers would help maintain water levels under Alternative 2. Table 3.1-1 shows water levels downstream of the barrier at Old River compared to the No Action/No Project Alternative. Water levels are generally the same under both alternatives, with only very minor changes to water levels. Appendix C contains water levels at other points, both upstream of barriers and in other waterways.

<u>These other areas show impacts to water levels that are similar or less than those shown in Table 3.1-1. Therefore, the impacts to south Delta water supplies would be less than significant.</u>

Table 3.1-1. Difference in Minimum Stage (ft) at Old River Downstream of Barrier for Alternative 2 minus the No Action/No Project Alternative

WY	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
1970	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1971	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1972	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1973	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1974	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1975	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1976	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
1977	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0	0.0
1978	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1979	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1980	0.0	0.0	0.0	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1981	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	0.0
1982	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1983	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1984	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.2	-0.1
1988	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1989	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
1990	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1991	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2	-0.1	0.0
1992	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
1993	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1994	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1
1995	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1996	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1997	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1998	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1999	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2000	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2001	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	-0.1
2002	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2003	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0	0.0
Average	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Critical	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-0.1	0.0
Dry	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Wet	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

3.1.2.4.2 Buyers Service Area

Transfers would increase water supplies in the Buyer Service Area. Under the No Action Alternative, water users would be subject to reductions in their water supply due to dry hydrologic conditions. Under the Proposed Action, additional water supply would benefit water users who receive the transferred water. The transfer water would help provide supplemental water to lands that are experiencing substantial shortages. For transfers to agricultural users, water would only be delivered to lands that were previously irrigated. Water transfers to M&I users would also help relieve shortages. Any water transferred to buyers would need to be used for beneficial uses. The increased water supply to buyers would be a beneficial effect.

3.1.2.5 Alternative 3: No Cropland Modifications

The No Cropland Modification Alternative does not include cropland idling. Potential water supply effects of the Proposed Action are caused by groundwater substitution and stored reservoir release transfers, which are the same in Proposed Action and Alternative 3. The effects in the Seller and Buyer Service Areas and the Delta would be the same as the Proposed Action.

3.1.2.6 Alternative 4: No Groundwater Substitutions

With the No Groundwater Substitution Alternative there would not be any groundwater substitution pumping. The potential water supply impacts associated with streamflow depletion would not occur. However, the potential impacts associated with stored reservoir release transfers would be the same as the Proposed Action. Effects in the Buyer Service Area and the Delta would be the same as the Proposed Action.

3.1.3 Comparative Analysis of Alternatives

Table 3.1-~~1~~ 2 lists the effects of each of the action alternatives and compares them to the existing conditions and No Action/No Project Alternative.

Table 3.1-~~1~~2. Comparative Analysis of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance after Mitigation
Surface water supplies would not change relative to existing conditions	1	NCFEC	None	NCFEC
Groundwater substitution transfers could decrease flows in surface water bodies following a transfer while groundwater basins recharge, which could decrease pumping at Jones and Banks Pumping Plants and/or require additional water releases from upstream CVP~~/SWP~~ reservoirs.	2, 3	S	WS-1: Streamflow Depletion Factor	LTS
Water supplies on the rivers downstream of reservoirs could decrease following reservoir release water transfers	2, 3, 4	LTS	None	LTS
Changes in Delta diversions could affect Delta water levels ~~and supplies to in-Delta users~~	2, 3, 4	LTS	None	LTS
Transfers would increase water supplies in the Buyers Service Area	2, 3, 4	B	None	B

Notes:
B = Beneficial
LTS = Less than significant
NCFEC = No change from existing conditions
S = Significant

3.1.3.1 Alternative 1: No Action/No Project Alternative

There would be no impacts on water supplies.

3.1.3.2 Alternative 2: Full Range of Transfers (Proposed Action)

Streamflow depletion from groundwater substitution transfers could result in small decreases in water supplies to CVP and SWP users. Stored reservoir release transfers could decrease carryover storage in participating reservoirs, but refill criteria would prevent water supply impacts to downstream users from refilling that storage. The effects on water supply would be less than significant.

3.1.3.3 Alternative 3: No Cropland Modifications

This alternative would have similar effects on water supply as the Proposed Action. The effects to water supply would be less than significant.

3.1.3.4 Alternative 4: No Groundwater Substitution

Alternative 4 would not include groundwater substitution transfers, so the streamflow depletion effects on CVP and SWP supplies in the other two action alternatives would not occur. Effects from refilling surface water storage from stored reservoir release transfers could still occur, but they would be avoided with the inclusion of the refill criteria. The effects on water supply would be less than significant.

3.1.4 Environmental Commitments/Mitigation Measures

3.1.4.1 Mitigation Measure WS-1: Streamflow Depletion Factor

The purpose of Mitigation Measure WS-1 is to address potential streamflow depletion effects to CVP and SWP water supply. Reclamation will apply a streamflow depletion factor to mitigate potential water supply impacts from the additional groundwater pumping due to groundwater substitution transfers. The streamflow depletion factor equates to a percentage of the total groundwater substitution transfer that will not be credited to the transferor and is intended to offset the streamflow effects of the added groundwater pumping due to transfer.

As described in the impact analysis, the magnitude of the potential water supply impact depends on hydrologic conditions surrounding the transfer period (both before and after). The exact percentage of the streamflow depletion factor will be assessed and determined on a regular basis by Reclamation and DWR, in consultation with buyers and sellers, based on the best technical information available at that time. The percentage will be determined based on hydrologic conditions, groundwater and surface water modeling, monitoring information, and past transfer data. Application of the streamflow depletion factor will offset potential water supply effects and reduce them to a less than significant level. The streamflow depletion factor may not change every year, but will be refined as new information becomes available and may become more site specific as better data and groundwater modeling becomes available. The minimum streamflow depletion factor (based on modeling completed for this EIS/EIR) will be 13 percent, but this factor may be adjusted based on additional information on local conditions.

Reclamation and DWR require the imposition of a streamflow depletion factor because they will not move transfer water if doing so will violate the no injury rule. This process to evaluate and determine the streamflow depletion factor will help verify that the factor reduces potential impacts to avoid legal injury to CVP or SWP water supplies and a substantial impact or injury.

3.1.5 Potentially Significant Unavoidable Impacts

None of the action alternatives would result in potentially significant unavoidable impacts on water supply.

3.1.6 Cumulative Effects

The timeframe for the Long-Term Water Transfers cumulative analysis extends from 2015 through 2024, a ten year period. The cumulative effects analysis for water supply considers SWP water transfers, the Lower Yuba River Accord (Yuba Accord), CVP M&I Water Shortage Policy (WSP), ~~and~~ the San Joaquin River Restoration Program (SJRRP), and refuge transfers. Chapter 4 further describes these projects and policies.

3.1.6.1 Alternative 2: Full Range of Transfers (Proposed Action)

3.1.6.1.1 Seller Service Area

Groundwater substitution transfers in combination with other cumulative projects could decrease flows in surface water channels following a transfer while groundwater basins recharge, and could decrease pumping at the Jones and Banks Pumping Plants or require additional releases from upstream Project storage. The SWP transfers include groundwater substitution up to a maximum of 6,800 AF. As described in Section 3.1.2.4.1, increased groundwater pumping could result in decreased surface water supplies as a result of surface water and groundwater interactions, resulting in decreased water available for exports at the Delta pumping plants or the need to release additional water from upstream Project reservoirs. Mitigation Measure WS-1 would reduce the impacts of the Proposed Action to less-than-significant levels.

Mitigation Measure WS-1 includes a streamflow depletion factor determined and applied by Reclamation and DWR; both CVP and SWP transfers would be held to this standard to avoid any significant incremental effects. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to changes in surface water flows.

The Proposed Action in combination with other cumulative projects could increase Delta diversions, which could decrease Delta water levels and affect in-Delta water users. SWP transfers, the Yuba Accord, and refuge transfers could affect Delta operations during the same period (July through September) as the Proposed Action. These efforts could increase Delta diversions during dry years. Reclamation and DWR install temporary barriers each year during this time period to reduce effects to Delta water levels; therefore, the effects of the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact.

3.1.6.1.2 Buyer Service Area

The Proposed Action in combination with other cumulative past, present, and future projects could affect water supply in the Buyer Service Area. As described in Table 1-1 in Section 1.2.1, existing CVP water supply allocations for water users south of the Delta are frequently not fully met. In any given WY, the volume of water delivered is dependent on forecasted reservoir inflows and Central Valley hydrologic conditions, amounts of storage in CVP reservoirs, regulatory requirements, and management of Section 3406(b)(2) water resources and Sections 3406 (b)(3) and (d) concerning refuge water supplies (including refuge transfers) in accordance with implementation of the CVPIA. These conditions have had a significant cumulative impact on water supplies in the region.

Other cumulative projects could also affect water supplies. The M&I WSP could change water supplies to CVP users. The SJRRP could affect supplies within the Buyer Service Area as a result of reduced flood flows from the San Joaquin River that could supplement water supply to buyers in wet years. SWP transfers and the ~~Lower~~ Yuba ~~River~~ Accord could also increase supplies to the Buyer Service Area.

Cumulatively, past, present, and future physical and regulatory limitations have reduced water supplies to the Buyer Service Area, which would be a significant cumulative effect on water supply. The Proposed Action would increase water supplies to buyers who may be affected by reduced allocations, which would help offset adverse impacts. Therefore, the Proposed Action's incremental contribution to potentially significant cumulative water supply impacts would not be cumulatively considerable.

3.1.6.2 Alternative 3: No Cropland Modification

Cumulative effects would be the same or less than those described for the Proposed Action in the Seller and Buyer Service Areas.

3.1.6.3 Alternative 4: No Groundwater Substitution

Cumulative effects would be the same or less than those described for the Proposed Action in the Seller and Buyer Service Areas.

3.1.7 References

Bureau of Reclamation. 2004a. *Federal Register December 16, 2004 Volume 69 Number 241, Sacramento River Settlement Contractors. Page 75341-75342*. Accessed on: September 02, 2014. Available at: http://www.gpo.gov/fdsys/pkg/FR-2004-12-16/pdf/04-27479.pdf

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National Oceanic and Atmospheric Administration Fisheries Service (NOAA Fisheries). 2009. Biological Opinion on the Long-Term Central Valley Project and State Water Project Operations Criteria and Plan. National Marine Fisheries Service, Southwest Region, Long Beach, CA. June 4, 2009. 844 pp.

U.S. Fish and Wildlife Service. 2008. *Biological Opinion on the Coordinated Operations of the Central Valley Project (CVP) and State Water Project (SWP). Final*. December 15, 2008.

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Section 3.2 Water Quality

Maintaining surface water quality in California's water bodies is important to ensure safe drinking water and to maintain environmental, recreational, industrial, and agricultural beneficial uses. This section describes the existing water quality of the water bodies within the area of analysis, and discusses potential effects on surface water quality from implementation of the proposed alternatives. Section 3.3 addresses potential water quality effects to groundwater.

Surface water quality effects could occur from all types of transfer methods including cropland idling, crop shifting, groundwater substitution, stored reservoir water, and conservation.

3.2.1 Affected Environment/Environmental Setting

This section identifies the area of analysis, describes applicable laws and policies relevant to water quality, and provides a description of existing water quality for each of the water bodies with the potential to be affected by long-term water transfers.

3.2.1.1 Area of Analysis

The area of analysis for water quality is divided into two regions: the Seller Service Area and the Buyer Service Area. Figure 3.2-1 shows the area of analysis for water quality.

3.2.1.1.1 Seller Service Area

The alternatives have the potential to affect water bodies within the Sacramento River Basin, including:

- Shasta Reservoir and the Sacramento River downstream of Shasta Reservoir to the Sacramento-San Joaquin Delta (Delta);
- Lake Oroville and the Feather River downstream of Lake Oroville; Camp Far West Reservoir, the Bear River downstream of Camp Far West Reservoir, and the Yuba River downstream of the confluence with the Bear River; and Collins Lake and Dry Creek downstream of Collins Lake;

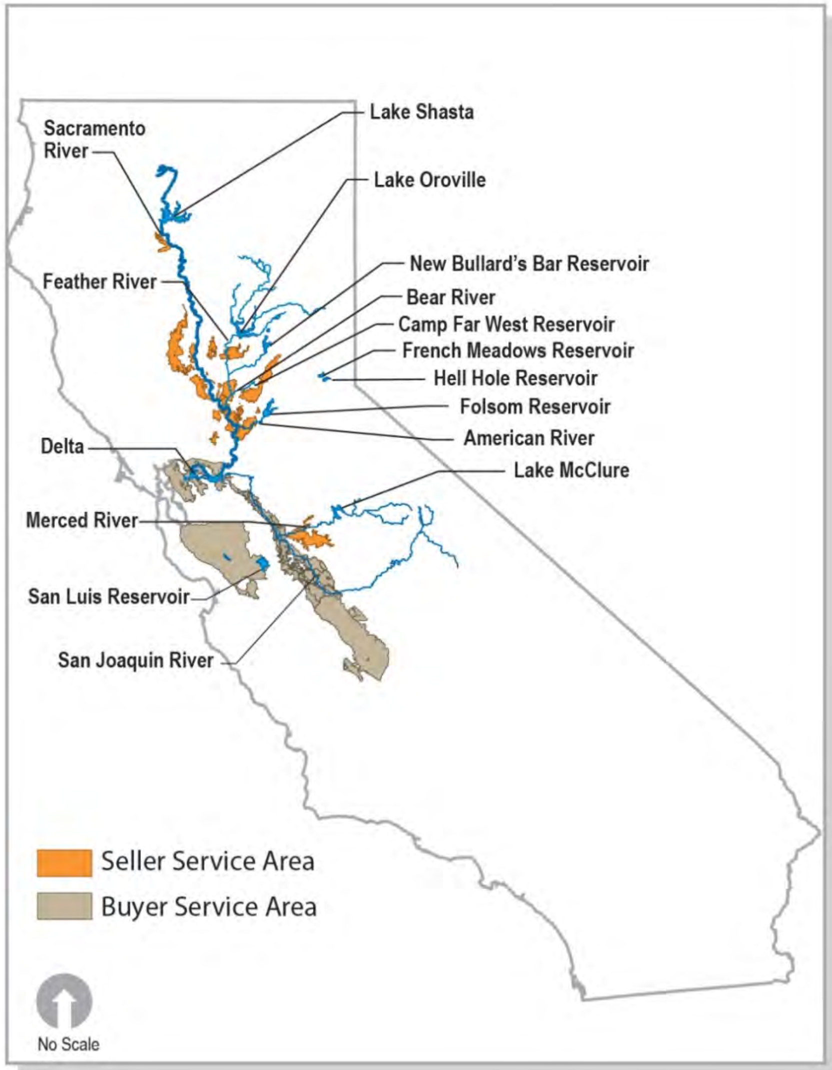


Figure 3.2-1. Water Quality Area of Analysis

- Folsom Reservoir and the American River downstream of Folsom Reservoir to its confluence with the Sacramento River, and Hell Hole and French Meadows reservoirs and the Middle Fork American River downstream of Hell Hole and French Meadows reservoirs; and
- Delta Region, including the river channels and sloughs at the confluence of the Sacramento and San Joaquin rivers.

Within the San Joaquin River Basin, potentially affected water bodies in the Seller Service Area include:

- Lake McClure and the Merced River downstream of Lake McClure; and
- San Joaquin River from the Merced River to the Delta.

3.2.1.1.2 Buyer Service Area

Potentially affected water bodies in the Buyer Service Area include:

- San Luis Reservoir in Merced County.

3.2.1.2 Regulatory Setting

There are numerous Federal and State laws and policies that protect water quality.

3.2.1.2.1 Federal

Safe Drinking Water Act (SDWA)

The Federal SDWA was enacted in 1974 and authorized the U.S. Environmental Protection Agency (USEPA) to establish safe standards of purity for naturally-occurring and man-made contaminants. It requires all owners or operators of public water systems to comply with primary (health-related) standards and encourages attainment of secondary standards (nuisance-related). Contaminants of concern in a domestic water supply are those that either pose a health threat or in some way alter the aesthetic acceptability of the water. These types of contaminants are currently regulated by the USEPA through primary and secondary maximum contaminant levels (MCLs). As directed by the SDWA amendments of 1986, the USEPA has been expanding its list of primary MCLs. MCLs have been proposed or established for approximately 100 contaminants. In California, the USEPA has delegated SDWA powers to the state government.

Clean Water Act (CWA)

The Federal Water Pollution Control Act of 1948 was the first major law addressing water pollution in the United States. When it was amended in 1972, this law became commonly known as the CWA. The CWA established the basic structure for regulating discharges of pollutants into the waters of the U.S. It gave the USEPA the authority to implement pollution control programs and to set water quality standards for known contaminants in surface waters. The CWA also made it unlawful for any person to discharge any pollutant from a point source into navigable waters, unless a permit was obtained under its provisions (USEPA 2002). In California, the USEPA has delegated authority to the state government.

Section 303(d) of the CWA requires states, territories and authorized tribes to develop a list of water quality-impaired segments of waterways. The 303(d) list includes water bodies that do not meet water quality standards for their beneficial uses. The CWA requires that these jurisdictions establish priority rankings for water on the lists and develop action plans, called Total Maximum Daily Loads (TMDLs), to improve water quality (USEPA 2012a). A TMDL is the sum of the allowable loads within an individual waterbody of a single pollutant from all contributing point and nonpoint sources (USEPA 2012a). TMDLs are tools for implementing water quality standards and establish the allowable daily pollutant loadings or other quantifiable parameters (e.g., pH or temperature) for a waterbody.

Several water bodies within the area of analysis have been identified as impaired by certain constituents of concern and appear on the most recent 303(d) list. Table 3.2-1 presents the 2010 303(d) listed water bodies within the area of analysis.

Table 3.2-1. 303(d) Listed Water Bodies Within the Area of Analysis and Associated Constituents of Concern

Water Body Name	Constituent	Estimated Area Affected [2]	Proposed TMDL Completion Year
Shasta Reservoir	Cadmium Copper Zinc Mercury	20 acres 20 acres 20 acres 27,335 acres	2020 2020 2020 2021
Sacramento River (Keswick Dam to Delta)	Chlordane DDT Dieldrin Mercury PCBs Unknown toxicity	16 miles 98 miles 98 miles 16 miles 98 miles 129 miles	2021 2021 2021 2021 2021 2019
Lake Oroville	Mercury PCBs	15,400 acres 15,400 acres	2021 2021
Lower Feather River	Chlorpyrifos Group A Pesticides [1] Mercury PCBs Unknown Toxicity	42 miles 42 miles 42 miles 42 miles 42 miles	2019 2011 2012 2021 2019
Camp Far West Reservoir	Chlorpyrifos Copper Diazinon Mercury	21 miles 21 miles 21 miles 21 miles	2021 2021 2010 2015
Lower Bear River (Below Camp Far West Reservoir)	Mercury	1,945 acres	2015
Dry Creek	Chlorpyrifos Diazinon E.Coli Unknown Toxicity	34 Miles	2021
Hell Hole Reservoir	Mercury	1,370 acres	2021
Folsom Reservoir	Mercury	11,064 acres	2019
Lower American River	Mercury Unknown Toxicity PCBs	27 miles 27 miles 27 miles	2010 2021 2021
Lake McClure	Mercury	5,605 acres	2021

Water Body Name	Constituent	Estimated Area Affected [2]	Proposed TMDL Completion Year
Merced River	Chlorpyrifos	50 miles	2008
	Diazinon	50 miles	2008
	Group A Pesticides [1]	50 miles	2011
	Mercury	50 miles	2019
	Unknown Toxicity	50 miles	2021
	Water Temperature	50 miles	2021
	E.Coli	50 miles	2021
San Joaquin River (Merced River to Delta)	Alpha-BHC	29 miles	2022
	Boron	29 miles	2007
	Chlorpyrifos	40 miles	2007
	DDE	32 miles	2011
	DDT	40 miles	2011
	Diazinon	8.4 miles	2007
	Group A Pesticides [1]	40 miles	2011
	Electrical Conductivity	40 miles	2021
	Mercury	40 miles	2012
	Water Temperature	40 miles	2021
	Toxaphene	3 miles	2019
	Diuron	3 miles	2021
	Unknown Toxicity	40 miles	2019
Sacramento-San Joaquin Delta	Chlordane	6,795 acres	2007
	Chlorpyrifos	43,614 acres	2011
	DDT	43,614 acres	2011
	Diazinon	43,614 acres	2007
	Dieldrin	6,795 acres	2011
	Dioxin	1,603 acres	2019
	Electrical Conductivity	20,819 acres	2019
	Furan Compounds	1,603 acres	2019
	Group A Pesticides	43,614 acres	2011
	Invasive Species	43,614 acres	2019
	Mercury	43,614 acres	2009
	Organic Enrichment/ Low Dissolved Oxygen	1,603 acres	2007
	Pathogens	1,603 acres	2008
	PCBs	8,398 acres	2019
	Unknown Toxicity	43,614 acres	2019

Source: SWRCB 2011.

Key:

alpha-BHC = Benzenehexachloride or alpha-HCH

DDE = Dichlorodiphenyldichloroethylene

DDT =Dichlorodiphenyltrichloroethane

PCBs = Polychlorinated biphenyls

Notes:

[1] Group A Pesticides: aldrin, dieldrin, endrin, chlordane, heptachlor, heptachlor expoxid, hexachlorocyclohexane, endosulfan, and toxaphehe

[2] Estimated area affected is given as the surface area (acres) of lakes or estuaries or length (river miles) for river systems.

The National Pollutant Discharge Elimination System is a permit program authorized by the CWA that controls water pollution by regulating point source discharges into waters of the United States. In California, the USEPA has delegated authority of this program to the State Water Resources Control Board (SWRCB). The SWRCB ensures that all point source discharges to surface waters will not conflict with existing water quality laws and the water quality standards established for that specific water body.

3.2.1.2.2 State

Porter-Cologne Water Quality Control Act

The California Porter-Cologne Water Quality Act (Porter-Cologne Act) was enacted in 1969 and established the SWRCB and nine Regional Water Quality Control Boards (RWQCBs). These boards are the primary agencies responsible for protecting California water quality to meet present and future beneficial uses. They are also responsible for regulating appropriative surface rights allocations.

According to the Porter-Cologne Act, the RWQCBs must establish water quality objectives for water bodies within their regions. The Porter-Cologne Act defines water quality objectives as "… the limits or levels of water quality constituents or characteristics which are established for the reasonable protections of the beneficial uses of water or the preventions of nuisance within a specified area" [Water Code 13050(H)]. The RWQCBs do this through the adoption of water quality control plans, or Basin Plans.

Regional Water Quality Control Plans

California Water Code (Section 13240) requires the preparation and adoption of water quality control plans (Basin Plans), and the Federal CWA (Section 303) supports this requirement. According to Section 13050 of the California Water Code, Basin Plans consist of a designation or establishment of beneficial uses to be protected, water quality objectives to protect those uses, and an implementation program for achieving the objectives. Because beneficial uses, together with their corresponding water quality objectives, can be defined per Federal regulations as water quality standards, the Basin Plans are regulatory references for meeting the State and Federal requirements for water quality control (40 Code of Federal Regulations 131.20).

Basin Plans present water quality objectives in numerical or narrative format for specified water bodies or for protection of specified beneficial uses throughout a specific basin or region. State law defines beneficial uses to include (but not be limited to) "...domestic; municipal; agricultural and industrial supply; power generation; recreation; aesthetic enjoyment; navigation; and preservation and enhancement of fish, wildlife, and other aquatic resources or preserves" (Water Code Section 13050(f)). The beneficial uses designated for water bodies within the area of analysis are presented in Table 3.2-2 (Seller Service Area), and Table 3.2-3 (Buyer Service Area).

