Chapter 4
Surface Water Supply and Management

This chapter discusses how and when surface water supplies are delivered to water users, the management of surface water, and how the EWA would benefit and/or affect water users in areas where EWA actions would take place. Section 4.1 below discusses existing water supplies, including source and management, for agencies that could take part in the EWA. Additionally, associated waterways or agencies not participating in the EWA, but which could be affected by program actions, are described. Section 4.2 analyzes effects of the No Action/No Project, Flexible Purchase, and Fixed Purchase Alternatives. Also included in Section 4.2 are a cumulative effects discussion and a comparative analysis of the alternatives.

4.1 Affected Environment/Existing Conditions

4.1.1 Area of Analysis

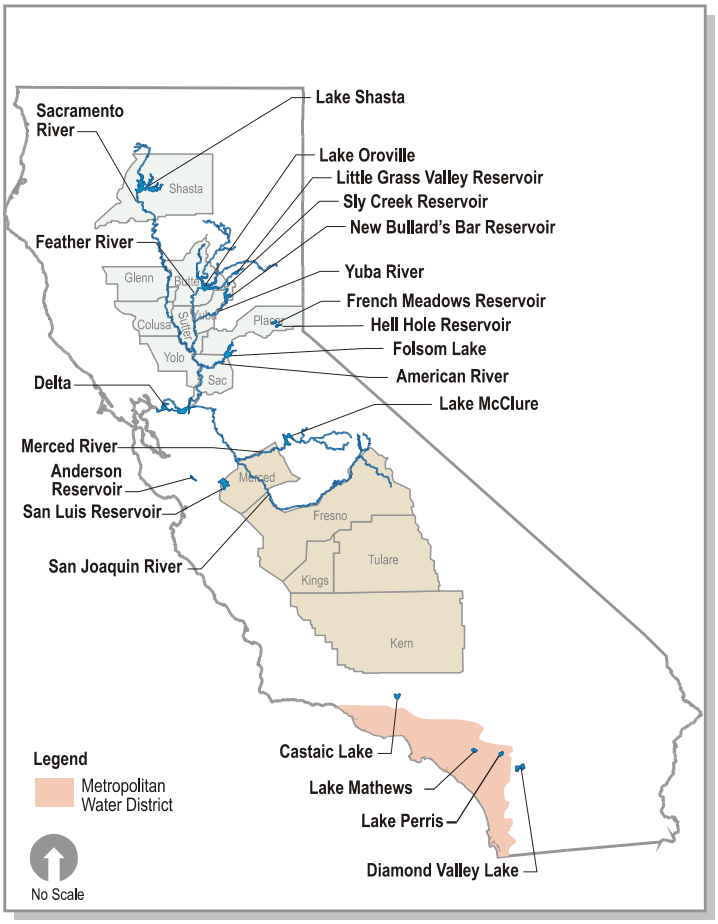

Figure 4-1
Water Supply Area of Analysis

The evaluation of potential effects on surface water supply and management from the implementation of the EWA includes water users in the following area of analysis (Figure 4-1):

- Sacramento River from Lake Shasta downstream to the Delta;
- Feather River downstream from Little Grass Valley and Sly Creek Reservoirs;
- Yuba River downstream from New Bullards Bar Reservoir;
- American River downstream from French Meadows and Hell Hole Reservoirs;
- Merced River downstream from Lake McClure;
- San Joaquin River downstream from Merced River to the Delta;

- Delta;
- Water users with supply from Anderson Reservoir;
- Water users with supply from Metropolitan Water District; and
- Water users supplied by return flows from agencies that could sell to the EWA.