Table 3.2-2. Beneficial Uses of Water Bodies in the Seller Service Area

Beneficial Use Designation	Shasta Reservoir	Sacramento River	Lake Oroville	Lower Feather River	Bear River	Camp Far West Reservoir	Lower Yuba River	Hell Hole and French Meadows Reservoirs	Middle Fork American River	Folsom Reservoir	Lower American River	Lake McClure	Merced River	San Joaquin River	Sacramento-San Joaquin Delta
Municipal and Domestic Supply	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓
Agricultural Irrigation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Stock Watering		✓			✓	✓	✓	✓	✓				✓	✓	✓
Industrial Process Supply													✓	✓	✓
Industrial Service Supply		✓									✓		✓		✓
Power Generation	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓	✓	
Water Contact Recreation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Canoeing and Rafting		✓		✓	✓		✓		✓		✓		✓	✓	
Non-contact Water Recreation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Warm Freshwater Habitat	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	✓	✓
Cold Freshwater Habitat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Beneficial Use Designation	Shasta Reservoir	Sacramento River	Lake Oroville	Lower Feather River	Bear River	Camp Far West Reservoir	Lower Yuba River	Hell Hole and French Meadows Reservoirs	Middle Fork American River	Folsom Reservoir	Lower American River	Lake McClure	Merced River	San Joaquin River	Sacramento-San Joaquin Delta
Warm and Cold Water Migration Areas		✓		✓			✓						✓	✓	✓
Warm Water Spawning Habitat	✓	✓	✓	✓			✓			✓			✓	✓	✓
Cold Water Spawning Habitat	✓	✓	✓	✓			✓	✓	✓		✓		✓		
Navigation		✓													✓
Wildlife Habitat	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

Source: RWQCBCV 2011

Table 3.2-3. Beneficial Uses of Water Bodies in the Buyer Service Area

Beneficial Use Designation	California Aqueduct	Delta-Mendota Canal	San Luis Reservoir
Municipal and Domestic Supply	✓	✓	✓
Agricultural Irrigation	✓	✓	✓
Stock Watering	✓	✓	✓
Industrial Process	✓	✓	
Service Supply	✓		✓
Power Generation	✓		✓
Water Contact Recreation	✓	✓	✓
Non-contact Water Recreation	✓	✓	✓
Warm Freshwater Habitat		✓	✓
Wildlife Habitat	✓	✓	✓

Source: RWQCBCV 2011

The current Basin Plan that covers the water bodies in the Seller Service Area and Buyer Service Area (with the exception of the Delta) is the *Water Quality Control Plan (Basin Plan) for the Sacramento River and San Joaquin River Basins* (RWQCB, Central Valley [RWQCBCV] 2011). The current plan that covers the Delta is the *Water Quality Control Plan for the San Francisco Bay/Sacramento-San Joaquin Delta Estuary* (SWRCB 2006), which was originally adopted in 1996 and revised in 2006. This plan is referred to as the Bay-Delta Plan.

SWRCB Decision 1641

SWRCB Decision-1641 and Water Right Order 2001-05 describe the current water right requirements to implement the flow-dependent objectives outlined in the Bay-Delta Plan. In SWRCB Decision-1641, the SWRCB assigned responsibilities to Reclamation and Department of Water Resources (DWR) for meeting these requirements. These responsibilities require that the Central Valley Project (CVP) and State Water Project (SWP) be operated to protect water quality, and that DWR and/or Reclamation ensure that the flow dependent water quality objectives are met in the Delta (SWRCB 2000).

Reclamation Non-Project Water Acceptance Criteria

Reclamation has developed water quality criteria that must be met to add non-CVP water into the Delta-Mendota Canal (Reclamation 2014). Reclamation has developed these criteria to measure constituents of concern that would affect downstream users. The concentration for selenium must not exceed 2 μg/L, the limit for the Grasslands wetlands water supply channels specified in the 1988 Basin Plan. The salinity of any source shall not exceed 1,500 mg/L TDS. The other constituents are mainly agricultural chemicals listed in the California Drinking Water Standards.

DWR Non-Project Water Acceptance Criteria
DWR has developed acceptance criteria to govern the water quality of non-Project water that may be conveyed through the California Aqueduct. These criteria dictate that a pump-in entity of any non-project water program must demonstrate that the water is of consistent, predictable, and acceptable quality prior to pumping the local groundwater into the SWP. Since there cannot be any adverse impacts to SWP water deliveries, operations or facilities, the water quality criteria cannot constrain DWR's ability to operate the SWP for its intended purposes or to protect its integrity during emergencies (DWR 2014).

The Sustainable Groundwater Management Act (SGMA)
The Sustainable Groundwater Management Acts (SGMA) [California State Assembly Bill 1739 and Senate Bills 1168 and Senate Bill 1319] were signed into law in September, 2014. See section 3.3.1.2 for the effect on proposed buyer and seller regions in regard to their groundwater management, land use, water demands, and water availability due to the implementation of the SGMA.

3.2.1.3 Existing Conditions

The following sections describe the general water quality for each of the water bodies in the area of analysis. The water quality information varies by geographic area due to availability of water quality data and the specific water quality concerns for each water body.

3.2.1.3.1 Seller Service Area

Sacramento River Area of Analysis

Shasta Reservoir
Shasta Reservoir receives water from the Sacramento River, McCloud River, and Pit River drainages and generally has good water quality. Shasta Reservoir is listed on the 2010 303(d) list as impaired due to heavy metal accumulations (mercury, cadmium, copper and zinc) from natural resource extraction. Streams that drain into Shasta Reservoir come in contact with areas disturbed by mining and become acidic and can contain concentrations of dissolved metals that violate existing water quality standards. The sources of the include West Squaw Creek below Balakala Mine, lower Little Backbone Creek, lower Horse Creek, and Town Creek, which are listed as impaired on the 2010 303(d) list (Reclamation 2013a).

Turbidity in Shasta Reservoir occurs from sediment discharge from tributaries, as well as wave erosion and shoreline erosion from changing surface water levels. Turbidity can decrease the clarity of the lake along the shoreline and can affect water-based recreation (Reclamation 2013a).

Table 3.2-4 summarizes general water quality in Shasta Reservoir.

Table 3.2-4. Water Quality in Shasta Reservoir

Water Quality Parameter	Minimum	Maximum	Average
pH[1] (standard units)	7.3	8.3	7.8
Turbidity[2] (NTU)	0.1	6553	27.5
Dissolved Oxygen[2] (mg/L)	0.1	24.2	10.7
Total Nitrogen[1](mg/L)	0.2	0.2	0.2
Total Phosphorus[1](mg/L)	0.01	0.03	0.02
Electrical Conductivity[1] (μS/cm)	68.0	109	95.3

Sources: [1-]Storet 1975; [2-]California DWR 2013. Water quality data from the California Data Exchange Center is from continuously hourly data from 2006 through 2011.

Key: NTU = Nephelometric Turbidity Units , mg/L = milligrams per liter; μS/cm = micro siemens per centimeter

Sacramento River

The 303(d) list indicates that certain segments of the Sacramento River contain several constituents of concern, including Chlordane, dichlorodiphenyltrichloroethane, Dieldrin, mercury, polychlorinated biphenyls (PCBs), and unknown toxicity (see Table 3.2-1); however, the water quality in the Sacramento River is generally of high quality and concentrations of undesirable constituents are generally low. The following sections report general water quality data for two locations along the Sacramento River.

Sacramento River at Balls Ferry

The Sacramento River sampling site at Balls Ferry is downstream of Shasta Dam approximately 21 miles south of Redding. Stream flow at this site is greatly influenced by managed releases from Shasta Reservoir and, during the rainy season, by storm water runoff. Water quality in this region is also influenced by human activities along the Sacramento River including agricultural, historical mining, and municipal and industrial (M&I) inputs (Reclamation 2013a). Land cover in the area is mainly forestland; cropland, pasture, and rangeland cover most of the remaining land area (U.S. Geological Survey [USGS] 2002).

Water quality within this portion of the Sacramento River is generally good. Water quality issues include the presence of mercury, pesticides, and trace metals.

Table 3.2-5 presents data for the general water quality parameters.

Table 3.2-5. Water Quality Parameters Sampled[1]on the Sacramento River at Balls Ferry

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.69	8.32	7.5
Turbidity (NTU)	0.54	64.3	7.5
Dissolved Oxygen (mg/L)	8.1	14	10.9
Total Organic Carbon (mg/L)	0.5	3.5	1.65
Total Nitrogen (mg/L)	0	1.3	0.14
Total Phosphorus (mg/L)	0.01	0.16	0.03
Electrical Conductivity (µS/cm)	79	136	113

Sources: DWR 2013
[1] Samples Collected 12/2000 – 08/2010

Sacramento River at Hood

The Sacramento River sampling site at Hood is located on the Lower Sacramento River south of Sacramento. Therefore, water quality samples at this site reflect the impacts of land use upstream. Impacts to water quality in this region include agricultural runoff, acid mine drainage, stormwater runoff, water releases from dams, diversions, and urban runoff (Reclamation 2013a). Table 3.2-6 presents the general water quality data for samples collected at Hood.

Table 3.2-6. Water Quality Parameters Sampled[1] at Sacramento River at Hood

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.4	8.4	7.5
Turbidity (NTU)	1.2	240	18.7
Dissolved Oxygen (mg/L)	5.2	12.4	8.8
Total Organic Carbon (mg/L)	0.6	11	2.4
Total Nitrogen (mg/L)	0.01	0.4	0.1
Total Phosphorus (mg/L)	0.02	1.0	0.09
Electrical Conductivity (µS/cm)	73	234	154

Sources: DWR 2013
[1] Samples Collected 01/2006 - 01/2013.

Feather River Area of Analysis

Lake Oroville

Lake Oroville generally has good water quality. The following water quality information was obtained from the 2007 Draft Environmental Impact Report (EIR) Oroville Facilities Relicensing (DWR 2007), which described water quality monitoring results for 2002 through 2004. Water temperatures from Lake Oroville releases generally met the Feather River temperature requirements established for the downstream hatchery. When temperature exceedances did occur, they were usually minor. In Lake Oroville, dissolved oxygen and pH levels at the monitoring stations generally met the objectives in the Basin Plan for the Sacramento River and San Joaquin River Basins.

Occasionally, when Lake Oroville is thermally stratified during the summer, dissolved oxygen measured near the surface and bottom of the reservoir did not meet the Basin Plan objective. Mineral and electrical conductivity (EC) met all Basin Plan objectives (DWR 2007).

Lake Oroville retains most sediment that flows into the reservoir from the upper watershed, and only suspended material is released into the lower Feather River. Wave and wind action at the reservoir can result in some shoreline erosion (DWR 2007). Recreation activities can introduced contaminants into Lake Oroville, including sediment, petroleum hydrocarbons, bacteria/organic sewage, metals, pesticides, and garbage (California Department of Parks and Recreation [CDPR] 2004). Lake Oroville is not a significant source of metals but does trap sediments from upstream historic mining. Lake Oroville is listed as impaired on the 2010 303(d) list for mercury and PCBs. The source of the mercury is listed as resource extraction and likely attributed to upstream historic mining activities; the source of the PCBs is unknown.

Lower Feather River

The Lower Feather River extends from Lake Oroville down to its confluence with the Sacramento River. Water quality in the lower Feather River is substantially affected by agriculture and urbanization (Sacramento River Watershed Program 2010). The lower Feather River appears on the 2010 303(d) list of impaired water bodies for chlorpyrifos, Group A pesticides, mercury, PCBs and unknown toxicity. The source of the chlorpyrifos and Group A pesticides is listed as agriculture while the source of the mercury is listed as abandoned mines. The source of the PCBs and unknown toxicity remains unknown.

A major constituent of concern on the lower Feather River is diazinon, a pesticide applied to orchards growing plums, peaches and almonds. In 2002, the lower Feather River was listed on the 303(d) list of impaired water bodies for diazinon. In 2003, the RWQCBCV implemented TMDLs for this pesticide and worked with stakeholders to implement methods to reduce diazinon loading. As a result, 79 miles of river, including the lower Feather River, were removed from the 303(d) list in 2010 (USEPA 2012b) for impairment by diazinon.

Table 3.2-7. Water Quality Parameters Sampled[1] at the Feather River near Verona

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.8	8.5	7.6
Turbidity (NTU)	2.77	46.8	13.3
Dissolved Oxygen (mg/L)	7.5	10.7	9.1
Total Organic Carbon (mg/L)	0.8	4.6	1.8
Total Nitrogen (mg/L)	0.02	0.16	0.06
Total Phosphorus (mg/L)	0.01	0.08	0.03
Electrical Conductivity (µS/cm)	65	131	97

Sources: DWR 2013
[1] Samples Collected 01/2006 - 01/2013.

Yuba River Area of Analysis

Collins Lake
Collins Lake is a reservoir created to provide additional irrigation water for Browns Valley Irrigation District (ID). The reservoir has a total storage capacity of 49,500 acre-feet (AF) (Browns Valley ID 2014). Dry Creek is located downstream of the lake, which eventually joins the Yuba River. Collins Lake is not currently listed for any 303(d) water quality impairments.

Dry Creek
Dry Creek is currently listed as impaired by chlorpyrifos, diazinon, E.Coli, and unknown toxicity. Chlorpyrifos and diazinon are pesticides with agriculture listed as potential sources. Potential sources of E.Coli and unknown toxicity are listed as unknown.

Lower Yuba River
The water quality of the lower Yuba River is generally good and has improved in recent decades due to controls on hydraulic and other destructive mining techniques, changes in pesticide regulations, and the establishment of minimum instream flows (HDR and SWRI 2007). Dissolved oxygen concentrations, total dissolved solids (TDS), pH, hardness, alkalinity, and turbidity are well within acceptable or preferred ranges for salmonids and other key freshwater biota. The surface water monitoring performed by the Sacramento River Watershed Program over the past decade generally indicates that water quality supports the beneficial uses (e.g., irrigation, fisheries habitat) designated for the water bodies in the Yuba River Basin (Sacramento River Watershed Program 2010). To date, no TMDLs have been established for the Yuba River.

Table 3.2-8 presents general water quality data for the lower Yuba River near the Feather River confluence.

Table 3.2-8. Water Quality Parameters Sampled[1] on the Yuba River Upstream of Feather River Confluence (Yuba R A MO)

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.9	8.3	7.5
Turbidity (NTU)	1.17	46.8	9.18
Dissolved Oxygen (mg/L)	7.72	12.2	10.3
Total Organic Carbon (mg/L)	0.9	2.3	1.6
Total Nitrogen (mg/L)	0.01	0.07	0.04
Total Phosphorus (mg/L)	0.01	0.03	0.01
Electrical Conductivity (µS/cm)	66	100	85.7

Sources: DWR 2013
[1] Samples collected 11/2008 – 2/2011

Bear River Area of Analysis

Camp Far West Reservoir

Camp Far West Reservoir is listed as impaired by mercury on the 2010 303(d) list. Historic gold mining has led to elevated mercury concentrations in fish, especially spotted bass. The California Office of Environmental Health Hazard Assessment (OEHHA) has issued a public advisory recommending no consumption of largemouth, smallmouth, or spotted bass from Camp Far West Reservoir by women of childbearing age and children (California OEHHA 2009).

Bear River

Flows within the Bear River are continuous and dependent on releases from Camp Far West Reservoir. The lower Bear River is listed as impaired by chlorpyrifos, copper, diazinon, and mercury. The source of the chlorpyrifos and diazinon is agriculture. The source of the copper is unknown. The mercury is from historic mining, as noted above for Camp Far West Reservoir (SWRCB 2011).

Table 3.2-9 presents general water quality data for the lower Bear River.

Table 3.2-9. Water Quality Parameters Sampled[1] on the Lower Bear River (Bear R NR MO)

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.8	7.9	7.4
Turbidity (NTU)	0.8	101	23.3
Dissolved Oxygen (mg/L)	5.5	12.1	8.7
Total Organic Carbon (mg/L)	1.1	10.5	4.3
Total Nitrogen (mg/L)	0.02	0.26	0.97
Total Phosphorus (mg/L)	0.02	0.19	0.07
Electrical Conductivity (µS/cm)	85	208	140

Sources: DWR 2013
[1] Samples collected 11/2008 – 8/2012

American River Area of Analysis

French Meadows Reservoir

Water in French Meadows Reservoir is generally considered to be of good quality with a strong trout population. There are currently no TMDLs developed for French Meadows Reservoir. Limited water quality data is available for French Meadows Reservoir, as shown in Table 3.2-10.

Table 3.2-10. Water Quality Parameters Sampled~~1~~ at French Meadows Reservoir

Water Quality Parameter	Value
pH (standard units)	7.3
Turbidity (NTU)	0.4
Total Organic Carbon (mg/L)	1.2
Total Phosphorus (mg/L)	1.1
Electrical Conductivity (µS/cm)	26

Source: Storet 1985

Hell Hole Reservoir

Water in Hell Hole Reservoir is generally considered to be of good quality. In 2010 the Commercial and Sport Fishing designated use was listed as impaired due to mercury impairment. A TMDL has not yet been developed for this impairment. The source of the mercury exceedance is listed as unknown (USEPA 2013). Limited water quality data is available for Hell Hole Reservoir, as shown in Table 3.2-11.

Table 3.2-11. Water Quality Parameters Sampled~~1~~ at Hell Hole Reservoir

Water Quality Parameter	Value
pH (standard units)	7.1
Electrical Conductivity (µS/cm) a	26

Source: Storet 1969

Middle Fork American River

Water in the Middle Fork American River is generally considered to be of good quality. Table 3.2-12 presents the results of a region-wide RWQCBCV Recreation Beneficial Use Study in 2008 for the Middle Fork American River.

Table 3.2-12. Water Quality Parameters Sampled on the Middle Fork American River at Mammoth Bar

Water Quality Parameter	08/27/2008	08/31/2008	09/03/2008
pH (standard units)	9.08	7.11	5.41
Temperature (º C)	20.8	18.8	18.4
Specific Conductivity (umhos/cm)	40	40	37
E Coli (MPN/100mL)	2	2	1

Sources: SWRCB 2008

Folsom Reservoir

Snowmelt and precipitation from the upper American River Watershed discharges water into Folsom Reservoir and Lake Natoma. In general, runoff from the relatively undeveloped watershed is of very high quality, rarely exceeding California's water quality objectives (Wallace, Roberts, & Todd et al. 2003). Due to changes in the operation of Shasta Dam, releases from Folsom Reservoir are used to fulfill water delivery obligations and downstream water quality standards that would normally be met by releases from Shasta (Reclamation 2013b). The reservoir is listed on the 2010 303(d) list as impaired by mercury. The source of the mercury is historic mining. Table 3.3-13 presents general water quality data for Folsom Reservoir.

Table 3.2-13. Water Quality Parameters Sampled at Folsom Reservoir

Water Quality Parameter	Minimum	Maximum	Average
PH (standard units)	5.8	8.5	7.1
Turbidity (NTU)	1	68	1.2
Dissolved Oxygen (mg/L)	7.0	14	10.3
Total Organic Carbon (mg/L)	2	3.5	N/A
Total Nitrogen (mg/L)	N/A	N/A	N/A
Total Phosphorus (mg/L)	N/A	N/A	N/A
Electric Conductivity (µS/cm)	19	123	52

Source: Larry Walker Associates 1999

Lower American River

Gold mining has occurred within the American River basin since the Gold Rush in 1848. The lower American River is listed as an impaired water body because of mercury lost during gold recovery. The urbanized portions of the lower American River are also listed for unknown toxicity. This is believed to be a result of use of herbicides and pesticides on landscaped residential and commercial areas.

Table 3.2-14. Water Quality Parameters Sampled[1] on the Lower Fork American River (American River at Water Treatment Plant)

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	5.9	9.3	7.4
Turbidity (NTU)	0.7	146	4.5
Dissolved Oxygen (mg/L)	5.2	12.95	9.5
Total Organic Carbon (mg/L)	0.7	3.0	1.7
Total Nitrogen (mg/L)	0.01	0.19	0.05
Total Phosphorus (mg/L)	0.01	0.1	0.02
Electrical Conductivity (µS/cm)	40	95	60

Sources: DWR 2013

[1] Samples collected 01/2006 – 12/2012

Table 3.2-15 summarizes water quality data measured downstream of Folsom Dam in Lake Natoma at Negro Bar from April to September 2008. In general, water quality in Lake Natoma meets standards in the Basin Plan for the Sacramento River and San Joaquin River Basins.

Table 3.2-15. Water Quality at Lake Natoma (at Negro Bar) - April to September 2008

Water Quality Parameter	Units	Minimum	Maximum	Average	RL
Arsenic (Dissolved)	µg/l	<0.5	<0.5	0.5	0.5
Barium (Dissolved)	µg/l	11	17	13.5	0.5
Calcium (Dissolved)	mg/l	5	9	7	1
Chromium (Dissolved)	µg/l	<0.5	1	0.74	0.5
Copper (Dissolved)	µg/l	0.5	0.8	0.6	0.5
Cyanide	µg/l	<2.0	<2.0	<2.0	2.0
Iron (Dissolved)	µg/l	<100	<100	<100	100
Magnesium (Dissolved)	mg/l	1	3	2	1
Manganese (Dissolved)	µg/l	5	28	15.5	0.6
Mercury	ng/l	<2.0	<2.0	<2.0	2.0
Nickel (Dissolved)	µg/l	<1.0	<1.2	<1.2	1.2
Silver (Dissolved)	µg/l	<0.5	<0.6	<0.6	0.5
TDS	mg/l	40	72	52	10
TSS	mg/l	<1.0	3.4	2.4	1.0
Zinc (Dissolved)	µg/l	<2.0	<2.5	<2.5	2.5

Source: Reclamation 2009
Key:
RL = reporting limit

Merced River Area of Analysis

Lake McClure

Very little water quality data was available for Lake McClure. The lake is listed as impaired for mercury due to resource extraction. Table 3.2-16 presents general water quality data collected on the Merced River, just upstream from Lake McClure.

Table 3.2-16. Water Quality Parameters Sampled[1] on the Merced River Near Briceburg

Water Quality Parameter	Average
pH (standard units)	7.2
Turbidity (NTU)	2
Dissolved Oxygen (mg/L)	10
Total Organic Carbon (mg/L)	1.6
Total Nitrogen (mg/L)	0.16
Total Phosphorus (mg/L)	0.02
Electrical Conductivity (µS/cm)	43

Source: Kratzer and Shelton 1998
[1] *Samples were collected during the period from 1972 through 1990.*

The results from three additional sampling events in March and April 2003 on the Merced River at Briceberg are presented in Table 3.2-17.

Table 3.2-17. Water Quality Parameters Sampled on the Merced River At Briceburg

Water Quality Parameter	Average[1]
pH (standard units)	7.8
Turbidity (NTU)	1.7
Dissolved Oxygen (mg/L)	12
Total Organic Carbon (mg/L)	1.5
Electrical Conductivity (µS/cm)	61

Source: DWR 2013
[1] Samples were collected from March-April 2003

Merced River
Table 3.2-18 presents general water quality data for the Merced River near Stevinson (near the mouth of the Merced River). The Merced River is listed as impaired by mercury due to resource extraction.

Table 3.2-18. Water Quality Parameters Sampled[1] on the Merced River Near Stevinson

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.29	7.5	6.9
Turbidity (NTU)	2.13	22.8	7.3
Dissolved Oxygen (mg/L)	7.88	12.1	9.7
Electrical Conductivity (µS/cm)	58	156	105

Source: DWR 2013
[1] Samples were collected during the period from 09/1998 – 05/1999.

San Joaquin River Area of Analysis
Agricultural drainage, along with wastewater treatment plant discharges, runoff from dairies, and other sources, contribute to suspended sediment and other constituents of concern in the river. San Joaquin River water quality standards include salinity standards at Vernalis, which is just downstream of the confluence with the Stanislaus River. The salinity standard (measured as EC) is 700 µS/cm from April 1 to August 31, and 1000 µS/cm for the remainder of the year. Water quality in the San Joaquin River at Maze River (just upstream of the water quality compliance point at Vernalis) is shown in Table 3.2-19. Water quality at Vernalis is presented in Table 3.2-20. The Stanislaus River enters the San Joaquin River between these two points, and at some times, can be used to improve water quality to meet standards at Vernalis.

Table 3.2-19. Water Quality Parameters Sampled[1] on the San Joaquin River At Maze Bridge

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	7.2	8.5	7.8
Turbidity (NTU) [2]	5	160	32.1
Total Organic Carbon (mg/L)	3.6	7.7	4.9
Total Nitrogen (mg/L)	1.6	3.3	2.4
Total Phosphorus (mg/L)	0.19	0.57	0.42
Electrical conductivity (µS/cm)	213	1700	1140

Source: DWR 2013
[1] Samples taken from 1984 through 1994.

Table 3.2-20. Water Quality Parameters Sampled[1] on the San Joaquin River At Vernalis

Water Quality Parameter	Minimum	Maximum	Average
pH (standard units)	6.9	9.07	7.7
Turbidity (NTU) [2]	1.9	157	18.5
Total Organic Carbon (mg/L)	1.4	10.4	3.8
Total Nitrogen (mg/L)	0.08	3.2	1.3
Total Phosphorus (mg/L)	0.05	0.37	0.15
Electrical conductivity (µS/cm)	99	1077	531

Source: DWR 2013
[1] Samples taken from 2006 through 2013.

Delta Region

Delta Water Quality Concerns

The existing water quality constituents of concern in the Delta can be categorized broadly as metals, pesticides, nutrient enrichment and associated eutrophication, constituents associated with suspended sediments and turbidity, salinity, bromide, and organic carbon. Salinity is a water quality constituent that is of specific concern and is described below. Table 3.2-21 presents water quality data for salinity at selected stations within the Delta.

Table 3.2-21. Water Quality Data for Selected Stations within the Delta

Location	Mean TDS (mg/L)	Mean Electrical Conductivity (µS/cm)	Mean Chloride, Dissolved (mg/L)
Sacramento River at Hood	92.4	155	6.1
North Bay Aqueduct at Barker Slough	188	323	24
SWP Clifton Court Intake	235	401	62
CVP Banks Pumping Plant	225	392	59
Contra Costa Intake at Rock Slough	255	553	77
San Joaquin River at Vernalis	324	531	68

Source: DWR 2013
mg/L = milligram per liter.
µS/cm = microsiemen per centimeter
Sampling period varies, depending on location and constituent, but generally is between 2006-2012

Salinity

Salinity is a measure of the mass fraction of dissolved salts (including chloride and bromide) in water, typically measured in parts per thousand (ppt). Salinity may also be measured using other methods. TDS is a measure of the concentration of salt, as measured in milligrams per liter (mg/L) (DWR 2001). TDS is defined as those solids remaining after drying a sample to a constant weight at 180 degrees Celsius. EC is a measure of the ability of a solution to carry a current and depends on the total concentration of ionized substances dissolved in the water. Because changes in EC of water are generally directly proportional to changes in dissolved salt concentrations, EC is a convenient surrogate measure for TDS.

Salinity is a concern in the Delta because it can adversely affect municipal, industrial, agricultural, and recreational uses. Table 3.2-22 illustrates that within the Delta, mean TDS concentrations are highest in the west Delta and the south Delta channels that are affected by the San Joaquin River (CALFED 2007~~0~~). Salinity issues in the Sacramento and San Joaquin rivers result from natural sources, urban discharges, and agricultural discharges. As the water from the rivers flows through the Delta, salinity intrusion from the Pacific Ocean contributes to these issues. The extent of seawater intrusion into the Delta is a function of daily tidal fluctuations, the freshwater inflow to the Delta from the Sacramento and San Joaquin rivers, the rate of export at the SWP and CVP intake pumps, and the operation of various control structures, such as the Delta Cross-Channel Gates and Suisun Marsh Salinity Control System (DWR 2001). In the southern Delta, salinity is largely associated with the high concentrations of salts carried by the San Joaquin River into the Delta (SWRCB 1999). The high mean concentration of TDS in the San Joaquin River at Vernalis reflects the accumulation of salts in agricultural soils and the effects of recirculation of salts via the Delta Mendota Canal (CALFED 2007~~0~~). Locations in the north portion of the Delta at Barker Slough and in the Sacramento River at Greene's Landing, which are not substantially affected by seawater intrusion, have lower mean concentrations of TDS than other locations in the Delta. A similar pattern is seen using mean EC levels as a surrogate for TDS.

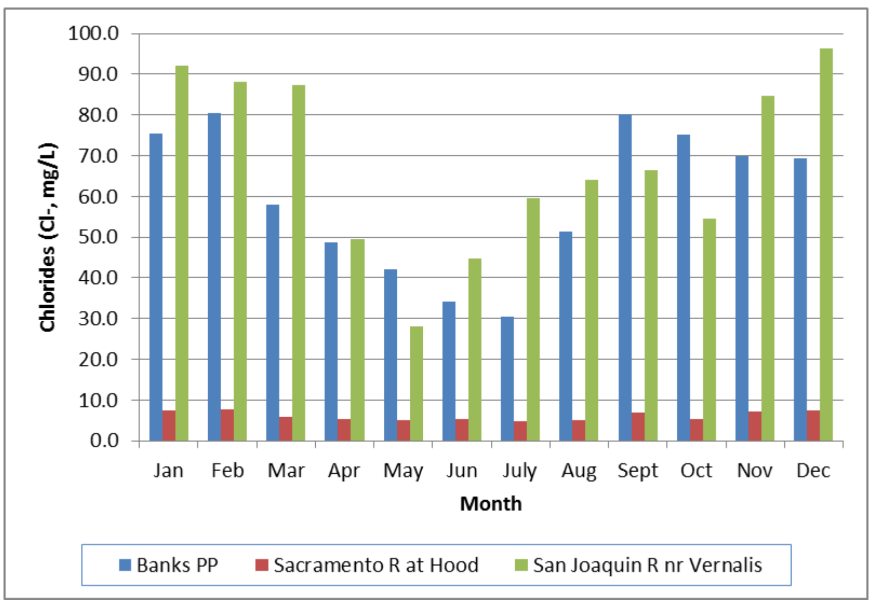
Table 3.2-22. Comparison of TDS Concentrations at Selected Stations Within the Delta

TDS (mg/L)	Sacramento River at Greenes/Hood	Old River at Station 9	Banks Pumping Plant	San Joaquin River Near Vernalis/Mossdale
Mean	95	200	195	273
Median	92	173	182	261
Low	50	107	116	83
High	404	450	388	578

Source: DWR 2001
TDS detection limit = 1.0 mg/L
Samples collected between 1996 and 1999

Water quality data collected between 1996 and 1999 show that TDS levels at Banks Pumping Plant, in the Sacramento River at Hood, and in the western Delta at Old River at Station 9 never exceeded the secondary MCL for drinking water of 500 mg/L (Table 3.2-22) (DWR 2001). In the San Joaquin River near Vernalis, only six out of the 143 samples exceeded the secondary MCL for TDS. The secondary MCL for chloride is 250 mg/L, and the secondary MCL for EC is 900 microsiemen per centimeter (µS/cm). Because TDS is a measure of the TDS and does not measure the relative contribution of individual constituents such as chloride and bromide, it is possible to meet the secondary TDS MCL for TDS (500 mg/L) but still exceed a standard for an individual salt constituent such as chloride (250 mg/L) (DWR 2001). For this reason, and because of their importance in formation of disinfection by-products, chloride is addressed in detail in the following sections.

Figure 3.2-2 presents monthly median chloride concentrations at Banks Pumping Plant, Sacramento River at Hood, and the San Joaquin River near Vernalis. As Figure 3.3-2 shows, the lowest median concentrations of chloride typically occur in spring and early summer (April through July). The monthly median concentrations of chloride for the period of record (January 2006-December 2012) do not exceed the secondary MCL for chloride of 250 mg/L. <u>D-1641 standards also require that export locations maintain mean monthly chloride concentration less than 250mg/L.</u>

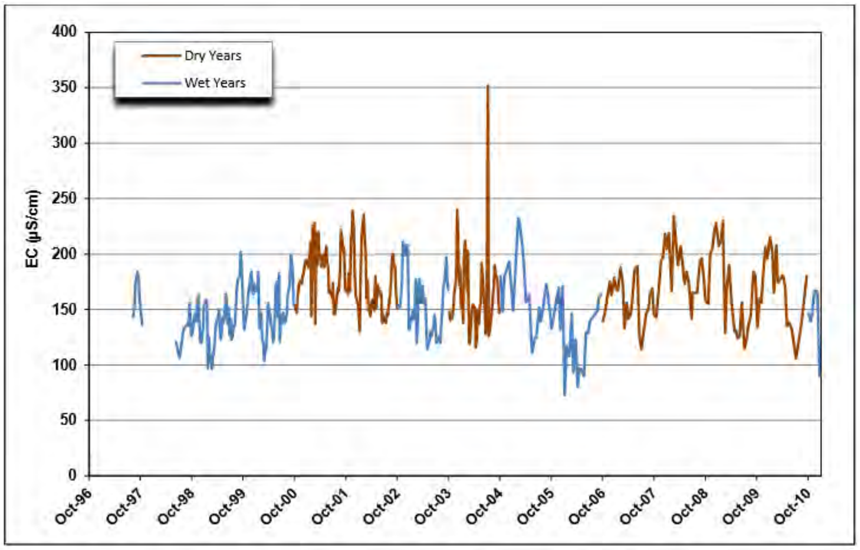


Source: DWR 2013.

Note: Bars represent the average monthly value.

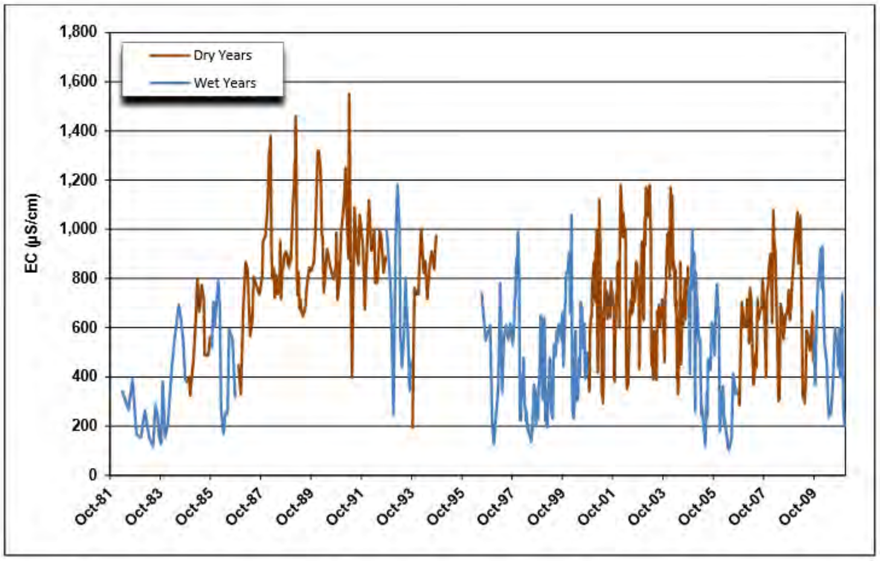
Figure 3.2-2. Monthly Average Chloride Concentrations at Banks Pumping Plant, Sacramento River at Hood, and San Joaquin River near Vernalis

Salinity patterns in the Delta also vary with water year type. As shown in Figure 3.2-3 through 3.2-5, salinity, as measured by EC, is higher in dry years than in wet years. In addition, EC levels generally rise during the late summer and fall months when river flows are low and saltwater from the San Francisco Bay flows into the Delta.



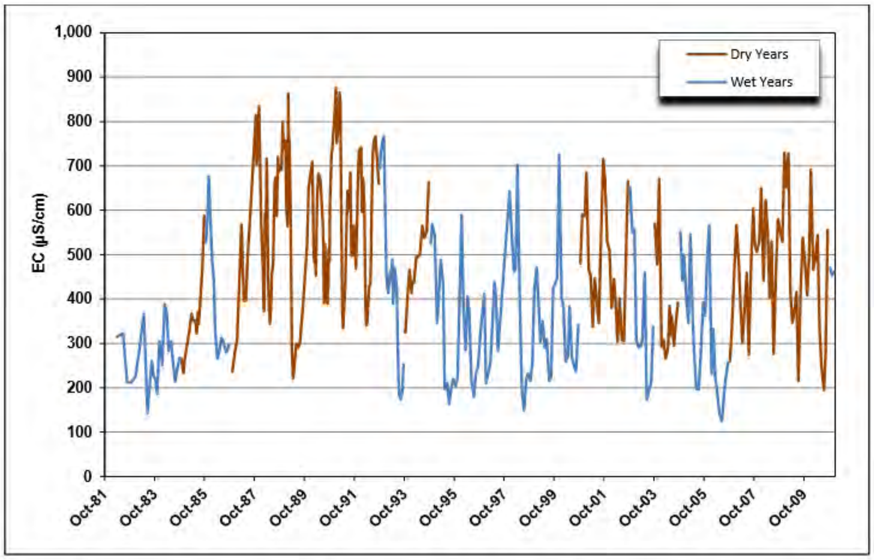
Source: DWR 2013.

Figure 3.2-3. Average EC (µS/cm) by Year Type at the Sacramento River at Hood in the Sacramento-San Joaquin Delta



Source: DWR 2013. Blank periods indicate no data available.

Figure 3.2-4. Average EC (µS/cm) by Year Type at the San Joaquin River at Vernalis in the Sacramento-San Joaquin Delta



Source: DWR 2013.

Figure 3.2-5. Average EC (µS/cm) by Year Type at Banks Pumping Plant in the Sacramento-San Joaquin Delta

Buyer Service Area

San Luis Reservoir

San Luis Reservoir is an off-stream reservoir that stores excess winter and spring water from Delta. Water is delivered to the reservoir through the California Aqueduct and Delta-Mendota Canal. In the summer months, the reservoir provides a water supply for over 20 million residents and more than half a million acres of irrigated agriculture. Water levels in San Luis Reservoir vary each season because of the amount and timing of water delivered from the California Aqueduct and Delta-Mendota Canal.

The 2013 *San Luis Reservoir State Recreation Area Final Resource Management Plan/General Plan and Final Environmental Impact Statement/Environmental Impact Report (EIS/EIR)* states that water quality in the reservoir generally meets drinking water standards, but the reservoir has several water quality concerns:

- High turbidity and TDS levels in the reservoir;
- Algal blooms and taste and odor problems (during a drought year);
- High total organic carbon and bromide concentration from the source water; and
- Pathogen contamination through grazing trespass and recreation (Reclamation and CDPR 2013).

During the summer months, when water levels are lowest, water quality in San Luis Reservoir can decline due to a combination of warmer temperatures, wind-induced nutrient mixing, and algal blooms near the reservoir surface. When San Luis Reservoir approaches its late summer/early fall low point, algae concentrations in water drawn into the reservoir's pumping plants may be high enough that the water becomes difficult to treat. A low point issue occurs when the water levels continue to decline and the algae blooms reach the Lower San Felipe Intake. Typically, this point occurs when water levels reach an elevation of 369 feet above mean sea level or 300 thousand acre-feet (TAF). If water levels fall below 369 feet (300 TAF), Santa Clara Valley Water District cannot withdraw water for M&I purposes from San Luis Reservoir because their existing water treatment plants cannot treat the algae-laden water to meet their existing water quality standards.

San Luis Reservoir was designated as mercury impaired on the 2010 California 303(d) List. The potential source of the mercury was listed as unknown (SWRCB 2011).

3.2.2 Environmental Consequences/Environmental Impacts

This section describes the methodology applied for the water quality analysis and presents the environmental impacts/environmental consequences associated with each alternative.

3.2.2.1 Assessment Methods

This section describes the assessment methods used to analyze potential water quality effects of the alternatives.

3.2.2.1.1 Reservoirs and Waterways within the Seller and Buyer Service Areas

The analysis for reservoirs and waterways uses both quantitative and qualitative methods to assess changes in water quality. The quantitative analysis relies on hydrologic modeling results that estimate changes in river flow rates and reservoir storage for the CVP and SWP reservoirs and the rivers that they influence. ~~If the change in storage is equal to or less than 1,000 AF, or if the change in flow is less than ten cubic feet per second (cfs), it is assumed that there would be no water quality impacts as this is within the error margins of the model.~~ If the changes are small and within the normal range of fluctuations (similar to the No Action/No Project Alternative) for that time period, it is generally assumed that any water quality impacts would be less than significant. Appendix B describes the modeling efforts to quantify changes in reservoir surface water storage and river flow rates.

Reservoir storage data is not available for all reservoirs included in the area of analysis. Where this data is not available, effects are evaluated based on transfer quantities, anticipated changes in water storage (increases or decreases), and the timing of the changes.

3.2.2.1.2 Sacramento-San Joaquin Delta

The analysis for the Delta uses both quantitative and qualitative methods to assess changes in water quality. The quantitative analysis relies on water quality modeling results that predict changes in various water quality parameters under each of the action alternatives. Appendix C describes the modeling analysis undertaken to quantify changes in water quality in the Delta. Where modeling is not available, effects are evaluated based on transfer quantities, anticipated changes in flow through the Delta (increases or decreases), and the timing of the changes.

3.2.2.1.3 Other Water Quality Impacts

All other water quality effects are analyzed at a qualitative level using the best available information and taking into consideration the magnitude and timing of the change, as well as any location specific water quality issues.

3.2.2.2 Significance Criteria

For the purposes of this EIS/EIR, impacts to water quality would be considered significant if implementation of any of the alternatives would:

- Violate existing water quality objectives or standards;
- Result in long-term adverse effects on beneficial uses; or
- Substantially degrade existing water quality.

3.2.2.3 Alternative 1: No Action/No Project Alternative

3.2.2.3.1 Seller Service Area

Under the No Action/No Project Alternative, changes in reservoir storage and river flows would not affect water quality in reservoirs within the Seller Service Area. Reservoir storage and river flows would continue to fluctuate seasonally and annually based on hydrologic conditions. Therefore, there would be no changes in water quality associated with the No Action/No Project Alternative.

3.2.2.3.2 Buyer Service Area

The No Action/No Project Alternative could result in crop idling, which could increase sediment deposition into waterways and could degrade water quality in the Buyer Service Area. Under the No Action/No Project Alternative, significant water shortages are anticipated in the Buyer Service Area. These water shortages have the potential to lead to a decrease in agricultural water supply, therefore forcing farmers to resort to crop idling due to lack of irrigation water. Leaving fields bare would increase the potential for sediment transport via wind erosion and deposition of transported sediment onto surface water, which could affect water quality. However, users in the buyers' area have faced shortages under the existing conditions, and have had to make these types of planting decisions for many years. Overall, crop idling is not expected to increase significantly from existing conditions in the Buyer Service Area, therefore potential crop idling would cause no change from existing conditions. There would be no changes to water quality in the Buyer Service Area compared to existing conditions.

San Luis Reservoir

Under the No Action/No Project Alternative, changes in reservoir storage would not affect water quality in San Luis Reservoir. Similar to the Seller Service Area, the water operations in the Buyer Service Area in the No Action/No Project Alternative would not change from existing conditions. Water quality and water temperatures in the San Luis Reservoir would exhibit the same range of constituent levels and be subject to the same environmental influences and variations that are already present. Therefore, there would be no water quality effects and no changes from existing conditions associated with the No Action/No Project Alternative in San Luis Reservoir.

3.2.2.4 Alternative 2: Full Range of Transfers (Proposed Action)

3.2.2.4.1 Seller Service Area

Cropland idling transfers could result in increased deposition of sediment on water bodies. Crop management practices and soil textures are key factors to determine erosion potential. The Proposed Action could result in farmers in Butte, Colusa, Glenn, Solano, Sutter, and Yolo counties leaving up to 59,973 acres of fields idle. Since these fields would be dry and have less vegetative cover, they may be more susceptible to erosion from strong winds and runoff. Increased sediment transport via wind erosion could result in increased deposition of transported sediment onto surface water bodies which could increase turbidity and affect water quality.

As described in Section 3.4, the rice crop cycle and the prevalent soil textures in Butte, Colusa, Glenn, Sutter, and Yolo Counties would reduce potential impacts from wind erosion in this region. Rice cultivation typically includes discing the field after harvest to incorporate the leftover rice straw into the soils. After harvest and discing in late September and October, rice fields are flooded to aid in decomposition of the straw. Once dried, the combination of decomposed straw and clay texture soils typically produces a hard, crust-like surface. If left undisturbed, this surface crust would remain intact throughout the summer, when wind erosion would be expected to occur, until winter rains begin. This surface crust would not be conducive to soil loss from wind erosion. During the winter rains, the hard, crust-like surface typically remains intact and the amount of sediment transported through winter runoff would not be expected to increase. Therefore, there would be little-to-no increase in sediment transport resulting from wind erosion or winter runoff from idled rice fields under the Proposed Action.

In Butte, Colusa, Glenn, Solano, Sutter, and Yolo counties, there could be a combined maximum of 8,500 acres of alfalfa, corn, or tomato cropland idled. The sellers who expressed interest in participating in cropland idling transfers in these counties are located mainly on clay and clay loam soils that have low erodibility (as described in greater detail in Section 3.4). Due to the primary clay soil textures in counties in the Seller Service Area as well as relatively small acreages of non-rice crops proposed for idling, substantial soil erosion as a result of idling non-rice crops is not expected.

Under normal farming practices, farmers typically leave fields fallow during some cropping cycles in order to make improvements such as land leveling and weed abatement or to reduce pest problems and improve soils. As discussed in Section 3.4, Geology and Soils, farmers employ management practices to reduce potential soil erosion impacts, to avoid substantial loss of soils and to protect soil quality (U.S. Department of Agriculture [USDA] Natural Resources Conservation Service [NRCS] 2009). While farmers would not be able to engage in management practices that require consumptive use of water on an idled field, they could continue to employ erosion control techniques such as surface roughening tillage to produce clods, ridges, and depressions to reduce wind velocity and trap drifting soil; establishment of barriers at intervals perpendicular to wind direction; or, application of mulch covers (USDA NRCS 2009). Therefore, cropland idling under the Proposed Action would not result in substantial soil erosion or sediment deposition into waterways. Impacts to water quality would be less than significant.

Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff. Under the Proposed Action, cropland idling/shifting would occur, and regionally, changes in irrigation practices and pesticide application could occur compared to the No Action/No Project Alternative. The changes in the quantity of irrigation water applied to the land could alter the concentration of pollutants associated with leaching and runoff. Because farmers would apply less water to fields under the Proposed Action, there would be less potential for leaching of salts and other pollutants. In addition, the reduction in application of fertilizers and pesticides under the Proposed Action compared to the No Action/No Project Alternative would result in decreased concentrations of nitrogen and phosphorus in surface water runoff. In cases of crop shifting, farmers may alter the application of pesticides and other chemicals which negatively affect water quality if allowed to enter area waterways. Since crop shifting would only affect currently utilized farmland, a significant increase in agricultural constituents of concern is not expected.

Because there would be less total leaching potential and runoff under the Proposed Action than there would be under the No Action/No Project Alternative, water quality would not decrease as a result of a reduction in applied water. There could be an improvement in the quality of surface water runoff returning to nearby water bodies. Overall, the effect on water quality with respect to leaching and surface water runoff would be less than significant.