4.1.1.1 California Water Resources

Water supplies come from either groundwater or surface water. Because this chapter is entitled "Surface Water Supply and Management," the focus will be on the movement of surface water supplies from sources to their users. Within California, lakes, rivers, and reservoirs receive their water from precipitation and runoff, which is available during the rainy season (typically October through April). Water users need water year-round, with increased water needs during the summer because of increased temperatures and agricultural uses. This imbalance is exacerbated by the differences in precipitation and demand between northern California and southern California. More than 70 percent of runoff comes from northern California, but more than 75 percent of urban and agricultural demand is south of Sacramento. (DWR 1998)

Because of the uneven distribution of the location of water supply and water demand, aqueducts and canals are used to transport water to users. As discussed in Section 1.3, the Federal and State governments constructed the Central Valley Project (CVP) and State Water Project (SWP) to store and transport water to water users. All water that moves from the Upstream from the Delta Region to the Export Service Area must pass through the Delta and the Delta export pumps. The amount of water that can be transported south is dependent on Delta pump capacity[1].

Direct flows to the Delta drain over 40 percent of the State of California. The Sacramento River contributes roughly 75 to 80 percent of the Delta inflow in most years, while the San Joaquin River contributes about 10 to 15 percent. The Mokelumne, Cosumnes, and Calaveras Rivers, which enter into the eastern side of the Delta, contribute the remainder. Precipitation also contributes an annual average inflow of 990,000 acre-feet, approximately 5 percent of the annual inflow (Figure 4-2). The rivers flow through the Delta and into Suisun Bay.

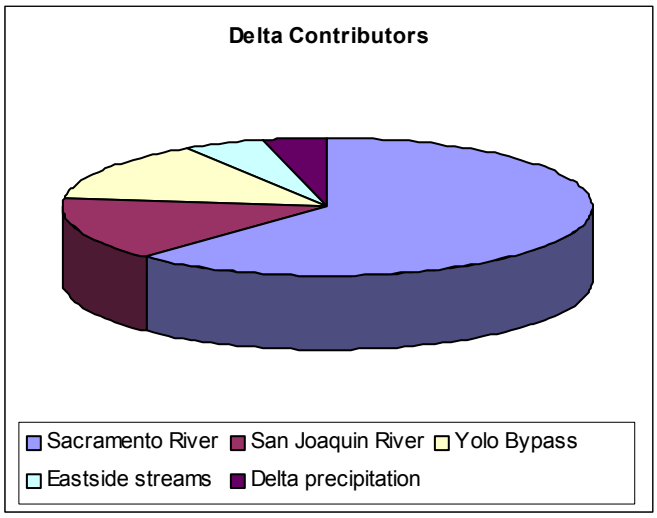

Figure 4-2
Contributors to Delta Inflow

[1] Delta pumping capacity is not simply limited on exports (e.g., fish protection requirements, and water quality requirements).

From Suisun Bay, water flows through the Carquinez Strait into San Pablo Bay, then south into San Francisco Bay, and then out to sea through the Golden Gate. On average, local users withdraw about 10 percent of the Delta inflow, and the CVP and SWP withdraw about 30 percent for export; 20 percent of the Delta inflow is required for salinity control, and the remaining 40 percent provides outflow to the San Francisco Bay ecosystem in excess of minimum identified requirements. Water that is not consumed or stored in northern California or pumped through the Delta to central and southern California flows out to the Bay and into the ocean.

4.1.2 Upstream from the Delta Region

Sections 4.1.2.1 through 4.1.2.5 are grouped by river and then further divided by agency. Included in the description of each agency is a discussion of the source of water supply, water supply facilities, and management practices. Preceding this description is an explanation of the type of water rights or entitlements the agencies may have.

As the Projects constructed dams and reservoirs, downstream flows became altered. Landowners and water agencies with either appropriative or riparian water rights[2] that diverted from the Sacramento and San Joaquin Rivers prior to construction of the CVP are guaranteed more reliable water supplies than other contractors (Water Education Foundation 1998). Likewise, water rights holders that diverted from the Feather River prior to the construction of the SWP are guaranteed a more reliable water supply. These "settlement contractors" negotiated agreements with the US Bureau of Reclamation (Reclamation) and the State of California to receive more reliable supplies during water shortages. CVP and SWP water service contracts differ, as compared to settlement contracts. During dry years, CVP and SWP contracts are subject to greater and more frequent deficiencies than settlement contracts.