Cropland idling/shifting transfers could change the quantity of organic carbon in waterways. Both cropland idling and crop shifting would lead to reductions in irrigation which would decrease the amount of agricultural runoff entering waterways. Agricultural runoff often contains nutrients such as nitrogen and phosphorous that promote excessive algae growth and increase organic carbon in waterways. A reduction in agricultural runoff could reduce the amount of nutrients that would enter waterways and could reduce one source of organic carbon. The reduction in agricultural runoff may not actually cause a quantifiable decrease in organic carbon because there are other sources and a variety of factors that contribute to organic carbon levels in waterways. However, cropland idling/crop shifting under the Proposed Action would not be expected to increase organic carbon in waterways, and therefore this impact would be less than significant.

Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows. Groundwater substitution transfers would use groundwater for irrigation instead of surface water. The amount of groundwater substituted for surface water under the Proposed Action would be relatively small compared to the amount of surface water used to irrigate agricultural fields in the Seller Service Area. Groundwater would mix with surface water in agricultural drainages prior to irrigation return flow reaching the rivers. Constituents of concern that may be present in the groundwater could enter the surface water as a result of mixing with irrigation return flows. Any constituents of concern, however, would be greatly diluted when mixed with the existing surface waters applied because a much higher volume of surface water is used for irrigation purposes in the Seller Service Area. Additionally, groundwater quality in the area is generally good and sufficient for municipal, agricultural, domestic, and industrial uses. Section 3.3 provides additional discussion of groundwater quality. Groundwater substitution transfers would result in a less-than-significant impact on water quality.

Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts. Based on modeling efforts, changes in CVP and SWP reservoir storage between the Proposed Action and the No Action/No Project Alternative are shown in Table 3.2-23. Changes in reservoir storage are primarily influenced by storing transfer water in April, May, and June of dry and critical years (until the Delta pumps can convey the water to the buyers) and streamflow depletion from groundwater substitution transfers.

Table 3.2-23. Changes in CVP and SWP Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	-0.6	-0.6	-0.4	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.6	-0.7
AN	-4.6	-4.6	-3.4	-2.8	-2.3	-2.3	-2.3	-0.1	-0.4	-0.5	-0.7	-0.8
BN	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.3	-1.5	-1.5	-1.7	-1.7
D	-2.3	-2.1	-2.1	-2.0	-2.0	-2.0	4.4	16.2	43.3	29.0	-3.5	-3.6
C	-5.0	-5.2	-5.2	-5.2	-5.7	-5.7	-3.1	25.6	70.5	10.8	-7.3	-7.3
Lake Oroville												
W	-4.1	-3.8	-2.8	-2.3	0.0	0.0	0.0	0.0	-0.3	-0.6	-1.5	-2.2
AN	-13.0	-13.0	-13.1	-13.1	-10.9	-0.9	-0.9	-0.9	-0.3	-6.3	-4.4	-3.1
BN	-3.2	-3.8	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9	-5.2	-5.5	-6.4	-6.8
D	-5.1	-5.2	-5.5.	-5.5	-5.5	-5.5	-5.2	1.9	3.4	0.7	-9.6	-5.5
C	-12.8	-13.5	-14.6	-14.6	-15.0	-15.2	-15.5	-14.4	-10.9	-5.7	-20.1	-20.1
Folsom Reservoir												
W	0.9	-1.5	-1.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.4	-0.8
AN	-2.2	-2.9	-3.1	-0.9	0.0	0.0	0.0	0.0	-0.2	-1.4	-2.8	-4.5
BN	-2.5	-3.1	-4.4	-4.4	0.0	0.0	0.0	0.0	-0.8	-1.6	-1.6	-2.1
D	2.2	1.7	-1.1	-1.1	-2.0	-1.0	-1.0	7.5	12.0	10.2	10.9	12.6
C	6.1	4.0	2.5	1.4	0.4	-1.3	0.0	4.4	12.1	7.8	6.7	8.8

Note: Negative numbers indicate that the Proposed Action would decrease reservoir storage compared to the No Action/No Project Alternative; positive numbers indicate that the Proposed Action would increase reservoir storage.

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

During dry and critical years, Shasta and Folsom reservoirs show an increase in reservoir storage during spring months. Lake Oroville shows a similar change in dry years. These changes are caused by the CVP and SWP storing water, when possible, until the transfer period for the Delta pumps becomes available in July. The transfer water is released from July through September. This type of operation would not be possible in all transfer years because of downstream temperature and flow requirements for fish.

Folsom Reservoir shows elevated reservoir levels for several additional months during dry and critical years because of upstream stored reservoir water transfers. Placer County Water Agency could transfer water through reservoir release, and this water would be stored in Folsom Reservoir until the buyers can convey this water to the end user. Water from Placer County Water Agency may go to East Bay Municipal Utility District (MUD), which could accept transfer water at its Freeport Diversion over a longer period than the CVP and SWP Delta export pumps. Therefore, water levels in Folsom could be elevated while water is stored and slowly released to East Bay MUD.

Reservoir storage during other times of the year (not April through September of a transfer year) is decreased because of streamflow depletion from groundwater substitution transfers. Refilling groundwater storage after a groundwater substitution transfer would decrease flows in neighboring streams. The CVP and SWP would have less water in key waterways (including the Sacramento, Feather, and American rivers). The CVP and SWP would either reduce Delta exports or release additional water from storage to account for those streamflow reductions. These changes would reduce water in storage; however, these reductions are small and less than one percent of the reservoir volumes.

CVP and SWP reservoirs within the Seller Service Area would experience only small changes in storage, which would not be of sufficient magnitude and frequency to result in substantive changes to water quality. These changes would not be large enough to affect dilution of other runoff into the reservoir, or the water quality within the reservoir. Any small changes to water quality would not adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential effects on reservoir water quality would be less than significant.

Water transfers could change reservoir storage in non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts. Table 3.2-24 shows the changes in reservoir storage in the reservoirs that could participate in reservoir release transfers. These reservoirs would release additional water for transfers, so the reservoir storage would decline during and after a transfer (until the reservoir refills).

As described in the existing conditions, water in these facilities is of generally good quality. Collins Lake and French Meadows Reservoir are not identified as impaired for any water quality constituents. Camp Far West Reservoir, Hell Hole Reservoir, and Lake McClure are listed as impaired for mercury, which is from legacy mining operations. Mercury entered the system from upstream flows, and short-term changes in storage would not likely affect mercury within the reservoir. Therefore, changes to reservoir levels in non-Project reservoirs would have less than significant impacts on water quality.

Table 3.2-24. Changes in Non-Project Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Camp Far West Reservoir												
W	-0.4	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-2.5	-2.5	-2.5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.1	-1.8	-2.5
C	-3.6	-3.6	-3.6	-3.6	-1.1	-0.7	-0.7	-0.7	-0.7	-4.3	-4.3	-4.3
Collins Lake												
W	-0.4	-0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.8	-0.8	-0.8	-0.8	-0.2	0.0	0.0	0.0	0.0	-1.1	-1.7	-1.7
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Hell Hole and French Meadows Reservoirs												
W	-6.1	-6.1	-4.1	-1.8	-0.7	-0.6	-0.6	-1.2	-0.4	-0.4	-0.3	-0.1
AN	-22.3	-22.3	-22.3	-13.9	-1.8	0.2	0.2	0.2	0.2	0.2	0.1	0.1
BN	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-16.6	-16.7	-16.7	-13.4	-11.4	-7.9	-1.1	-4.9	-8.5	-12.5	-16.8	-20.4
C	-28.2	-28.5	-29.0	-29.0	-29.0	-29.0	-28.9	-34.5	-39.5	-44.5	-49.8	-55.2
Lake McClure												
W	-2.3	-2.3	-2.3	-2.3	0.0	0.0	-3.3	-4.8	-3.5	-2.0	-0.8	-0.2
AN	-15.0	-15.0	-15.0	-15.0	-15.0	-10.0	-17.7	-20.9	-12.8	-9.3	-6.4	-5.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	-9.1	-15.0	-15.0	-15.0	-15.0	-15.0
D	-5.0	-5.0	-5.0	-5.0	-5.0	-5.0	-15.7	-21.9	-19.9	-17.8	-16.1	-15.2
C	0.0	0.0	0.0	0.0	0.0	0.0	-6.7	-10.3	-8.6	-6.6	-5.1	-4.5

Note: Negative numbers indicate that the Proposed Action would decrease reservoir storage compared to the No Action/No Project Alternative; positive numbers indicate that the Proposed Action would increase reservoir storage.

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Water transfers could change flow rates in rivers within the Seller Service Area and could affect water quality. Based on modeling results, Table 3.2-25 provides changes in river flows in the Seller Service Area between the Proposed Action and the No Action/No Project Alternative.

Under the Proposed Action, long-term average flow rates in the Sacramento River at Freeport would be lower than flow rates under the No Action/No Project Alternative during October through June. Average monthly flow rates would decrease by less than 0.5 percent during this period because of streamflow depletion associated with groundwater substitution transfers (as described above). From July through September, long-term monthly average flow rates at Freeport would be higher under the Proposed Action compared with the No Action/No Project Alternative. Greater increases in flow rates would occur during dry and critical years because transfers would be released upstream for conveyance through the Delta. During critical years, average flow rates in July and August may increase by greater than 13 percent. Sacramento River flows at Wilkins Slough would follow the same trend, with minor decreases during non-transfer periods and increased flow during water transfers.

Long-term average monthly flow rates in the Feather River below Thermalito Afterbay and in the Lower Feather River would be similar to the flows under the No Action/No Project Alternative. Long-term monthly average flow rates at locations along the Feather River would increase during August, when flows would increase by 1.7 percent below Thermalito Afterbay and 1.8 percent in the Lower Feather River. This increase in flows in August would be the result of a release of transfer water. Slight variations in flow throughout the year result from required releases from Lake Oroville to address stream depletion. Increases in Feather River flow during August would be small and would not result in any adverse water quality impacts, but may have some small benefits.

Under the Proposed Action, average monthly flow rates along the Yuba River at Marysville would not change substantially from the No Action/No Project Alternative. Flow rates would increase by about 1.6 percent during July of dry and critical years when reservoir release transfers from Collins Lake are released downstream for conveyance through the Delta. During the rest of the year, flows would decrease by a maximum of 0.4 percent because of reservoir refill (the reservoir will capture additional flow to refill the empty storage after the transfer) and streamflow depletion. These small changes would not affect water quality in the Yuba River.

Average monthly flow rates in the Bear River at Feather River would remain similar to the No Action/No Project Alternative, with the exception of July and August. Flows in July and August would increase substantially (34 percent and 50 percent, respectively). Flows during August and September are extremely low in this reach of the Bear River, averaging only 12 and 17 cfs respectively. Although the Proposed Action would only increase flows by a maximum of 18 cfs, this is a substantial increase over the No Action/No Project Alternative. Increases in flows on the Bear River at the Feather River would occur during August and September in dry and critical years when storage and releases from Camp Far West Reservoir would occur due to transfer requirements; the remaining months would have almost no change except for the few months when the reservoir refills. These increases would not adversely affect water quality, and the increased summer flows may have small water quality benefits as they would have the potential to dilute pollutants.

Under the Proposed Action, long-term average monthly flow rates in the lower American River at H Street below Nimbus Dam would be slightly lower than the No Action/No Project Alternative during winter and spring months of January through June, by up to one percent. Under the Proposed Action, Reclamation may store water from transfers in Folsom Reservoir during April through October. During summer and fall months of July through October when stored reservoir water would be released, flow rates are expected to be higher, by up to 2.2 percent. The increases in flows in the lower American River would allow dilution of water quality constituents, including pesticides and fertilizers present in agricultural runoff. These changes in flow throughout the year are not substantial relative to the No Action/No Project Alternative. During the remainder of the year, when reservoir storage refills, the small decreases in river flows would be a very small percentage of river flows and would have less than significant effects on water quality.

Under the Proposed Action, flows in the Merced River at the confluence with the San Joaquin River would increase in April and May by 105 cfs (20.4 percent) and 59 cfs (7.2 percent), respectively, when water is released from stored reservoir release transfers. During winter months, as the reservoir refills, the river flows would decrease during winter months up to 1.3 percent. The decreases in flow would be small compared to overall river flows. The increased flow from the Merced River would carry high quality water into the San Joaquin River, which could dilute the constituents of concern in the San Joaquin River. The modeling effort analyzed the potential impacts of diverting these transfers at Banks or Jones pumping plants, but they could also be diverted upstream at Banta-Carbona ID, West Stanislaus ID, or Patterson ID pumping plants. If the transferred water was diverted upstream, the transfers would still contribute to increased quality in the San Joaquin River water, but the flows entering the Delta in April and May would be the same as under the No Action/No Project Alternative.

Overall, changes in flows in the Seller Service Area would not be of significant frequency and magnitude to affect water quality. Predicted changes in flow are not sufficient to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Therefore, water quality impacts associated with changes in flow in the Seller Service Area are expected to be less than significant.

Overall, the decreases in flow under the Proposed Action would be very small and would occur during the wetter months of October through June. They would not be of sufficient frequency or magnitude to adversely affect water quality or result in adverse effects to designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. The anticipated increases in flows under the Proposed Action would occur in July through September when transfer water would be released from upstream reservoirs to be conveyed through the Delta. The increases in flow could be beneficial to water quality, but are fairly small in comparison to average monthly flow rates and would be unlikely to result in substantive water quality improvements.

Table 3.2-25. Changes in River Flows between the No Action/No Project Alternative and the Proposed Action (in cfs)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Sacramento River at Freeport												
W	-22.0	-20.6	-122.3	-148.0	-121.4	-62.3	-49.2	-32.5	-42.2	-17.9	-13.1	-7.2
AN	-12.6	-43.8	-106.3	-421.5	-385.3	-306.3	-83.0	-147.6	-62.6	130.4	9.2	7.8
BN	0.0	0.0	0.0	-42.5	-119.6	-38.3	-33.2	-24.7	0.0	0.0	0.0	0.0
D	-42.0	-63.0	-56.8	-140.5	-94.8	-214.9	-176.4	-65.7	-73.2	885.3	1,243.6	248.8
C	-81.0	-69.6	-78.8	-112.0	-187.1	-162.3	-71.7	-63.1	-59.1	2,136.6	1,597.5	622.5
Sacramento River at Wilkins Slough												
W	-8.9	-5.1	-8.0	-10.7	-6.3	-5.3	-5.0	-3.2	-1.9	-2.4	-1.4	-1.3
AN	-8.3	-8.2	-27.2	-19.6	-18.2	-7.9	-8.2	-44.3	-2.6	7.2	7.2	7.8
BN	-4.5	-3.7	-3.5	-3.5	-3.5	-3.3	-4.3	0.0	0.0	-3.3	0.0	-3.0
D	-11.0	-14.1	-10.1	-11.0	-7.9	-7.6	-53.1	-33.5	-252.6	465.6	758.9	162.0
C	-21.5	-15.8	-15.2	-14.1	-5.2	-15.1	-0.2	-114.5	-274.4	1,517.7	838.4	356.1
Feather River below Thermalito Afterbay												
W	8.3	-5.4	-16.4	-9.0	-40.8	0.0	0.0	0.0	4.6	6.0	13.3	12.2
AN	29.4	1.1	2.0	0.0	-39.5	-162.9	0.0	0.0	-9.3	96.9	-29.8	-22.5
BN	10.2	10.0	17.9	0.0	0.0	0.0	0.0	0.0	5.4	4.7	14.1	7.0
D	10.7	1.7	3.7	0.0	0.0	0.0	0.0	-105.1	-12.1	43.5	168.1	-70.0
C	10.7	11.1	17.5	0.0	7.7	3.8	11.6	-1.8	-36.5	-84.9	233.4	0.8
Lower Feather River												
W	0.2	-13.8	-32.1	-25.8	-52.4	-16.4	-10.4	-9.1	-3.5	-1.1	7.1	6.4
AN	16.3	-11.7	-9.9	-55.2	-55.8	-196.8	-15.5	-58.8	-22.0	86.1	-39.3	-31.2
BN	5.3	5.4	13.4	-5.0	-7.5	-9.6	-9.2	-7.2	0.0	0.7	10.7	4.0
D	-1.9	-10.0	-8.2	-13.3	-25.2	-35.2	-7.9	-109.4	-16.0	120.1	240.8	-35.7
C	-11.0	-8.5	-0.3	-18.5	-56.0	-21.1	-0.6	-0.5	-31.3	113.9	318.3	49.2
Lower Yuba River												
W	-0.4	-0.9	-7.7	-0.9	-2.0	-6.3	-0.8	-0.7	-0.7	-0.6	-0.6	-0.6
AN	0.0	-1.0	-1.1	-1.2	-1.1	-19.1	-1.0	-45.6	-0.9	-0.9	-0.9	-0.9
BN	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
D	-0.3	-0.8	-0.7	-0.7	-12.7	-22.2	-0.5	0.0	0.0	34.8	8.9	-0.2
C	-0.6	-1.5	-1.5	-1.5	-1.5	-1.5	-0.1	-0.1	-0.1	50.4	0.0	0.0

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Bear River at the Feather River												
W	0.0	0.0	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	26.6	12.3
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	0.0	58.1	0.0	0.0
All	0.0	0.0	0.0	-9.6	-9.2	-1.2	0.0	0.0	0.0	12.3	4.7	2.2
American River at H Street												
W	16.4	38.7	-36.7	-56.2	-22.4	-2.7	-1.3	8.3	-13.7	4.1	-1.6	3.5
AN	21.2	12.1	0.9	-173.0	-235.7	-34.9	-1.3~~2~~	-1.3	1.8	32.7	36.5	41.0
BN	12.1	11.9	21.5	-0.4	-79.4	-0.5	-0.4	-0.5	12.3	13.6	-0.3	8.2
D	25.4	8.9	43.7	-53.1	-22.0	-73.9	-114.5	-63.7	-0.9	130.5	80.0	56.1
C	51.5	40.0	30.3	16.9	17.0	25.8	-23.3	19.4	-45.9	195.1	141.3	82.4
Merced River at San Joaquin River												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	32.9	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	127.5	71.4	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	85.0	47.6	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	36.4	20.4	0.0	0.0	0.0	0.0
San Joaquin River at Vernalis												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	32.5	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	21.7	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0

Note: Negative numbers indicate that the Proposed Action would decrease river flows compared to the No Action/No Project Alternative; positive numbers indicate that the Proposed Action would increase river flows.

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Water transfers could change Delta inflows and could result in water quality impacts. Under the Proposed Action, Delta inflows would be similar to the No Action/No Project Alternative. Inflows will generally increase during July through September of Dry and Critical water years. Delta inflows slightly decrease most other months of the year. The timing of these changes is due to the timing of the release of transfer water from storage in upstream dams. Percent decreases in Sacramento River inflow are less than 2 percent under the Proposed Action. Average increases in Sacramento River inflow may be as high as 15.8 percent during summer months of Critical water years. These changes would have a less than significant effect on water quality.

Water transfers could change Delta outflows and could result in water quality impacts. Under the Proposed Action, long-term Delta outflows would be similar to the No Action/No Project Alternative. Outflows would generally increase during the transfer period because carriage water would become additional Delta outflow. The most substantial change in flow would occur in August when Delta outflows would increase by an average of ~~1.8~~2.1 percent across all water years. During July of Critical water years. Outflows may increase by approximately 12 percent. Delta outflows would decrease slightly (by less than 0.~~3~~ 4 percent) during the winter and spring compared to the No Action/No Project Alternative as reservoir storage and groundwater storage refill. These slight changes in flow would not affect water quality in the Delta.

Net Delta Outflow (NDO) is the sum of all inflows and outflows. NDO percent changes calculated in DSM2 modeling reflect the changes in Sacramento inflow. During non-transfer periods, the NDO decreases by a small amount (less than 1 percent), which reflects the streamflow depletion changes in Delta inflow. The largest percent changes occur during July through September of Critical and Dry water years when transfers are moving through the Delta. The NDO increases during transfers by up to 12.3 percent during a critical year in July. Increased NDO could help Delta water quality, and the decreases could have an adverse effect. The decreases, however, represent a very small change in NDO. More detailed information is provided in Appendix C. These changes would have a less than significant effect on water quality.

Water transfers could change Delta salinity concentrations, resulting in water quality impacts. Changes in EC in the Delta are largely influenced by 1) increases in Sacramento River inflows which cause decreased EC and 2) increased SWP and CVP exports, which tend to increase EC. Based on water quality modeling results, minor changes in average monthly EC in the Delta occur between the No Action/No Project Alternative and the Proposed Action. Table 3.2-26 shows average monthly EC percent change from the No Action/No Project Alternative for the Proposed Action at several locations, with the largest variation in percent change at SWP and CVP locations occurring at the SWP intake to Clifton Court Forebay. Trends at CVP intakes were similar but with smaller magnitudes. Increases in EC are greatest (up to 4.2 percent) in July and August of critical and dry water years. Delta SWP and CVP exports are highest during the summer months of critical and dry water years, which increases EC near the diversion facilities. Decreases are greatest (4.3 percent) during September of critical water years because of Sacramento River flow increases compared to the No Action/No Project Alternative. Additional intake locations show similar trends in average monthly percent change in EC.

Table 3.2-26. Average Monthly Percent Change in EC from the No Action/No Project Alternative to the Proposed Action ~~at SWP intake to Clifton Court Forebay~~

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SWP intake to Clifton Court Forebay												
W	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-1.0	-0.3	0.1	0.0	-0.5	0.0	0.0	-0.6	0.0	0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.9	-0.9	-0.2	0.1	0.2	0.1	0.2	0.6	0.6	1.2	1.9	-1.6
C	-3.8	-2.2	-1.1	-0.7	-0.1	0.4	0.3	0.6	0.6	4.2	1.0	-4.3
CVP intake at Delta Mendota Canal												
W	-0.3	-0.2	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.6	-0.8	-0.2	0.0	-0.1	-0.7	-0.1	0.0	-0.6	0.1	0.1	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.6	-0.8	-0.2	0.1	0.2	0.0	0.2	0.6	0.5	1.0	0.7	-1.4
C	-3.2	-1.8	-0.8	-0.5	0.0	0.4	0.2	0.7	0.6	3.3	0.8	-3.9
CCWD Victoria Canal location												
W	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-0.7	-0.3	0.0	1.1	-0.3	-0.1	0.1	-0.6	-0.3	0.1	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.5	-0.6	-0.2	0.1	0.2	0.1	0.2	0.3	0.5	-0.3	0.0	-1.8
C	-3.1	-1.3	-0.9	-0.6	-0.2	0.2	0.3	0.4	0.4	0.5	-1.9	-5.9
CCWD Old River location												
W	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.9	-1.1	-0.4	0.1	0.5	-0.4	-0.1	0.0	-0.4	0.2	0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-2.0	-1.0	-0.2	0.2	0.2	0.2	0.2	0.5	0.5	1.7	2.4	-1.5
C	-4.0	-2.3	-1.5	-0.9	-0.3	0.3	0.3	0.6	0.6	4.9	0.5	-4.4
CCWD Rock Slough location												
W	-0.4	-0.3	-0.2	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.8	-1.4	-0.6	0.2	0.3	0.3	-0.3	0.0	-0.3	0.3	0.2	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-2.0	-1.4	-0.5	0.1	0.2	0.2	0.2	0.4	0.4	2.6	2.9	-0.6
C	-4.1	-2.9	-1.8	-1.1	-0.4	0.2	0.3	0.4	0.6	7.3	2.3	-3.3
RSAC081 Collinsville												
W	-0.1	-0.1	0.2	0.2	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2
AN	-0.9	-0.3	0.5	0.9	0.1	0.2	0.0	0.2	1.3	0.3	-0.1	-0.2
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.3	0.3	0.1	0.0	0.0	0.0
D	-1.0	-0.1	0.5	0.5	0.9	0.9	1.5	1.1	0.6	-3.1	-5.6	-3.7
C	-1.9	-0.8	-0.2	0.5	1.4	1.7	1.5	1.0	1.1	-6.9	-9.2	-6.1

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
RSAN007 near Antioch												
W	-0.3	-0.2	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1
AN	-1.2	-0.5	0.4	0.7	0.0	0.0	-0.2	0.0	0.7	0.5	-0.2	-0.2
BN	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
D	-1.3	-0.3	0.5	0.5	0.5	0.5	0.6	0.9	0.5	-2.6	-5.0	-4.2
C	-2.5	-1.1	-0.5	0.1	0.9	1.4	1.4	1.1	1.3	-5.8	-8.8	-6.5
RSAN018 Jersey Point												
W	-0.5	-0.3	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
AN	-1.7	-1.0	0.0	0.4	0.1	0.0	-0.2	0.0	0.1	1.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-1.9	-0.8	0.3	0.3	0.0	0.1	0.1	0.1	0.0	2.2	1.1	-3.2
C	-3.8	-2.2	-1.3	-0.9	0.0	0.5	0.5	0.6	1.4	3.5	-2.4	-5.0

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Changes in EC regime were calculated at all D-1641 locations. It was found that results at many locations were either small, with average monthly percent difference of around +/- 1 percent or less, or were characteristic of a region (e.g., Suisun Marsh). It was found that at locations RSAN018, Jersey Point, and RSAC092, Emmaton, there are potential violations of D-1641 EC criteria in June and July of Critical water years; however, these exceedances would occur only a few days sooner than under the No Action/No Project Alternative, and this could be changed with a minor variation in export timing. The CVP and SWP regularly make this type of variation in real-time operations; therefore, this change is a modeling artifact that does not reflect real Delta operations.

Modeling results also indicate that San Joaquin River inflow EC for the Proposed Action makes little difference to inflow EC, as changes in San Joaquin River EC were found to be infrequent and small in magnitude.

Chloride calculations were completed to convert values from EC. Bay-Delta D-1641 standards dictate maximum mean daily chloride levels of 250 mg/L for all intake locations. Modeling results indicate that chloride concentrations are below the 250 mg/L threshold at all export locations.

The modeling efforts estimated X2 locations to determine the movement of salinity throughout the Delta. The “X2” water quality parameter represents the distance (in kilometers [km]) from the Golden Gate to the location of 2 ppt salinity concentration in the Delta. Larger values indicate higher salinity concentrations in the Delta, and smaller values indicate lower salinity concentrations. According to SWRCB criteria (SWRCB 1999), eastward changes in monthly average X2 position (positive values in our analysis) of 1.1 km are not significant in general, and in critically dry years an eastward movement of 3.0 km is not significant. Based on these criteria, all monthly changes in X2 were found to be are insignificant, as all monthly average differences are less than 1.1 km.

Overall, the Proposed Action would not cause significant changes to Delta water quality. ~~a~~Any violation of Delta water quality standards could be changed with minor variations in export timing; therefore, the impacts to water quality would be less than significant.

Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal. Reservoir release transfers from Merced ID could be diverted at these diversion facilities on the San Joaquin River or at CVP or SWP Delta pumping facilities. If Merced ID transfer water is diverted at these facilities, the districts could use the water in their districts and transfer their CVP water, or they could move the water through their districts into the Delta-Mendota Canal. Water quality at these diversions in the San Joaquin River is different than the water that is diverted from the Delta into the Delta-Mendota Canal. Banta Carbona ID is downstream of Vernalis, and water quality at Vernalis (Table 3.2-20) is similar to the Banta Carbona ID diversion location. West Stanislaus ID and Patterson ID are upstream of Vernalis, so Table 3.2-19 is more similar to the water quality at these diversion points.

The San Joaquin River has greater EC concentrations than those at the Delta diversion pumps (see Table 3.2-21). If this water travels through the diverting districts to the Delta-Mendota Canal, it has the potential to degrade the water quality of CVP diversions. However, the amount of water would be relatively small compared to the overall flow in the Delta-Mendota Canal. At most, the transfer would result in about 250 cfs entering the Delta-Mendota Canal from all three districts added together. The canal capacity is about 4,600 cfs in the northern portion. While the Delta-Mendota Canal may not be at maximum capacity during dry and critical years, the flows would still be great enough that the increased EC in the water entering the canal would likely not result in a substantive change to EC in the canal. The impacts to water quality in CVP deliveries would be less than significant.

3.2.2.4.2 Buyer Service Area

Transfers water would result in increased irrigation in the Buyer Service Area, which could affect water quality. Under the Proposed Action, surface water supplies in the San Joaquin Valley would increase. If this water were used to irrigate drainage impaired lands, increased irrigation could cause water to accumulate in the shallow root zone and could leach pollutants into the groundwater and potentially drain into the neighboring surface water bodies. Because the Proposed Action would be implemented to meet water needs during a potential shortage, it is likely that most water would be applied to permanent crops or crops planted on prime or important farmlands. As a result, farmers would continue to leave marginal land and drainage impaired lands out of production and use water provided by the Proposed Action for more productive lands.

The amount of transfer water that would be provided is minimal compared to existing applied irrigation water in the area. Further, many farmers in the drainage impaired areas have decreased drain water by improving irrigation efficiency and changing cropping patterns. The small incremental supply within the drainage-impaired service areas would not be sufficient to change drainage patterns or existing water quality, particularly given drainage management, water conservation actions and existing regulatory compliance efforts already implemented in that area. Therefore, the Proposed Action would not result in impacts to water quality in the Buyer Service Area as a result of crop irrigation.

Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Table 3.2-27 presents average end-of-month differences in combined SWP and CVP storage at San Luis Reservoir under the Proposed Action compared to the No Action/No Project Alternative. Storage under the Proposed Action would be less than the No Action/No Project Alternative for all months of the year because of decreased CVP and SWP exports associated with streamflow depletion from groundwater substitution transfers. San Luis Reservoir storage could decrease by as much as six percent (of water in storage in the No Action/No Project Alternative) during August of critical water years. Monthly storage changes during most year types would be less than three percent.

As discussed in Section 3.2.1.3, Existing Conditions, a low point water quality issue exists when reservoir volumes fall below approximately 300 TAF. Based on historical monthly data from 1970-2003 used for CalSim modeling purposes, average monthly storage for San Luis Reservoir fell below the 300 TAF threshold a total of 30 times under the No Action/No Project Alternative. Under the Proposed Action, modeling indicates storage levels below 300 TAF over three additional months (total of 33 times) during this time period, with storage declining from 324, 338, and 306 TAF to 291, 299, and 275 TAF, respectively. Under the Proposed Action, during these 33 times storage levels fall below 300 TAF, overall average storage falls 9 TAF below the No Action/No Project Alternative, with a maximum decline of 42 TAF (during a period where levels are below 300 TAF under the No Action/No Project Alternative) and a maximum increase in storage of 28 TAF. Reclamation and Santa Clara Valley Water District are evaluating alternatives that would address the water quality and water supply issues associated with the reservoir low point.

Additionally, in some cases water levels are expected to increase in San Luis Reservoir under the Proposed Action due to additional water storage opportunities based on regulation of the delivery schedule of transfer water. San Luis Reservoir may be used for short term water storage prior to delivery based on contractors' desired delivery schedules. These short term increases in storage were not included in the CalSim modeling analysis, and they would reduce the potential effects on the frequency of the San Luis Low Point issue. Based on modeling results, the Proposed Action would not substantially affect the low point issue beyond the complications experienced under the No Action/No Project Alternative.

These small changes in storage are not sufficient to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.

Table 3.2-27. Changes in San Luis Reservoir Storage between the No Action/No Project Alternative and the Proposed Action (in 1,000 AF)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
W	-0.5	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2	-0.8	-0.4	-0.2	0.1	0.0
AN	-16.5	-18.5	-18.8	-18.8	-11.8	-11.8	-11.8	-11.7	-11.6	-12.1	-12.0	-12.0
BN	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8	-20.8
D	-5.6	-7.2	-6.5	-8.8	-9.9	-10.1	-10.5	-8.8	-9.0	-9.8	-11.5	-16.6
C	-29.4	-33.6	-36.8	-39.3	-39.8	-41.2	-41.5	-30.6	-20.4	-15.4	-11.4	-19.8
All	-11.4	-13.2	-13.9	-14.6	-13.7	-14.0	-14.2	-11.5	-9.2	-7.6	-7.6	-10.3

3.2.2.5 Alternative 3: No Cropland Modifications

3.2.2.5.1 Seller Service Area

Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows. Groundwater substitution transfers would use groundwater for irrigation instead of surface water. Groundwater would mix with surface water in agricultural drainages prior to irrigation return flow reaching the rivers. Constituents of concern that may be present in the groundwater could enter the surface water as a result of mixing with irrigation return flows.

Alternative 3, similar to the Proposed Action, would result in a small amount of increased groundwater pumping compared to the overall surface water use in the Seller Service Area. Any constituents of concern would be greatly diluted when mixed with the existing surface waters applied. Additionally, groundwater quality in the area is generally good and sufficient for municipal, agricultural, domestic, and industrial uses. Section 3.3 provides additional discussion of groundwater quality. Groundwater substitution transfers would result in a less-than-significant impact on water quality.

Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts. Based on modeling efforts, changes in CVP and SWP reservoir storage Alternative 3 and the No Action/No Project Alternative are shown in Table 3.2-28. Changes in reservoir storage are primarily influenced by storing transfer water in April, May, and June of dry and critical years (until the Delta pumps can convey the water to the buyers) and streamflow depletion from groundwater substitution transfers.

Table 3.2-28. Changes in CVP and SWP Reservoir Storage between the No Action/No Project Alternative and the Alternative 3 (in 1,000 AF)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	-0.6	-0.6	-0.4	-0.1	0.0	0.0	-0.1	-0.2	-0.3	-0.4	-0.6	-0.7
AN	-4.6	-4.6	-3.4	-2.8	-2.3	-2.3	-2.3	-0.1	-0.4	-0.5	-0.7	-0.8
BN	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.0	-1.3~~2~~	-1.5	-1.5	-1.7	-1.7
D	-2.3	-2.1	-2.1	-2.0	-2.0	-2.0	4.4	11.1	30.4	18.3	-3.5	-3.6
C	-5.0	-5.2	-5.2	-5.2	-5.7	-5.7	-3.1	10.7	33.5	-1.1	-7.3	-7.3
Lake Oroville												
W	-4.1	-3.8	-2.8	-2.3	0.0	0.0	0.0	0.0	-0.3	-0.6	-1.5	-2.2
AN	-13.0	-13.0	-13.1	-13.1	-10.9	-0.9	-0.9	-0.9	-0.3	-6.3	-4.4	-3.1
BN	-3,2	-3.8	-4.9	-4.9	-4.9	-4.9	-4.9	-4.9	-5.2	-5.5	-6.4	-6.8
D	-5.1	-5.2	-5.5	-5.5	-5.5	-5.5	-5.2	1.4	2.5	0.4	-9.6	-5.5
C	-12.8	-13.5	-14.6	-14.6	-15.0	-15.2	-15.5	-14.9	-12.3	-13.3	-20.1	-20.1
Folsom Reservoir												
W	0.9	-1.5	-1.1	0.0	0.0	0.0	0.0	0.0	-0.1	-0.4	-0.4	-0.8
AN	-2.2	-2.9	-3.1	-0.9	0.0	0.0	0.0	0.0	-0.2	-1.4	-2.8	-4.5
BN	-2.5	-3.1	-4.4	-4.4	0.0	0.0	0.0	0.0	-0.8	-1.6	-1.6	-2.1
D	2.2	1.7	-1.1	-1.1	-2.0	-1.0	-1.0	7.5	12.0	10.2	10.9	12.6
C	6.1	4.0	2.5	.14	0.4	-1.3	0.0	4.3	12.0	7.9	6.7	8.8

Note: Negative numbers indicate that Alternative 3 would decrease reservoir storage compared to the No Action/No Project Alternative; positive numbers indicate that Alternative 3 would increase reservoir storage.

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

During dry and critical years, Shasta and Folsom reservoirs show an increase in reservoir storage during spring months. Lake Oroville shows a similar change in dry years. These changes are caused by the CVP and SWP storing water, when possible, until the transfer period for the Delta pumps becomes available in July. The transfer water is released from July through September. This type of operation would not be possible in all transfer years because of downstream temperature and flow requirements for fish.

Folsom Reservoir shows increased reservoir storage for several additional months during dry and critical years because of upstream stored reservoir water transfers. Placer County Water Agency could transfer water through reservoir release, and this water would be stored in Folsom Reservoir until the buyers can convey this water to the end user. Water from Placer County Water Agency may go to East Bay MUD, which could accept transfer water at its Freeport Diversion over a longer period than the CVP and SWP Delta export pumps. Therefore, water storage in Folsom could be elevated while water is stored and slowly released to East Bay MUD.

Reservoir storage during other times of the year (not April through September of a transfer year) is decreased because of streamflow depletion from groundwater substitution transfers. Refilling groundwater storage after a groundwater substitution transfer would decrease flows in neighboring streams. The CVP and SWP would have less water in key waterways (including the Sacramento, Feather, and American rivers). The CVP and SWP would either reduce Delta exports or release additional water from storage to account for those streamflow reductions. These changes would reduce water in storage; however, these reductions are small and less than one percent of the reservoir volumes.

CVP and SWP reservoirs within the Seller Service Area would experience only small changes in storage, which would not be of sufficient magnitude and frequency to result in substantive changes to water quality. Any small changes to water quality would not adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential effects on reservoir water quality would be less than significant.

Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts. Alternative 3 includes the same reservoir release transfers as the Proposed Action; therefore, the changes in reservoir storage in these facilities would be the same as those described above for the Proposed Action. As described in the existing conditions, water in these facilities is of generally good quality; therefore, changes to reservoir storage in non-Project reservoirs would have less than significant impacts on water quality.

Water transfers could change river flow rates in the Seller Service Area and could affect water quality. Differences in river flows between Alternative 3 and the No Project/No Action Alternative are shown in Table 3.2-29. Generally, the changes in river flows are very similar to those shown in the Proposed Action, and the reasons for the changes are similar. The peak changes during the transfer period are less in Alternative 3 because it has fewer overall transfers because cropland idling and crop shifting transfers are not included.

Table 3.2-29. Changes in River Flows between the No Action/No Project Alternative and Alternative 3 (in cfs)

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Sacramento River at Freeport												
W	-22.0	-20.6	-122.3	-148.0	-121.4	-62.3	-49.2	-32.5	-42.2	-17.9	-13.1	-7.2
AN	-12.6	-43.8	-106.3	-421.5	-385.3	-306.3	-83.0	-147.6	-62.6	130.4	9.2	7.8
BN	0.0	0.0	0.0	-42.5	-119.6	-38.3	-33.2	-24.7	0.0	0.0	0.0	0.0
D	-42.0	-63.0	-56.8	-140.5	-94.8	-214.9	-176.4	-63.3	-69.5	696.7	924.7	157.4
C	-81.0	-69.6	-78.8	-112.0	-187.1	-162.3	-71.7	-61.3	-49.6	1,410.3	893.5	366.1
Sacramento River at Wilkins Slough												
W	-8.9	-5.1	-8.0	-10.7	-6.3	-5.3	-5.0	-3.2	-1.9	-2.4	-1.4	-1.3
AN	-8.3	-8.2	-27.2	-19.6	-18.2	-7.9	-8.2	-44.3	-2.6	7.2	7.2	7.8
BN	-4.5	-3.7	-3.5	-3.5	-3.5	-3.3	-4.3	0.0	0.0	-3.3	0.0	-3.0
D	-11.0	-14.1	-10.1	-11.0	-7.9	-7.6	-53.1	-33.5	-248.9	294.9	452.1	75.6
C	-21.5	-15.8	-15.2	-14.1	-5.2	-15.1	-0.2	-119.3	-273.7	715.3	251.9	102.1
Feather River below Thermalito Afterbay												
W	8.3	-5.4	-16.4	-9.0	-40.8	0.0	0.0	0.0	4.6	6.0	13.3	12.2
AN	29.4	1.1	2.0	0.0	-39.5	-162.9	0.0	0.0	-9.3	96.9	-29.8	-22.5
BN	10.2	10.0	17.9	0.0	0.0	0.0	0.0	0.0	5.4	4.7	14.1	7.0
D	10.7	1.7	3.7	0.0	0.0	0.0	0.0	-102.6	-12.1	34.4	162.6	-70.0
C	10.7	11.1	17.5	0.0	7.7	3.8	11.6	-1.8	-34.7	15.8	110.3	0.8
Lower Feather River												
W	0.2	-13.8	-32.1	-25.8	-52.4	-16.4	-10.4	-9.1	-3.5	-1.1	7.1	6.4
AN	16.3	-11.7	-9.9	-55.2	-55.8	-196.8	-15.5	-58.8	-22.0	86.1	-39.3	-31.2
BN	5.3	5.4	13.4	-5.0	-7.5	-9.6	-9.2	-7.2	0.0	0.7	10.7	4.0
D	-1.9	-10.0	-8.2	-13.3	-25.2	-35.2	-7.9	-106.9	-16.0	102.1	228.7	-40.7
C	-11.0	-8.5	-0.3	-18.5	-56.0	-21.1	-0.6	-0.5	-29.5	185.5	197.5	40.6
Lower Yuba River												
W	-0.4	-0.9	-7.7	-0.9	-2.0	-6.3	-0.8	-0.7	-0.7	-0.6	-0.6	-0.6
AN	0.0	-1.0	-1.1	-1.2	-1.1	-19.1	-1.0	-45.6	-0.9	-0.9	-0.9	-0.9
BN	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.3	-0.3	-0.3	-0.3
D	-0.3	-0.8	-0.7	-0.7	-12.7	-22.2	-0.5	0.0	0.0	33.7	10.0	-0.2
C	-0.6	-1.5	-1.5	-1.5	-1.5	-1.5	-0.1	-0.1	-0.1	43.7	6.7	0.0

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Bear River at the Feather River												
W	0.0	0.0	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.9	26.6	12.3
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	0.0	49.0	9.0	0.0
American River at H Street												
W	16.4	38.7	-36.7	-56.2	-22.4	-2.7	-1.3	8.4	-13.7	4.1	-1.6	3.5
AN	21.2	12.1	0.9	-173.0	-235.7	-34.9	-1.3	-1.3	1.8	32.7	36.5	41.0
BN	12.1	11.9	21.5	-0.4	-79.4	-0.5	-0.4	-0.5	12.3	13.6	-0.3	8.2
D	25.4	8.9	43.7	-53.1	-22.0	-73.9	-114.5	-63.7	-0.9	130.5	80.0	56.9
C	51.5	40.0	30.3	16.9	17.0	25.8	-23.3	20.5	-44.3	191.3	142.5	82.4
Merced River at San Joaquin River												
W	0.0	0.0	0.0	0.0	-41.6	0.0	58.8	32.9	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	127.5	71.4	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	85.0	47.6	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	85.0	47.6	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	36.4	20.4	0.0	0.0	0.0	0.0
San Joaquin River at Vernalis												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-81.3	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	32.5	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	21.7	0.0	0.0	0.0	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	9.3	0.0	0.0	0.0	0.0	0.0

Note: Negative numbers indicate that Alternative 3 would decrease river flows compared to the No Action/No Project Alternative; positive numbers indicate that Alternative 3 would increase river flows.

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

The small changes expected in river flow rates in the seller's service area under Alternative 3 would not be of sufficient magnitude or frequency to result in adverse effects to designated beneficial uses, violate existing water quality standards, or substantial degrade water quality. Consequently, potential flow-related effects on water quality would be less than significant.

Water transfers could change Delta inflows and could result in water quality impacts. Under Alternative 3, Delta inflows would be similar to the No Action/No Project Alternative. Inflows will generally increase during July through September of Dry and Critical water years, but these increases would be less than those under the Proposed Action. Delta inflows slightly decrease most other months of the year. The timing of these changes is due to the timing of the release of transfer water from storage in upstream dams. Percent decreases in Sacramento River inflow are less than 2 percent under Alternative 3. Average increases in Sacramento River inflow may be as high as 9.9 percent during summer months of Critical water years.

Water transfers could change outflow rates in the Delta and could result in water quality impacts. Under Alternative 3, long-term Delta outflows would be similar to the No Action/No Project Alternative. The most substantial change would occur in August when Delta outflows would increase by an average of 1.4 percent. Outflows would decrease slightly by approximately 0.1-0.3 percent during the winter and spring when water demands are lower in the region. This slight change in Delta region outflows would have a less than significant effect on water quality.

Under Alternative 3, NDOs would be similar to the No Action/No Project Alternative. Small decreases would occur during non-transfer periods (less than 1 percent) because streamflow depletion decreases Delta inflow. The largest percent changes occur during July through September of Critical and Dry water years when transfers are moving through the Delta. The NDO increases during transfers by up to 7.9 percent during a critical year in July. More detailed information is provided in Appendix C. These changes would have a less than significant effect on water quality.

Water transfers could change Delta salinity and could result in water quality impacts. EC modeling results are shown at several Delta locations in Table 3.2-30. Modeled impacts to EC, chloride concentrations, and X2 indicate that under Alternative 3, water quality impacts in the Delta would be less than those under the Proposed Action. As a result, impacts to water quality in the Delta region under Alternative 3 are less than significant.

Table 3.2-30. Average Monthly Percent Change in EC from the No Action/No Project Alternative to Alternative 3

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SWP intake to Clifton Court Forebay												
W	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.4	-0.7	-0.2	0.1	0.0	-0.5	0.0	0.0	-0.6	0.0	0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.4	-0.7	-0.1	0.2	0.2	0.1	0.2	0.6	0.6	0.8	1.5	-1.3
C	-3.0	-1.7	-0.9	-0.6	-0.1	0.4	0.3	0.6	0.5	2.7	0.6	-3.6
CVP intake at Delta Mendota Canal												
W	-0.3	-0.1	-0.1	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.2	-0.6	-0.1	0.0	-0.1	-0.7	-0.1	0.0	-0.6	0.1	0.1	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.2	-0.5	-0.1	0.1	0.2	0.0	0.2	0.6	0.5	0.6	0.6	-1.1
C	-2.5	-1.4	-0.6	-0.4	0.0	0.4	0.2	0.7	0.6	2.1	0.5	-3.2
CCWD Victoria Canal location												
W	-0.2	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-0.5	-0.1	0.1	1.1	-0.3	-0.1	0.1	-0.6	-0.3	0.1	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.1	-0.4	-0.1	0.2	0.2	0.1	0.2	0.3	0.5	-0.3	0.1	-1.2
C	-2.3	-0.9	-0.7	-0.4	-0.1	0.2	0.3	0.4	0.4	0.3	-1.1	-4.3
CCWD Old River location												
W	-0.3	-0.2	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.4	-0.8	-0.2	0.2	0.5	-0.4	-0.1	0.0	-0.4	0.2	0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-1.5	-0.7	-0.1	0.2	0.3	0.2	0.2	0.5	0.5	1.1	1.8	-1.4
C	-3.1	-1.8	-1.2	-0.8	-0.2	0.3	0.3	0.6	0.5	3.2	0.1	-3.8
CCWD Rock Slough location												
W	-0.4	-0.3	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-1.3	-1.0	-0.4	0.2	0.3	0.3	-0.3	0.0	-0.3	0.3	0.2	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-1.5	-1.1	-0.4	0.2	0.2	0.2	0.2	0.4	0.4	1.9	2.1	-0.6
C	-3.3	-2.3	-1.4	-0.9	-0.3	0.3	0.3	0.4	0.5	5.2	1.6	-2.8
RSAC081 Collinsville												
W	-0.1	-0.1	0.3	0.2	0.0	0.0	0.1	0.1	0.2	0.1	0.2	0.2
AN	-0.6	-0.2	0.6	0.9	0.1	0.2	0.0	0.2	1.3	0.3	-0.1	-0.2
BN	0.0	0.0	0.0	0.3	0.2	0.1	0.3	0.3	0.1	0.0	0.0	0.0
D	-0.7	-0.1	0.6	0.5	1.0	0.9	1.5	1.1	0.5	-2.5	-4.4	-2.8
C	-1.3	-0.5	0.0	0.6	1.5	1.8	1.5	1.0	0.8	-4.6	-5.9	-3.9
RSAN007 near Antioch												
W	-0.2	-0.1	0.2	0.2	0.0	0.0	0.0	0.1	0.1	0.1	0.2	0.1
AN	-0.8	-0.3	0.5	0.7	0.0	0.0	-0.2	0.0	0.7	0.5	-0.2	-0.2
BN	0.0	0.0	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.0	0.0	0.0
D	-1.0	-0.1	0.6	0.5	0.5	0.5	0.6	0.8	0.4	-2.1	-4.0	-3.3
C	-1.9	-0.8	-0.3	0.2	1.0	1.4	1.4	1.1	1.0	-3.8	-5.8	-4.3

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
RSAN018 Jersey Point												
W	-0.4	-0.3	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
AN	-1.3	-0.8	0.2	0.5	0.1	0.0	-0.2	0.0	0.1	1.0	-0.1	-0.2
BN	0.0	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-1.5	-0.6	0.4	0.3	0.0	0.1	0.1	0.1	-0.1	1.5	0.4	-2.9
C	-3.0	-1.8	-1.1	-0.7	0.0	0.5	0.5	0.6	1.0	2.3	-2.4	-4.0

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal. Water quality impacts to the Delta-Mendota Canal would be the same as those described above for the Proposed Action. While the new water introduced to the Delta-Mendota Canal may have higher EC concentrations, the flow would be much smaller than the flows in the Delta-Mendota Canal. Therefore, the increased EC in the water entering the canal would likely not result in a substantive change to EC in the canal. The impacts to water quality in CVP deliveries would be less than significant.

3.2.2.5.2 Buyer Service Area

Transfer water would result in increased irrigation in the Buyer Service Area, which could affect water quality. Under Alternative 3, surface water supplies in the San Joaquin Valley would increase. Some of this water may be used to irrigate drainage impaired lands, but it is much more likely to be used to support permanent crops or high quality farmland. This impact would be the same as described for the Proposed Action. Therefore, Alternative 3 would have less than significant impacts to water quality in the Buyer Service Area as a result of crop irrigation.

Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Under Alternative 3, storage would be the same as that under the Proposed Action. These small changes in storage are not sufficient enough to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Modeling indicates that San Luis Reservoir would fall below 300,000 acre-feet in 33 years rather than 30 years (under the No Action/No Project Alternative), but the modeling does not incorporate seasonal storage that would increase water levels during this period. Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.

3.2.2.6 Alternative 4: No Groundwater Substitution

3.2.2.6.1 Seller Service Area

Cropland idling transfers could result in increased deposition of sediment on water bodies. The effects of cropland idling transfers under Alternative 4 would be the same as described under the Proposed Action. Cropland idling would not result in substantial soil erosion or sediment deposition into waterways. Impacts to water quality would be less than significant.

Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff. The effects of cropland idling/crop shifting under Alternative 4 would be the same as described under the Proposed Action. Overall, the effect on water quality with respect to leaching and surface water runoff would be less than significant.

Cropland idling/shifting transfers could change the quantity of organic carbon in waterways. The effects of cropland idling/crop shifting under Alternative 4 would be the same as described for the Proposed Action. Cropland idling/shifting under Alternative 4 would not be expected to increase organic carbon in waterways, and therefore this impact would be considered less than significant.

Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts. Based on modeling efforts, changes in CVP and SWP reservoir storage Alternative 4 and the No Action/No Project Alternative are shown in Table 3.2-~~30~~31. Changes in reservoir storage are primarily influenced by storing transfer water in April, May, and June of dry and critical years (until the Delta pumps can convey the water to the buyers). No impacts to Shasta Reservoir or Lake Oroville are predicted during other time periods. Folsom Reservoir is downstream of French Meadows and Hell Hole reservoirs, which has small effects on storage to re-regulate releases and later refill the reservoirs.

The small changes in average monthly storage volumes in reservoirs within the Seller Service Area would not be of sufficient magnitude and frequency to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Consequently, potential storage-related effects on water quality would be less than significant.

Table 3.2-~~30~~31. Changes in CVP and SWP Reservoir Storage between the No Action/No Project Alternative and the Alternative 4 (in 1,000 AF)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Shasta Reservoir												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.3	17.5	8.7	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	17.2	46.0	7.4	0.0	0.0
Lake Oroville												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-3.3	-0.8	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	2.1	2.9	9.0	-4.5	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.7	2.6	6.6	0.0	0.0
Folsom Reservoir												
W	3.5	1.4	1.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-0.2
AN	-0.3	-0.5	-0.7	-0.9	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.1
BN	0.2	0.3	0.4	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	4.2	3.5	-0.1	-0.1	-1.0	0.0	0.0	5.2	8.9	9.5	11.7	13.5
C	8.5	7.2	5.7	4.6	3.6	1.9	0.3	3.6	9.1	8.2	10.0	12.1

Note: Negative numbers indicate that Alternative 4 would decrease reservoir storage compared to the No Action/No Project Alternative; positive numbers indicate that Alternative 4 would increase reservoir storage.
Key: Sac Yr Type = year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts. Alternative 4 includes the same reservoir release transfers as the Proposed Action; therefore, the changes in reservoir storage in these facilities would be the same as those described above for the Proposed Action. As described in the existing conditions, water in these facilities is of generally good quality; therefore, changes to reservoir storage in non-Project reservoirs would have less than significant impacts on water quality.

Water transfers under Alternative 4 could change river flow rates in the Seller Service Area and could affect water quality. Changes in river flow rates between Alternative 4 and the No Action/No Project Alternative are shown in Table 3.2-~~31~~32.

Table 3.2-~~31~~32. Changes in River Flows between the No Action/No Project Alternative and Alternative 4 (in cfs)

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Sacramento River at Freeport												
W	0.0	31.4	-39.7	-24.9	-20.7	-5.0	0.0	9.6	-13.5	-0.5	-0.8	0.0
AN	0.0	0.0	0.0	-172.8	-233.9	-50.0	0.3	-33.5	0.0	54.2	-40.7	-14.0
BN	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	47.2	-52.2	-33.2	-91.7	-113.6	-6.1	-9.2	37-.2	585.3	67.1
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	65.4	-16.6	1,286.2	805.4	368.2
Sacramento River at Wilkins Slough												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-73.8	279.9	279.9	89.1
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-31.7	-108.3	1,024.0	516.0	255.9
Feather River below Thermalito Afterbay												
W	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	54.2	-40.7	-14.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-24.~~8~~3	0.0	-99.0	219.6	-75.6
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-13.2	-65.5	107.9	0.0
Lower Feather River												
W	0.0	0.0	-6.3	-6.3	0.0	-3.9	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	-16.8	0.0	-33.6	0.0	54.2	-40.7	-14.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	-12.0	-19.5	0.0	-24.3	0.0	-2.1	237.2	-66.0
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	-13.2	65.2	127.2	12.4
Lower Yuba River												
W	0.0	0.0	-6.3	0.0	0.0	-3.9	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	-16.8	0.0	-33.6	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	-12.0	-19.5	0.0	0.0	0.0	43.9	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.4	0.0	0.0
All	0.0	0.0	-2.4	0.0	-2.1	-7.9	0.0	-5.9	0.0	18.1	0.0	0.0

Sac Yr Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
Bear River at the Feather River												
W	0.0	0.0	0.0	-6.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	-40.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	37.9	2.7	0.0
C	0.0	0.0	0.0	0.0	-44.6	-5.8	0.0	0.0	0.0	58.1	0.0	0.0
American River at H Street												
W	9.7	36.2	-28.6	-18.6	-20.7	-1.1	0.0	9.6	-13.5	-0.5	-0.8	0.0
AN	10.4	4.4	1.7	-132.1	-233.9	-33.2	0.3	0.1	0.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	6.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	20.8	11.7	57.6	-52.2	-21.2	-72.2	-113.6	-24.3	0.0	55.6	33.9	32.2
C	36.5	28.6	31.5	18.2	18.3	26.8	26.8	38.6	-6.8	97.4	59.6	55.8
Merced River at San Joaquin River												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162.6	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.7	0.0	0.0
San Joaquin River at Vernalis												
W	0.0	0.0	0.0	0.0	-41.6	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	-84.0	0.0	0.0	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	162.6	0.0	0.0
C	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	69.7	0.0	0.0

Note: Negative numbers indicate that Alternative 4 would decrease river flows compared to the No Action/No Project Alternative; positive numbers indicate that Alternative 4 would increase river flows.

Key: Sac Yr Type = year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Under Alternative 4, long-term average flow rates in the Sacramento River at Freeport would be up to 0.2 percent lower than flow rates under existing conditions during October through April. Long-term average flow rates at Freeport would be, at most, 1.8 percent higher than flow rates under the No Action/No Project Alternative during the summer months of May through September. Increases in flow during the summer months would be the result of increased reservoir releases. These increases in flow, however, would be slightly less than those resulting from the Proposed Action, as the Proposed Action would include additional flows from groundwater substitution. Sacramento River flows at Wilkins Slough show a similar trend.

Long-term average changes flow rates in the Feather River below Thermalito Afterbay and in the Lower Feather River would be less than under the Proposed Action. Long-term average monthly changes in flow rates in the lower American River at H Street would be less than under the Proposed Action due to the lack of groundwater substitution.

The effects of water transfers under Alternative 4 in the Lower Yuba, Bear, and Merced rivers are caused by reservoir release transfers, which would be the same as those described in the Proposed Action. The changes in flow would be similar to those described for the Proposed Action.

Overall, any changes in river flows under Alternative 4 would not be of sufficient magnitude or frequency to result in adverse effects to designated beneficial uses, violate existing water quality standards, or substantial degrade water quality. Consequently, potential flow-related effects on water quality in the rivers within the Seller Service Area would be less than significant.

Water transfers could change Delta inflows and could result in water quality impacts. Under Alternative 4, Delta inflows would be similar to the No Action/No Project Alternative. Inflows will generally increase during July through September of Dry and Critical water years, but these increases would be less than those under the Preferred Action. Delta inflows slightly decrease most other months of the year. The timing of these changes is due to the timing of the release of transfer water from storage in upstream dams. Percent decreases in Sacramento River inflow are less than 2 percent under Alternative 4. Average increases in Sacramento River inflow may be as high as 9.2 percent during summer months of Critical water years.

Water transfers could change outflows to the Delta and could result in water quality impacts. Under Alternative 4, the average maximum changes in long-term Delta outflows across all water years are less than one percent and this would occur during the summer months (July through August) when transfers are moving through the Delta. Outflows would decrease slightly by approximately 0.1 percent during the winter and spring when water demands are lower in the region. The maximum change in an individual water year type would occur during July of critical water years when outflows could increase by

7 percent. This slight change in Delta region outflows would have a less than significant effect on water quality.

Under Alternative 3, NDOs would be similar to the No Action/No Project Alternative. Small decreases would occur during January through April (less than 0.6 percent), likely because of decreased river flows during reservoir refill associated with reservoir release transfers. The largest percent changes occur during July through September of Critical and Dry water years when transfers are moving through the Delta. The NDO increases during transfers by up to 7.1 percent during a critical year in July. More detailed information is provided in Appendix C. These changes would have a less than significant effect on water quality.

Water transfers could change Delta salinity and could result in water quality impacts. Modeled impacts to EC, chloride concentrations, and X2 indicate that under Alternative 4, water quality impacts in the Delta would be less than those under the Proposed Action. Percent changes in EC at locations within the Delta are shown in Table 3.2-33. As a result, impacts to water quality in the Delta region under Alternative 4 are less than significant.

Table 3.2-33. Average Monthly Percent Change in EC from the No Action/No Project Alternative to Alternative 4

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
SWP intake to Clifton Court Forebay												
W	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.4	-0.2	0.0	0.0	0.0	0.1	0.0	-0.6	-0.2	0.0	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-0.7	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.3	1.0	-0.2
C	-1.5	-0.8	-0.4	-0.2	-0.1	0.0	0.0	0.0	-0.2	2.2	1.1	-1.6
CVP intake at Delta Mendota Canal												
W	-0.1	-0.1	0.0	0.0	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.4	-0.2	0.0	0.0	0.0	0.1	0.0	-0.6	-0.1	0.0	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-0.6	-0.3	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	1.1	0.3	-0.2
C	-1.3	-0.7	-0.3	-0.1	0.0	0.0	0.0	0.0	-0.1	0.6	0.2	-0.4
CCWD Victoria Canal location												
W	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.8	-0.4	-0.2	0.0	0.0	0.0	0.0	0.1	-0.6	-0.3	0.0	-0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-0.6	-0.3	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.2	0.2	-0.4
C	-1.4	-0.6	-0.4	-0.2	-0.1	0.0	0.0	0.0	-0.2	-0.1	-0.7	-2.8

Year Type	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep
CCWD Old River location												
W	-0.1	-0.1	-0.1	0.0	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.8	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.1	-0.4	-0.1	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
D	-0.7	-0.4	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.4	1.2	-0.1
C	-1.5	-0.9	-0.5	-0.3	-0.1	0.0	0.0	0.0	-0.3	2.7	0.8	-1.7
CCWD Rock Slough location												
W	-0.1	-0.1	-0.1	0.0	-0.1	-0.1	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.6	-0.3	-0.1	0.0	0.0	0.0	0.0	-0.3	0.0	0.0	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.6	-0.5	-0.2	-0.1	0.0	0.0	0.0	0.0	0.0	0.5	1.0	0.7
C	-1.5	-1.1	-0.6	-0.3	-0.1	0.0	0.0	0.0	-0.4	4.7	2.1	-0.7
RSAC081 Collinsville												
W	-0.1	-0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.5	-0.2	-0.2	0.1	0.1	0.0	0.0	0.0	0.5	0.2	0.1	0.1
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.5	-0.2	-0.3	-0.1	0.3	0.3	0.9	0.5	0.3	-1.5	-2.4	-1.2
C	-0.9	-0.4	-0.2	-0.2	0.4	0.3	0.1	-0.9	-0.2	-4.2	-4.9	-3.0
RSAN007 near Antioch												
W	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.6	-0.2	-0.2	0.0	0.1	0.0	0.0	0.0	0.1	0.2	0.1	0.0
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.6	-0.2	-0.2	-0.1	0.1	0.2	0.3	0.4	0.4	-1.2	-2.0	-1.3
C	-1.1	-0.5	-0.3	-0.2	0.3	0.3	0.1	-1.1	-0.2	-3.5	-4.6	-3.0
RSAN018 Jersey Point												
W	-0.1	-0.1	-0.1	0.0	-0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
AN	-0.7	-0.3	-0.2	0.0	0.1	0.0	0.0	0.0	-0.1	0.4	-0.1	-0.2
BN	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
D	-0.6	-0.3	-0.3	-0.1	0.0	0.0	0.0	0.1	0.3	0.9	1.1	-0.8
C	-1.3	-0.7	-0.4	-0.2	0.0	0.2	0.1	-0.9	-0.3	2.3	-0.9	-1.6

Key: Year Type = Sacramento watershed year type, W = wet, AN = above normal, BN = below normal, D = dry, C = critical

Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal. Water quality impacts to the Delta-Mendota Canal would be the same as those described above for the Proposed Action. While the new water introduced to the Delta-Mendota Canal may have higher EC concentrations, the flow would be much smaller than the flows in the Delta-Mendota Canal. Therefore, the increased EC in the water entering the canal would likely not result in a substantive change to EC in the canal. The impacts to water quality in CVP deliveries would be less than significant.

3.2.2.6.2 Buyer Service Area

Transfer water would result in increased irrigation in the Buyer Service Area, which could affect water quality. Under Alternative 4, surface water supplies in the San Joaquin Valley would increase. Some of this water may be used to irrigate drainage impaired lands, but it is much more likely to be used to support permanent crops or high quality farmland. This impact would be the same as described for the Proposed Action. Therefore, Alternative 4 would have less than significant impacts to water quality in the Buyer Service Area as a result of crop irrigation.

Table 3.2-~~32~~34. Comparison of Alternatives

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance After Mitigation
Changes in reservoir storage and river flows would not affect water quality in reservoirs within the Seller Service Area.	1	NCFEC	None	NCFEC
Changes in reservoir storage would not affect water quality in San Luis Reservoir.	1	NCFEC	None	NCFEC
Cropland idling in the Buyer's Service Area could result in increased deposition of sediment on water bodies	1	NCFEC	None	NCFEC
Cropland idling transfers could result in increased deposition of sediment on water bodies.	2, 4	LTS	None	LTS
Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff.	2, 4	LTS	None	LTS
Cropland idling/shifting transfers could change the quantity of organic carbon in waterways.	2, 4	LTS	None	LTS
Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows.	2, 3	LTS	None	LTS
Water transfers could change reservoir storage in CVP and SWP reservoirs and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change reservoir storage non-Project reservoirs participating in reservoir release transfers, which could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change river flow rates in the Seller Service Area and could affect water quality.	2, 3, 4	LTS	None	LTS

Potential Impact	Alternatives	Significance	Proposed Mitigation	Significance After Mitigation
Water transfers could change Delta inflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta outflows and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Water transfers could change Delta salinity and could result in water quality impacts.	2, 3, 4	LTS	None	LTS
Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal.	2, 3, 4	LTS	None	LTS
Use of transfer water in the Buyer Service Area could result in increased irrigation on drainage impaired lands in the Buyer Service Area which could affect water quality.	2, 3, 4	LTS	None	LTS
Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts.	2, 3, 4	LTS	None	LTS

Water transfers could change reservoir storage in San Luis Reservoir and could result in water quality impacts. Under Alternative 4, storage changes would be smaller than those~~would be the same as that~~ under the Proposed Action because the small decreases associated with streamflow depletion would not occur. The~~se~~ small changes in storage are not sufficient enough to adversely affect designated beneficial uses, violate existing water quality standards, or substantially degrade water quality. Modeling indicates that San Luis Reservoir would not fall below 300,000 acre-feet in more years than under the No Action/No Project Alternative. Consequently, potential storage-related effects on water quality would be less than significant for San Luis Reservoir.

3.2.3 Comparative Analysis of Alternatives

Table 3.2-~~32~~ 34 summarizes the potential water quality effects of each of the action alternatives and the No Action/No Project Alternative. The following text supplements the table by comparing the effects of the action alternatives and No Action/No Project Alternative.

3.2.3.1 No Action/No Project Alternative

Under the No Action/No Project Alternative, there would be no impacts from water transfers and no changes in river flows or reservoir storage; therefore, there would be no water quality impacts.

3.2.3.2 Alternative 2: Full Range of Transfers (Proposed Action)

The Proposed Action would result in the most water being transferred overall; however the impacts on river flows and reservoir storage are minimal. There would not be any significant water quality effects from the Proposed Action.

3.2.3.3 Alternative 3: No Cropland Modification

Alternative 3 would result in slightly less overall water to transfer than the Proposed Action. The effects on water quality would be similar to the Proposed Action, but less in some reservoirs and river systems. Overall, there would not be any significant water quality impacts.

3.2.3.4 Alternative 4: No Groundwater Substitution

Alternative 4 would result in slightly less overall water to transfer than the Proposed Action. The effects on water quality would be similar to the Proposed Action, but less in some reservoirs and river systems. Overall, there would not be any significant water quality impacts.

3.2.4 Cumulative Effects

The timeframe for the water quality cumulative effects analysis extends from 2015 through 2024, a ten year period. The projects considered for the water quality cumulative condition are the SWP water transfers, the CVP M&I Water Shortage Policy (WSP), the Lower Yuba River Accord, refuge transfers, and the San Joaquin River Restoration Program, described in more detail in Section 4.3. SWP transfers and the Lower Yuba River Accord could involve transfers in the Seller Service Area and, therefore, could affect water quality resources. The WSP could reduce agricultural water deliveries and increase land idling in the Buyer Service Area. Effects of the WSP in the Seller Service Area would be minor as agricultural water supplies would not substantially change relative to existing conditions. Refuge transfers could increase cropland idling in the San Joaquin Valley near the Buyer Service Area to make water available for transfer, and a small portion of the transferred water could flow through the Delta. The San Joaquin River Restoration Program could increase flows and affect water quality in the San Joaquin River system.

In addition to the efforts described in Section 4.3, the Central Valley Salinity Alternatives for Long-Term Sustainability initiative (CV-SALTS) could affect water quality in the Central Valley. CV-SALTS is a stakeholder-driven effort to manage salinity and nitrates in the Central Valley, and it includes efforts to implement the TMDL for salinity.

The following sections describe potential water quality cumulative effects for each of the proposed alternatives.

3.2.4.1 Alternative 2: Full Range of Transfers (Proposed Action)

3.2.4.1.1 Seller Service Area

Cropland idling transfers could result in increased deposition of sediment on water bodies. A combination of farming practices and soil types in the Seller Service Area reduce the potential of long-term water transfers to erode sediments from idled fields. SWP transfers could also include cropland idling of 86,930 AF, but these transfers would be on fields with similar crops (rice) and soil types. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to water quality.

Cropland idling/shifting transfers could change the water quality constituents associated with leaching and runoff. Cropland idling/crop shifting would change irrigation practices and pesticide application. The changes in the quantity of irrigation water applied to the land could alter the concentration of pollutants associated with leaching and runoff, resulting in less runoff of potential constituents. SWP transfers could have similar effects as those described above for the Proposed Action. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact with respect to leaching and surface water runoff.

Cropland idling/shifting transfers could change the quantity of organic carbon in waterways. Both cropland idling and crop shifting would decrease agricultural runoff entering waterways, which could reduce one source of organic carbon. SWP transfers would have a similar effect. The overall reduction in agricultural runoff may not actually cause a quantifiable decrease in organic carbon because there are other sources and a variety of factors that contribute to organic carbon levels in waterways. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to organic carbon.

Groundwater substitution transfers could introduce contaminants that could enter surface waters from irrigation return flows. Groundwater substitution transfers would use groundwater for irrigation instead of surface water, which has the potential to change the constituents in agricultural runoff. SWP transfers through groundwater substitution (approximately 6,800 AF) could have the same effect. The amount of groundwater substituted for surface water in the cumulative condition would be relatively small compared to the amount of surface water used to irrigate agricultural fields in the seller areas. Additionally, groundwater quality in the area is generally good and sufficient for municipal, agricultural, domestic, and industrial uses. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to water quality associated with groundwater contributions to agricultural runoff.

Changes in CVP and SWP operations could affect reservoir storage and river flows. Long-term water transfers would increase reservoir storage April through September and decrease storage at other times of year. They would also increase river flows from July through September and decrease river flows at other times. Other cumulative programs could also affect CVP and SWP operations. SWP transfers would have similar operations, and would change reservoir storage and river flows at the same time as long-term water transfers. The Yuba Accord would increase river flows during potential transfers, which could also have similar timing. The M&I WSP would have minor effects to CVP operations in Folsom Reservoir (and negligible effects to other parts of the CVP system). These overall changes to the operations of reservoirs would still represent a very small change based on the size of the reservoirs and the river flows. Therefore, the Proposed Action in combination with other cumulative actions would not result in a cumulative significant impact related to water quality of reservoirs and rivers.

Changes in Delta outflows could result in water quality impacts. As described in the existing conditions, the Delta has number water quality constituents of concern. Past and current projects have affected Delta outflows and degraded water quality in the Delta. Several efforts, including CV-SALTS and other SWRCB actions, are working to improve water quality in the Delta in the future. SWP transfers, refuge transfers, and the Yuba Accord would have similar effects. These effects on Delta outflow would generally be small, but would be increasing outflow during dry periods of the year. SWP transfers and the Yuba Accord~~These programs~~ could also decrease Delta outflow during other times of year, but these times are generally during wet parts of the year when the decrease would not affect water quality. Because of existing degraded water quality conditions in the Delta, the combination of cumulative actions is considered to have significant impacts on water quality in the Delta. Long-term water transfers would increase Delta outflows slightly during the transfer period because carriage water would become additional Delta outflow, which would not adversely affect Delta water quality. Therefore, the Proposed Action's incremental contribution to potentially significant cumulative water quality impacts would not be cumulatively considerable.

Changes in Delta inflows, outflows, and exports could affect Delta salinity. As discussed in existing conditions, salinity is a concern in the Delta because it can adversely affect municipal, industrial, agricultural, and recreational uses. Numerous projects and operations, including CVP and SWP operations, urban discharges, and agricultural discharge affect salinity in the Delta. SWP transfers, refuge transfers, and the Yuba Accord would increase Sacramento River Delta inflow and increase Delta exports; these two actions have opposite effects on Delta salinity. Other programs, such as CV-SALTS, are working to improve water quality in the tributaries to the Delta. These programs would decrease salinity in Delta inflow, which would improve conditions within the Delta in the future. While the end results of these programs may not achieve the desired benefits, it is likely that gradual improvements would occur. Because of existing salinity concerns in the Delta, the combination of cumulative actions is considered to have significant impacts on salinity in the Delta. As shown in the water quality modeling, the Proposed Action would not substantially change the position of X2. Therefore, the Proposed Action's incremental contribution to potentially significant cumulative salinity impacts in the Delta would not be cumulatively considerable.

Diversion of transfer water at Banta Carbona ID, West Stanislaus ID, and Patterson ID could affect water quality in the Delta-Mendota Canal. If Merced ID transfer water is diverted at these facilities, the districts could use the water in their districts and transfer their CVP water, or they could move the water through their districts into the Delta-Mendota Canal. Lake McClure is listed as impaired for mercury due to resource extraction, but otherwise, water quality is generally good. As discussed in existing conditions, water quality in the San Joaquin River is degraded from agricultural discharges, runoff, and wastewater discharges. The San Joaquin River has greater EC concentrations than those at the Delta diversion pumps. Some programs could improve water quality in the San Joaquin River in the future. CV-SALTS is working to reduce salinity in the river and its tributaries. Additionally, the San Joaquin River Restoration Program would increase flows from the upstream watershed into the San Joaquin River, which could provide high quality inflow to dilute constituents of concern in the system. Based on past and current projects, the combination of cumulative actions result in degraded water quality in the San Joaquin River. While the new water introduced to the Delta-Mendota Canal may have higher EC concentrations, the flow from the San Joaquin River into the Delta-Mendota Canal would be much smaller than the flows in the canal. Therefore, the cumulative impacts to water quality in CVP deliveries from San Joaquin River salinity would be less than significant.

Increased irrigation in the Buyer Service Area could affect water quality. Long-term water transfers could increase water supplies in the Central Valley and San Francisco Bay area. SWP transfers are generally to SWP contractors in southern California, but may also provide additional supplies to some of the same buyers. The Yuba Accord can also increase water supplies to these areas. The M&I WSP may result in decreases to water supplies for agricultural CVP contractors in the Central Valley. Refuge transfers could involve cropland idling transfers from the San Joaquin Valley near the Buyer Service Area, but the quantity of land idled would be very small.

Increased surface water supplies could be used to irrigate drainage impaired land. Increased irrigation could cause water to accumulate in the shallow root zone and could leach pollutants into the groundwater and potentially drain into the neighboring surface water bodies. Because of the severe supply limitations in the agricultural areas in the Buyer Service Area, increased supplies would likely be used for permanent crops or prime or important farmlands. As a result, farmers would continue to leave marginal land and drainage impaired lands out of production.

The amount of additional water supplies in the cumulative condition is minimal compared to existing applied irrigation water in the area. Therefore, the combination of cumulative actions is considered to have a less than significant impact on water quality in the Buyer Service Area as a result of crop irrigation.

3.2.4.2 Alternative 3: No Cropland Modification

Cumulative effects would be the same or less than those described for the Proposed Action in the Seller and Buyer Service Areas.

3.2.4.3 Alternative 4: No Groundwater Substitution

Cumulative effects would be the same or less than those described for the Proposed Action in the Seller and Buyer Service Areas.

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Section 3.3
Groundwater Resources

This section presents the existing conditions of groundwater resources within the area of analysis and discusses potential effects of the proposed alternatives on groundwater levels, land subsidence, and groundwater quality.

The descriptions and analyses presented in this section focus primarily on the effects of groundwater substitution transfers and cropland idling transfers on groundwater resources. Other transfer methods discussed in Chapter 2 (stored reservoir releases, crop shifting, and conservation transfers) would not adversely affect groundwater resources in the area of analysis. Several other sections analyze how groundwater-related changes could affect other resources, including:

- Section 3.1, Water Supply, analyzes how changes in groundwater levels have the potential to interact with surface water and potential effects to surface water supplies;
- Section 3.7, Fisheries, assesses how changes in groundwater/surface water interaction could affect aquatic resources;
- Section 3.8, Vegetation and Wildlife, determines if groundwater level changes could reduce water in the root zone and affect terrestrial vegetation; and
- Section 3.10, Regional Economics, analyzes changes in pumping costs associated with declining groundwater levels.

3.3.1 Affected Environment/Existing Conditions

This section presents the area of analysis (Section 3.3.1.1), describes the regulatory setting pertaining to groundwater resources in the area of analysis (Section 3.3.1.2), and describes the existing hydrologic and groundwater characteristics in the area of analysis (Sections 3.3.1.3).

3.3.1.1 Area of Analysis

The area of analysis extends from Shasta County in the northern portion of the Sacramento Valley to Kings County in the southern portion of the San Joaquin Valley and extends as far west as Santa Clara County. The area of analysis consists of the following groundwater basins and subbasins:

- Redding Area Groundwater Basin: Anderson subbasin
- Sacramento Valley Groundwater Basin: Colusa subbasin, West Butte subbasin, Sutter subbasin, Yolo subbasin, Solano subbasin, North and South American subbasins
- San Joaquin Valley Groundwater Basin: Merced subbasin and Westside subbasin
- Santa Clara Valley Groundwater Basin: Santa Clara subbasin
- Gilroy-Hollister Valley Groundwater Basin: Llagas subbasin

Figure 3.3-1 shows the area of analysis and the groundwater basins. The groundwater area of analysis is divided into Seller Service Area and Buyer Service Area.

The Seller Service Area for this resource section includes water districts that have groundwater pumping capabilities and have expressed an interest in groundwater substitution transfers. Groundwater substitution transfers are made by the selling agencies (listed in Table 2-5) that forego their surface water supplies and pump an equivalent amount of groundwater within the Central Valley groundwater basins.

The Buyer Service Area represents water districts that have expressed interest in transfers for purposes of this Environmental Impact Statement/Environmental Impact Report (EIS/EIR). Districts interested in receiving transfers include East Bay Municipal Utility District (MUD), Contra Costa Water District (WD), and Participating Members of the San Luis & Delta-Mendota Water Authority (SLDMWA). See Table 2-6 for a detailed list of interested buyers.

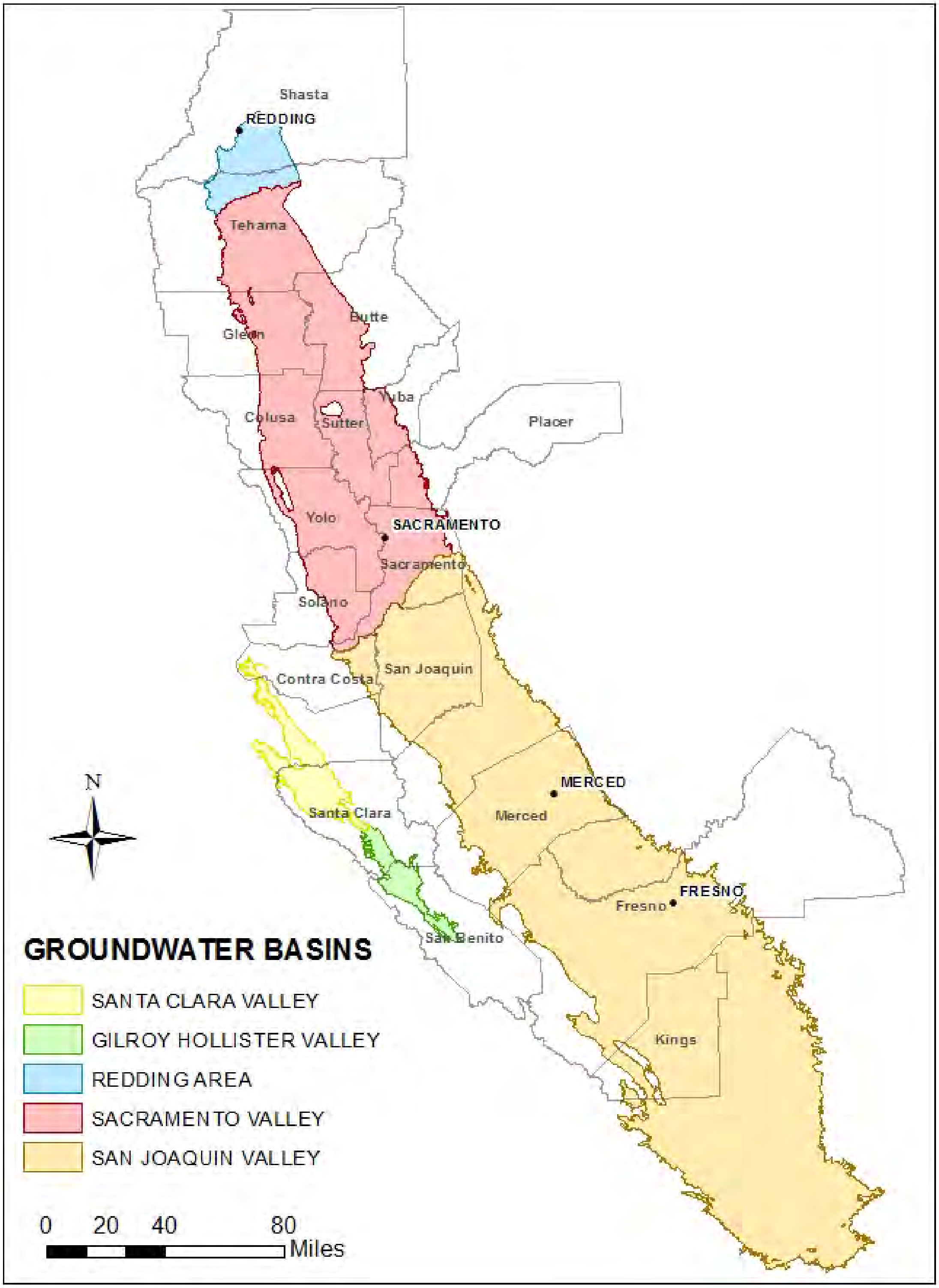

Figure 3.3-1. Groundwater Resources Area of Analysis

3.3.1.2 Regulatory Setting

All willing buying and selling agencies participating in this program will have to comply with applicable regulations: State regulations; Central Valley Project (CVP) and State Water Project (SWP) contractual requirements; and local regulations, as described below.

3.3.1.2.1 Federal Regulation

Central Valley Project Improvement Act (Section 3405)

Reclamation approves water transfers consistent with provisions of the Central Valley Project Improvement Act (CVPIA) and State law that protect against injury to other legal users of water. According to the CVPIA Section 3405, the following principles must be satisfied for any transfer:

- Transfer may not violate the provisions of Federal or state law;
- Transfer may not cause significant adverse effects on Reclamation's ability to deliver CVP water to its contractors or other legal user;
- Transfer will be limited to water that would be consumptively used or irretrievably lost to beneficial use;
- Transfers cannot exceed the average annual quantity of water under contract actually delivered; and
- Transfer will not adversely affect water supplies for fish and wildlife purposes.

Reclamation will not approve a water transfer if these basic principles are not satisfied and will issue its decision regarding potential CVP transfers in coordination with the U.S. Fish and Wildlife Service, contingent upon the evaluation of impacts on fish and wildlife.

3.3.1.2.2 State Regulation

Groundwater use is subject to limited statewide regulation; however, all water use in California is subject to constitutional provisions that prohibit waste and unreasonable use of water (State Water Resources Control Board [SWRCB] 1999). In general, groundwater and groundwater-related transfers are subject to a number of provisions in the California Water Code (Water Code). Some of these provisions are listed below~~:~~.

Water Code (Section 1745.10)
Section 1745.10 of the Water Code requires that for water transfers pursuant to Sections 1725[1] and 1735[2], the transferred water may not be replaced with groundwater unless the following criteria are met (SWRCB 1999):

- The transfer is consistent with applicable Groundwater Management Plans (GMPs); or
- The transferring water supplier approves the transfer and, in the absence of a GMP, determines that the transfer will not create, or contribute to, conditions of long-term overdraft in the groundwater basin.

Water Code (Section 1220)
Section 1220 of the Water Code regulates the direct export of groundwater from the combined Sacramento and Delta-Central Sierra Basins. It states that groundwater cannot be exported from these basins unless pumping complies with a GMP, adopted by the county board of supervisors in collaboration with affected water districts, and approved by a vote from the counties that lie within the basin. This excludes water seepage into groundwater from water supply project or export facilities, which may be returned to the facilities. In certain cases, the county board of supervisors may select a county water agency to represent the board.

In addition to these requirements, state well standards and local ordinances govern well placement, and the Water Code requires submission of well completion reports. Any groundwater substitution transfers would be subject to these regulations, as well as other applicable local regulations and ordinances. Reclamation requires sellers to submit well completion reports (if they are available) or video logs to evaluate proposed groundwater substitution transfers. Groundwater substitution transfers are not contingent on the submission of well completion reports.

Water Code (Section 1810) "no injury" provisions
Several provisions of the Water Code (including Sections 1702, 1706, 1725, 1735, and 1810, among others) provide that transfers cannot cause "injury to any legal user of the water involved." Both surface and groundwater users are protected by these provisions as long as they are legal users of water.

[1] Section 1725 of the Water Code pertains to short-term/temporary transfers of water under post 1914 water rights that involve the amount of water that would have been consumptively used or stored by the transferee in the absence of the change or transfer. Such changes or transfers are exempt from CEQA, but require findings of "no injury to other legal users" and "no unreasonable effects on fish and wildlife."

[2] Section 1735 of the Water Code pertains to long-term transfers of water or water rights involving a change of point of diversion, place of use, or purpose of use. A transfer is considered long-term if it exceeds a period of one year.

Water Code (Section 10750) or Assembly Bill (AB) 3030
AB 3030, commonly referred to as the Groundwater Management Act, permits local agencies to develop GMPs that cover certain aspects of management. Subsequent legislation has amended this chapter to make the adoption of a management program mandatory if an agency is to receive public funding for groundwater projects, creating an incentive for the development and implementation of plans.

Water Code (Section 10753.7) or Senate Bill (SB) 1938
SB 1938, requires local agencies seeking State funds for groundwater construction or groundwater quality projects to have the following: (1) a developed and implemented GMP that includes basin management objectives[3] (BMOs) and addresses the monitoring and management of groundwater levels, groundwater quality degradation, inelastic land subsidence, and surface water/ groundwater interaction; (2) a plan addressing cooperation and working relationships with other public entities; (3) a map showing the groundwater subbasin the project is in, neighboring local agencies, and the area subject to the GMP; (4) protocols for the monitoring of groundwater levels, groundwater quality, inelastic land subsidence, and groundwater/surface water interaction; and (5) GMPs with the components listed above for local agencies outside the groundwater subbasins delineated by the Department of Water Resources' (DWR) California's Groundwater Bulletin 118 (Bulletin 118), published in 2003 (DWR 2003).

Water Code (Section 10920-10936 and 12924) or SB X7 6
SB X7 6, established a voluntary statewide groundwater monitoring program and requires that groundwater data collected be made readily available to the public. The bill requires DWR to: (1) develop a statewide groundwater level monitoring program to track seasonal and long-term trends in groundwater elevation; (2) conduct an investigation of the state's groundwater basins delineated by Bulletin 118 and report its findings to the Governor and Legislature no later than January 1, 2012 and thereafter in years ending in five or zero; and (3) work cooperatively with local Monitoring Entities to regularly and systematically monitor groundwater elevations to demonstrate seasonal and long-term trends. AB 1152, Amendment to Water Code Sections 10927, 10932 and 10933, allows local Monitoring Entities to propose alternate monitoring techniques for basins meeting certain conditions and requires submittal of a monitoring plan to DWR for evaluation.

Water Code (Section 10927, 10933, 12924, 10750.1 and 10720) or SB 1168
SB 1168 requires the establishment of Groundwater Sustainability Agencies (GSA) and adoption of Groundwater Sustainability Plans (GSP). GSAs must be formed by June 30, 2017. GSAs are new entities that consist of local

[3] BMOs are management tools that define the acceptable range of groundwater levels, groundwater quality, and inelastic land subsidence that can occur in a local area without causing significant adverse impacts.

agency(ies) and include new authority to: 1) investigate and determine the sustainable yield of a groundwater basin; 2) regulate groundwater extractions; 3) impose fees for groundwater management; 4) require registration of groundwater extraction facilities; 5) require groundwater extraction facilities to use flow measurement devices; and 6) enforce the terms of a GSP.

Additionally, this bill requires groundwater basins to be prioritized as high-, medium-, low- or very low- with respect to groundwater conditions, adverse impacts on local habitat and adverse impacts on local stream flow no later than January 31, 2015. DWR has determined that the initial basin prioritization developed in June 2014 will be the initial prioritization adopted under this legislation. DWR has not identified basins with critical overdraft conditions as of January 31, 2015.

GSPs for groundwater basins designated by DWR as high- and medium-priority with critical overdraft conditions (per SB X7 6) are required to be developed by January 31, 2020. GSPs for the remaining high- and medium-priority groundwater basins are to be developed by January 31, 2022. GSPs are encouraged to be developed for groundwater basins prioritized as low- or very low-priority (Pavley 2014a). All high- and medium-priority basins must achieve sustainability within 20 years of adopting a GSP.

Water Code (Section 10729, 10730, 10732, 10733 and 10735) or AB 1739
AB 1739 establishes the following: (1) provides the specific authorities to a GSA (as defined by SB 1168); (2) requires DWR to publish best management practices for the sustainable management of groundwater by January 1, 2017; and (3) requires DWR to estimate and report the amount of water available for groundwater replenishment by December 31, 2016. The bill authorizes DWR to approve and periodically review all GSPs (Dickinson 2014).

The bill authorizes the State Water Resources Control Board (SWRCB) to: (1) conduct inspections and obtain an inspection warrant; (2) designate a groundwater basin as a probationary groundwater basin; (3) develop interim plans for probationary groundwater basins in consultation with DWR if the local agency fails to remedy a deficiency resulting in the designation of probationary; and (4) issue cease and desist orders or violations of restrictions, limitations, orders, or regulations issued under AB 1739 (Dickinson 2014).

Water Code (Section 10735.2 and 10735.8) or SB 1319
SB 1319 would authorize the SWRCB to designate high- and medium-priority basins (defined by SB 1168) as a probationary basin after January 31, 2025. This bill allows the SWRCB to develop interim management plans that may override a local agency. However, if the appointed GSA can demonstrate compliance with sustainability goals for the basin, then the SWRCB has to exclude the groundwater basin or a portion of the groundwater basin from probationary status (Pavley 2014b).

Other Groundwater Regulations

Groundwater quality issues are monitored through a number of different legislative acts and are the responsibility of several different State agencies including:

- SWRCB and nine Regional Water Quality Control Boards (RWQCB) - responsible for protecting water quality for present and future beneficial use;
- California Department of Toxic Substances Control - responsible for protecting public health from improper handling, storage, transport, and disposal of hazardous materials;
- California Department of Pesticide Regulation - responsible for preventing pesticide pollution of groundwater;
- California Department of Public Health (CDPH) - responsible for drinking water supplies and standards;
- California Integrated Waste Management Board - oversees non-hazardous solid waste disposal, and
- California Department of Conservation - responsible for preventing groundwater contamination due to oil, gas, and geothermal drilling and related activities.

3.3.1.2.3 Local Regulation

Local GMPs and county ordinances vary by authority/agency and region, but typically involve provisions to limit or prevent groundwater overdraft, regulate transfers, prevent subsidence and protect groundwater quality.

AB 3030, the Groundwater Management Act, encourages local water agencies to establish local GMPs. The Groundwater Management Act lists 12 elements that should be included within the GMPs to ensure efficient groundwater use, good groundwater quality, and safe production of water. Table 3.3-1 lists the current GMPs that apply to agencies that have expressed interest in participating in the Long-Term Water Transfers EIS/EIR.

Table 3.3-1. Local GMPs and Ordinances

Groundwater Basin	Potential Participating Agencies	GMPs, Agreements and County Ordinances
Redding Area	• Anderson-Cottonwood ID	• Shasta County AB 3030 Plan • Anderson-Cottonwood ID GMP
Sacramento Valley	• Conaway Preservation Group • Cranmore Farms • Eastside MWC • Glenn-Colusa ID • Natomas Central MWC • Pleasant Grove-Verona MWC • RD 108 • RD 2068 • Sycamore MWC • Te Velde Revocable Family Trust • Butte WD • Cordua ID • Garden Highway MWC • Gilsizer Slough Ranch • Goose Club Farms and Teichert Aggregates • Tule Basin Farms	• Glenn-Colusa ID GMP AB 3030 Plan • Glenn County GMP • Colusa County GMP • Reclamation District 108 GMP • RD 2068 GMP • Yolo County Water Management Plan • Butte County GMP • Yuba GMP
	• City of Sacramento • Sacramento County Water Agency • Sacramento Suburban WD	• Sacramento Groundwater Authority GMP • Sacramento County Water Agency GMP • Central Sacramento County GMP
San Joaquin Valley	• Merced ID • SLDMWA	• Merced ID AB 3030 Plan • Merced Groundwater Basin AB 3030 Plan • Merced County Wellhead Protection Program • Water Supply Plan and Update • Westlands Water District GMP
Santa Clara Valley	• East Bay MUD • Santa Clara Valley WD	• South East Bay Plain Basin GMP • Santa Clara Valley WD GMP

Source: DWR 2010a
Key:
AB = Assembly Bill
GMP = Groundwater Management Plan
ID = Irrigation District
MUD = Municipal Utility District
MWC = Mutual Water Company
RD = Reclamation District
SLDMWA = San Luis & Delta-Mendota Water Authority
WD = Water District

The following are descriptions of local regulations/ordinances which may need to be considered during a water transfer:

Shasta County Ordinance SCC 98-1

This ordinance requires a permit for extraction and export of groundwater, either directly or indirectly, for use outside the county. Groundwater substitution transfers as defined in Chapter 2 of this document will be subject to this ordinance. Applications for a transfer permit should be submitted to Shasta County Water Agency. Permits may only be granted if the proposed groundwater extraction (1) will not cause or increase an overdraft of the groundwater underlying the county; (2) will not adversely affect the long term ability for storage or transmission of groundwater; (3) will not exceed the annual yield of the groundwater underlying the county; (4) will not result in an injury to water replenishment, storage, or restoration project; (5) is in compliance with Water Code 1220; and (6) will not be detrimental to the health, safety and welfare of property owners overlying or in the vicinity of the proposed extraction site(s).

Glenn County Ordinance No. 1115

This ordinance does not prohibit the export of water nor does it prohibit groundwater management practices that may involve the export of water. The ordinance clearly states that groundwater management practices including water exports shall not cause harm to adjacent areas. The ordinance cites modification, reduction, or termination of wells involved with water exports as a first priority in a sequence of management actions to be taken in the event groundwater levels become critical.

Colusa County Ordinance No. 615

This ordinance prohibits direct or indirect extraction of groundwater for transfer outside county boundaries without permit approval, except in certain circumstances. The permit approval process includes public and environmental reviews. Permits may only be approved after the environmental review determines that the Proposed Action would not result in the following: (1) overdraft or increased overdraft, (2) damage to aquifer storage or transmissivity, (3) exceedance of the annual yield or foreseeable injury to beneficial overlying groundwater users and property users, (4) injury to water replenishment, storage, or restoration projects, or (5) noncompliance with Water Code Section 1220. If Colusa County grants a three-year permit under Ordinance 615, the permit may also be subject to additional conditions to avoid adverse effects. Violators of this permitting process may be subject to a fine (Colusa County 1999). The ordinance does have an exemption process that would allow transfers to occur without obtaining a permit.

Sacramento County Ordinance (Title 3 Section 3.40.090)

This ordinance requires a permit to be issued for groundwater or surface water export of any manner from Sacramento County. The Director of the Sacramento County Department of Water Resources (or his designated representative) is required to (1) issue a permit for each source of transfer (i.e. pumping location); (2) conduct necessary investigations to determine if the transfers in in conformance with county water planning policies; (3) investigate if transfers could cause adverse impacts on the source, the area of use or the environment; and (4) determine if transfers is consistent with the general plan of the County of Sacramento, or the water plan of the Sacramento County Water Agency, or a specific plan of the county or water agency that may be affected by the work or activity.

Yolo County Export Ordinance No. 1617

Yolo County Export Ordinance No. 1617 is similar to the Colusa County ordinance described above. Indirect or direct export of groundwater outside Yolo County requires a permit. In addition to review by the county, the Director of Community Development may review the permit application with other affected county departments, DWR, RWQCB, and any other interested local water agency neighboring the area of the proposed transfer. Following a California Environmental Quality Act (CEQA) environmental review and a public review, the Yolo County Board of Supervisors may grant the permit if the evidence suggests that the extraction would not cause (1) adverse effects to long-term storage and transmissivity of the aquifer, (2) exceedance of safe yield unless it is in compliance with an established conjunctive use program, (3) noncompliance with Water Code section 1220, or (4) injury to water replenishment, storage, or restoration projects. The Yolo County Board of Supervisors may impose additional conditions to the permit to ensure compliance with the aforementioned criteria. This ordinance subjects violators to fines (Yolo County 1996).

Water Forum Agreement (WFA)

The WFA consists of seven major elements designed to meet the following overall objective to: “Provide a reliable and safe water supply for the region’s economic health and planned development to the year 2030; and preserve the fishery, wildlife, recreational, and aesthetic values of the Lower American River.” The WFA’s Groundwater Element encourages the management of the limited groundwater resources in three hydrogeologic areas within Sacramento County (Water Forum 1999). The WFA areas that could be affected by the proposed action include the areas termed as the North Area and Central Area. The major outcomes of this agreement included (Water Forum 1999):

- Formation of the Sacramento Groundwater Authority (SGA) and the American River Basin Cooperating Agencies (ARBCA); and
- A recommended sustainable yield of 131,000 acre-feet (AF) per year for the North Area and 273,000 AF per year for the Central Area.

Groundwater management negotiations in the Central area and the South area will continue.

SGA's primary mission is to protect the basin's safe yield, defined in the WFA, and water quality. Additional goals and objectives of the SGA include: (1) develop/facilitate a regional conjunctive use program consistent with the WFA; (2) mitigate conditions of regional groundwater overdraft; (3) replenish groundwater extraction; (4) mitigate groundwater contaminant migration; (5) monitor groundwater elevations and quality; and (6) develop relationships with State and Federal Agencies. The basin has approximately 600,000 AF of evacuated storage that could be exercised in such a program. The ultimate potential wet year in-lieu banking potential is about 100,000 AF per year, with a potential dry year surface water exchange potential of over 50,000 AF per year.

American River Basin Regional Conjunctive Use Program (ARBCUP)
A partnership between the SGA and the ARBCA resulted in the ARBCUP.

An outcome of the WFA, the ARBCUP intends to assist in meeting the WFA objectives, discussed above, by using the overdrafted basin in the North Area for groundwater banking. Groundwater recharge as part of the ARBCUP consists of either (1) direct recharge using surface water from the American River and/or Sacramento River or (2) in lieu of recharge in which surface water is substituted for groundwater. The ARBCUP includes a combination of the use of groundwater and surface water to maximize "banking" of both groundwater below ground and surface water in reservoirs. ARBCUP assists in maintaining the WFA American River environmental flow standards. When the ARBCUP was completed in 2008, the program increased water supplies by 20,000 AF per year (Regional Water Authority [RWA] 2012).

Groundwater Management Plans
While GMPs aid in establishing best practices, not all of the GMPs set quantitative groundwater elevation triggers for their BMOs. Table 3.3-2 lists the counties in the Sacramento Valley with existing GMPs. The table also provides a description of the BMOs, as described in each GMP. This list is provided for the entire Sacramento Valley; however, in addition to listing counties that contain potential groundwater substitution pumping sellers, the list also contains counties that do not (e.g., Butte County).

Table 3.3-2. Groundwater Management Plans and BMOs in the Sacramento Valley

County	Basin Management Plan	Groundwater Basin Management Objective
Shasta (Anderson Cottonwood Irrigation District Groundwater Management Plan)	http://www.andersoncottonwoodirrigationdistrict.org/uploads/2/7/2/8/2728665/acid_gwmp.pdf	Pg. 3-2: No set elevation thresholds.
Shasta County (Shasta County Water Agency)	http://www.co.shasta.ca.us/index/pw_index/engineering/water_agency.aspx	No elevation thresholds.

County	Basin Management Plan	Groundwater Basin Management Objective
Tehama County (Tehama County Flood Control and Water Conservation District)	http://www.tehamacountypublicworks.ca.gov/Flood/ Groundwater trigger levels for each sub-basin located here: http://www.tehamacountypublicworks.ca.gov/Flood/groundwater.htm	Trigger levels vary based on groundwater measurements in each monitoring well. Trigger levels generally follow a pattern of: • Historical low of spring measurements plus 20% of the range of spring measurements: notify and inform public. • Second consecutive year of groundwater levels at or below spring trigger level 1: monitor and investigate cause. • Historical low of spring measurements: consider management options. • Historical low of late groundwater measurements: notify public and begin investigations.
Glenn County	http://www.glenncountywater.org/documents/GlennCoBMOdocument_000.pdf	There are 17 basin management sub-areas in the basin. BMOs for groundwater levels are established separately for each sub-area. There are no clear BMOs established yet. Objectives for the sub-areas are qualitative and relate to maintaining groundwater surface elevations at a level that will assure an adequate and affordable irrigation water supply; sustainable agricultural water supply; adequate groundwater supply for all domestic users. Additionally, some BMOs state that the objective is to develop an understanding of groundwater levels in the sub-area. Elevation thresholds vary depending on sub-area and monitoring well within each sub-area.
Butte County	http://www.buttecounty.net/Portals/26/GWMP/Section_3__1-7-05_2.pdf	Pg. 3-4: Groundwater level declines in many areas of the county have been observed. These range from 0.8 to 2.0 feet per year. Declining groundwater levels are used as a trigger for close observation of groundwater level trends.
Colusa County	http://colusagroundwater.ucdavis.edu/Technical%20Materials%20for%20Posting/ColusaCo_GMP_Volume-1_9-10-08.pdf	Pg. 34: From a review of the groundwater level hydrographs on Figure II.5, it can be seen that the extent to which the groundwater basin is utilized throughout the County varies significantly. Accordingly, the assessment of changes in groundwater levels in the respective areas must be performed with full consideration of the historic levels. It is premature to attempt to set groundwater level targets or thresholds in Colusa County. It is, however, very important to evaluate the groundwater level data in relation to historic data and report the results of that evaluation together with an assessment of overall hydrologic conditions, known changes in land use, etc.

County	Basin Management Plan	Groundwater Basin Management Objective
Sutter County	http://www.co.sutter.ca.us/pdf/pw/wr/gmp/Sutter_County_Final_GMP_20120319.pdf	There are three BMOs for groundwater levels. One is related to low groundwater levels: • Avoid ongoing declines in groundwater levels during water year types identified by DWR to be "above normal" or "wet" for the Sacramento Valley. The BMO also states "groundwater levels are to be managed to ensure adequate water supplies while avoiding adverse impacts and mitigating them if and when they do occur. Adverse impacts related to groundwater levels can occur from excessively high or low groundwater levels. What constitutes an excessively high or low groundwater level may change over time, and will also vary by land use and hydrologic and climatic conditions.
Yuba County Water Agency	http://www.ycwa.com/documents/943	Pg. 3-12: No specific threshold. Qualitative objectives: • Avoid potential unreasonable impacts that may occur from changes in groundwater surface elevations because of external transfers. • Monitor any lowering of groundwater surface elevations that may occur as a result of groundwater extraction to meet local demands in drier years.
Nevada County (Martis Valley Groundwater Management Plan)	http://www.pcwa.net/files/docs/enviro/MartisValleyGMPFinal07.22.2013.pdf	Very general BMO about protecting groundwater quantity. Plan includes details on the establishment of a groundwater elevation monitoring program.
Placer County Water Agency (Western Placer County Groundwater Management Plan)	http://www.pcwa.net/general-information/environmental-and-planning-documents.html and http://www.pcwa.net/files/docs/enviro/WPCGMP_Groundwater_Managerment_Plan_07.pdf	Pg. 3-8: discusses the need to create a uniform groundwater elevation monitoring program. No thresholds are set because historically, data have not been collected consistently.
Sacramento Groundwater Authority	http://www.sgah2o.org/sga/files/2008-SGA-GMP-FINAL-20090206-print_ready.pdf	Pg. 29: "SGA members intend that overall groundwater elevations in the basin be improved over time, and that the groundwater basin be managed such that the impacts during drier years will be minimized when surface water supplies are curtailed and are replaced by increased groundwater supplies. This is accomplished, similar to what is done in the Central Sacramento Basin, by measuring groundwater levels in more than 30 wells throughout the SGA. A similar 5 square mile grid pattern is used to monitor groundwater levels over time throughout the basin. SGA monitors groundwater elevations twice a year.

County	Basin Management Plan	Groundwater Basin Management Objective
Central Sacramento County	http://www.amwater.com/files/CSCGMP_final.pdf	Pg. 3-3: An operating range for groundwater elevations in the basin define the upper and lower groundwater elevation thresholds. Upper and lower elevation limits are defined for 5 square mile polygons throughout the basin. Each polygon represents its own management unit with lower and upper elevation attributes. Groundwater elevation contour maps are on pages 3-4 and 3-5 of the plan. Lower groundwater thresholds range from -90 feet msl in the southwestern part of the basin to 150 feet msl in the northeastern part of the basin. Upper groundwater thresholds range from -70 feet msl in the southwestern part of the basin to 200 feet msl in the northeastern part of the basin.
South Area Water Council	http://www.water.ca.gov/groundwater/docs/GWMP/SJ-20_SouthBasin_GWMP_2011.pdf	Similar to the Sacramento Groundwater Authority and Central Sacramento County, the South Area Water Council's groundwater management plan uses several wells throughout the basin to gather groundwater elevation data and high/low thresholds would be based on individual wells. The BMO, on p. 2-2, states generally: Maintain or enhance groundwater elevations to meet the long-term needs of groundwater users within the Groundwater Management Area.
Yolo County	http://www.water.ca.gov/groundwater/docs/GWMP/SR-35_YoloCountyFCWCD_GWMP_2006.pdf	p. 12: "when ¾ of monitoring wells reach within 25% of the lowest water level recorded for that well. Spring and fall measurements will be analyzed separately."

3.3.1.3 Affected Environment

3.3.1.3.1 Redding Area Groundwater Basin

The Redding Area Groundwater Basin is in the northernmost part of the Central Valley. Underlying Tehama and Shasta Counties, it is bordered by the Klamath Mountains to the north, the Coast Range to the west, and the Cascade Mountains to the east. Red Bluff Arch separates the Redding Area Groundwater Basin from the Sacramento Valley Groundwater Basin to the south. DWR Bulletin 118 subdivides the Redding Area Groundwater Basin into six subbasins (DWR 2003). Figure 3.3-2 shows the Redding Area Groundwater Basin and Subbasins. The following section provides information on geology, hydrogeology, hydrology, groundwater production, groundwater levels and storage, land subsidence, and groundwater quality.

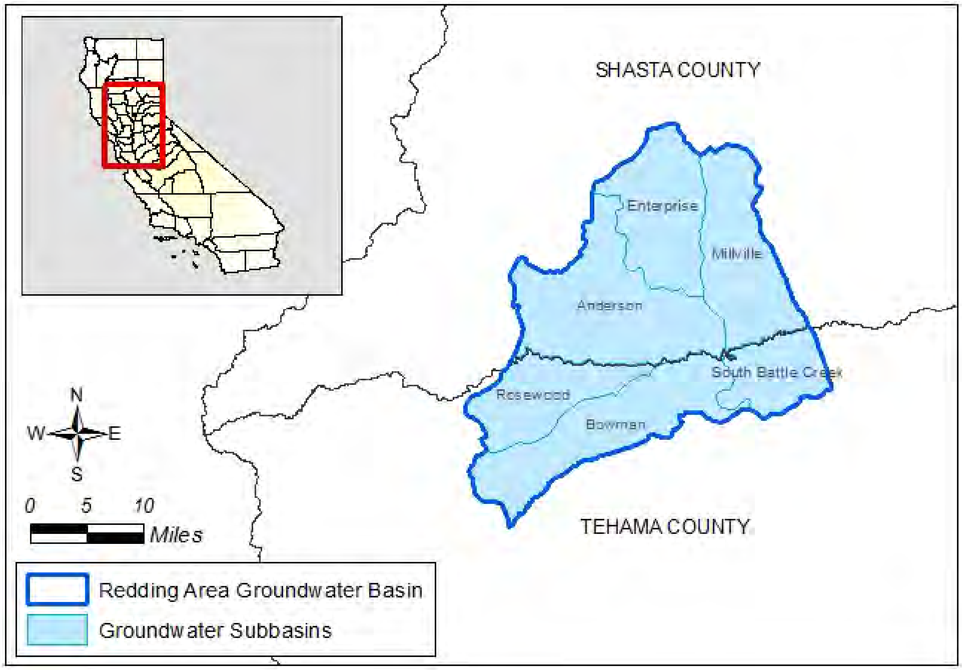

Figure 3.3-2. Redding Area Groundwater Basin and Subbasins

Geology, Hydrogeology, and Hydrology

The Redding Area Groundwater Basin is a sediment-filled, southward plunging symmetrical trough. The principal freshwater-bearing formation in the basin is formed by the simultaneous deposition of materials from the Coast and the Cascade Ranges. The Tuscan Formation in the eastern portion of the basin is derived from the Cascade Range volcanic sediments, and the Tehama Formation in the western and northwest portion of the basin is derived from Coast Range sediments. These formations are up to 2,000 feet thick near the confluence of the Sacramento River and Cottonwood Creek. The Tuscan Formation is generally more permeable and productive than the Tehama Formation (Shasta County Water Agency 2007).

Figure 3.3-3 shows a generalized geologic cross ~~sections~~section looking from north to south across the Redding Area Groundwater Basin (Shasta County Water Agency 2007).

The principal surface water features in the Redding Area Groundwater Basin are the Sacramento River and its tributaries: Battle Creek, Cow Creek, Little Cow Creek, Clear Creek, Dry Creek, and Cottonwood Creek. Surface water and groundwater interact in many areas in the Redding Basin. In general, groundwater flows southeasterly on the west side of the basin and southwesterly on the east side, toward the Sacramento River. The Sacramento River is the main drain for the basin (DWR Northern District 2002). The Shasta County Water Resources Master Plan Phase 1 Report estimated the total annual groundwater discharge to rivers and streams at about 266,000 AF, and seepage from streams and canals into groundwater at 59,000 and 44,000 AF, respectively (CH2M Hill 1997 as cited in CH2M Hill 2003). Groundwater is typically unconfined to semi-confined in the shallow aquifer system and confined where deeper aquifers are present.

Groundwater Production, Levels and Storage

The watersheds overlying the Redding Basin yield an average of 850,000 AF of annual runoff (CH2M Hill 2003). Much of this water is potentially available to recharge the Redding Area Groundwater Basin and replenish water levels that have been depressed because of groundwater pumping. Applied irrigation water (from all sources) totals approximately 270,000 AF annually in the Redding Basin area (CH2M Hill 1997 as cited in CH2M Hill 2003). While the exact quantity of groundwater pumped annually from the Redding Area Groundwater Basin is not known, it has been estimated that approximately 55,000 AF per year of water is pumped from municipal and industrial (M&I) and agricultural production wells (CH2M Hill 2003). This magnitude of pumping represents approximately six percent of the average annual runoff.

Figure 3.3-4 shows Spring 2013 groundwater elevation contours within the Redding Area and Sacramento Valley Groundwater Basin. In general, groundwater flows inward from the edges of the basin and south, towards the Sacramento River in the Redding Area Groundwater Basin.

The storage capacity for the entire Redding Area Groundwater Basin is estimated to be 5.5 million AF for 200 feet of saturated thickness over an area of approximately 510 square miles (Pierce 1983 as cited in Bulletin 118; DWR 2003).

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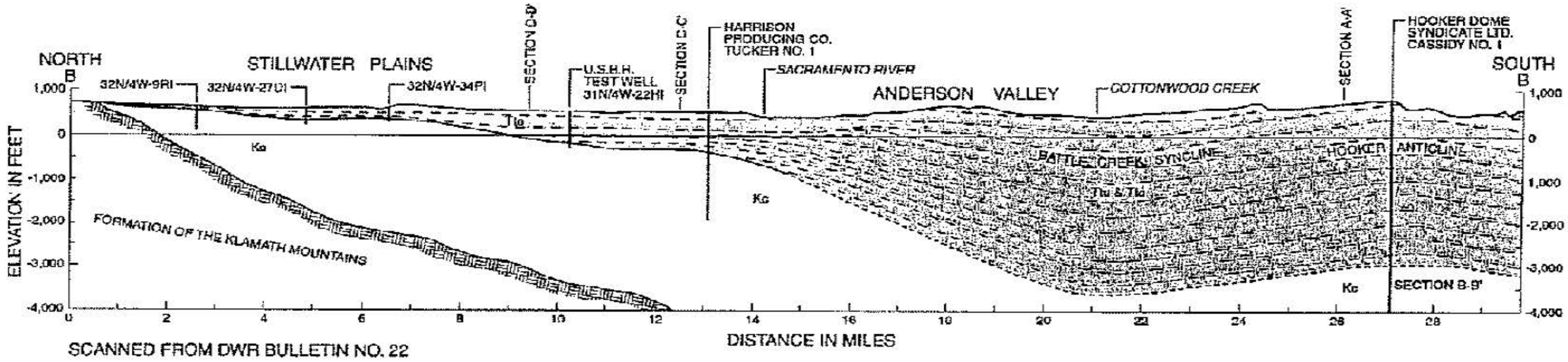

Source: Shasta County Water Agency, 2007

Figure 3.3-3. Generalized Geologic cross section of the Redding Area Groundwater Basin

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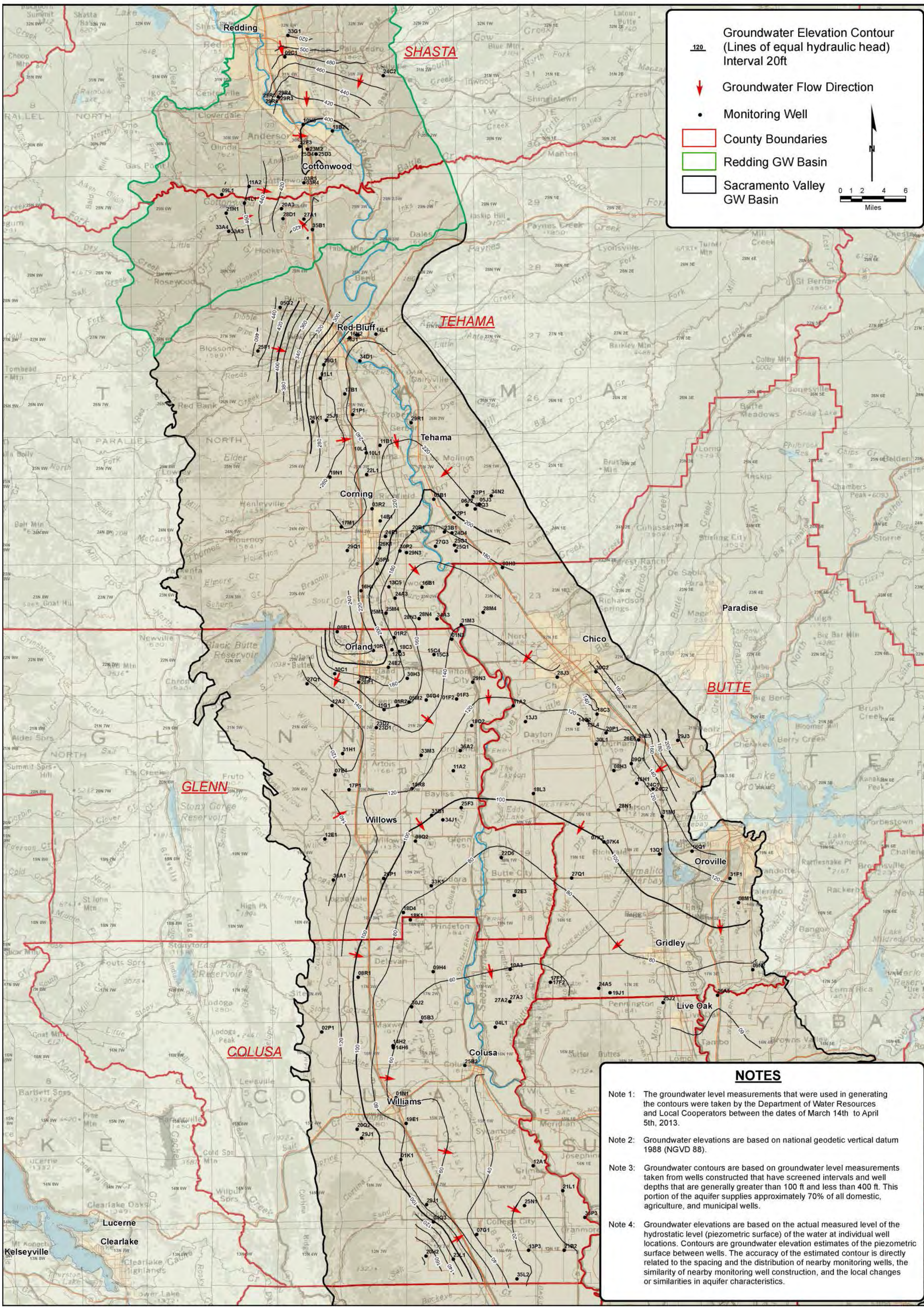

Source: DWR 2013

Figure 3.3-4. Redding Area and Sacramento Valley Spring 2013 Groundwater Elevation Contours

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