"Exchange contractors" are those water users along the San Joaquin River who receive CVP water exported from the Delta in exchange for not using their water rights. Exchange contractors have the same water cutback agreement as the settlement contractors.

4.1.2.1 Sacramento River

Sacramento River agencies that may sell water to the EWA (Anderson-Cottonwood Irrigation District, Glenn-Colusa Irrigation District, Natomas Central Mutual Water Company, and Reclamation District 108) receive CVP water that is stored upstream from their service areas in Lake Shasta, a CVP facility. The CVP releases water from Lake Shasta as needed to meet downstream temperature requirements or the flow

[2] An appropriative water right is based on physical control of water and since 1914, permit or license for its beneficial use. A riparian water right is based on ownership of land that physically touches the water source. Riparian rights are typically considered superior to appropriative rights (Water Education Foundation 1995).

requirement at Wilkins Slough. Lake Shasta is managed for flood control, water supply, recreation, fish and wildlife enhancement, power, and salinity control.

4.1.2.1.1 Anderson-Cottonwood Irrigation District

Anderson-Cottonwood Irrigation District (ID) has a CVP settlement contract. Anderson-Cottonwood ID diverts water from the Sacramento River near Redding. About 90 percent of Anderson-Cottonwood ID's customers irrigate pasture; Anderson-Cottonwood ID's service area accounts for two-thirds of all irrigated pasture in the Redding sub-basin. Although Anderson-Cottonwood ID does not have tailwater[3] available from outside its service area to use within the district, Anderson-Cottonwood ID operates five pumping plants to recapture return flows from lands within the district boundaries. The district reuses approximately 5,000 acre-feet annually. Although Anderson-Cottonwood ID's service area encompasses multiple municipal water purveyors, the District does not serve any major municipal and industrial (M&I) users (Reclamation et al. 2000).

4.1.2.1.2 Glenn-Colusa Irrigation District

Glenn-Colusa ID diverts water during the irrigation season under a CVP settlement contract from the Sacramento River and Stony Creek. Glenn Colusa ID may, according to its contract, also divert water for beneficial use November through March (typically for rice straw decomposition) to the extent authorized by California law, subject to Water Right Term 91 curtailments[4].

The Glenn-Colusa Canal is the principal conveyance mechanism for water delivery to the district. Glenn-Colusa ID also receives a portion of its water supply from the Tehama-Colusa Canal, on the west side of the Glenn-Colusa ID service area, at two connection points (Reclamation et al. 2000). The majority of the district's water supply is surface water; however, limitations on surface water deliveries because of environmental concerns and dry-year reductions have prompted farmers to rely more heavily on groundwater. The extent of groundwater use depends on the amount of available surface water; pumping ranges from 20,000 acre-feet during years of high surface supply to 95,000 acre-feet in dry years. Glenn-Colusa ID does not supply any M&I water.

Glenn-Colusa ID's water management program includes the recapturing of drainwater, including tailwater runoff and groundwater seepage. Glenn-Colusa ID recycles 155,000 acre-feet per year and delivers the water to either laterals or the main canal. Districts downstream of Glenn-Colusa ID, such as Provident Irrigation District, Princeton-Cordua-Glenn Irrigation District, and Maxwell Irrigation District, benefit from use of Glenn-Colusa ID's drainwater.

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[3] Tailwater is applied irrigation water that runs off of a field. Tailwater is not necessarily lost; it can be collected and reused on the same or adjacent fields.

[4] The SWRCB defined Term 91 in Water Rights Decision 1594: "Term 91 prohibits permittees from diverting water when stored Project water is being released to meet Delta water quality standards or other inbasin needs." Term 91 provisions are in permits issued after August 16, 1978.

4.1.2.1.3 Natomas Central Mutual Water Company

Natomas Central Mutual Water Company (MWC) diverts water from the Sacramento River during the irrigation season under a CVP settlement contract. Natomas Central MWC can also divert Sacramento River water during non-irrigation seasons for environmental water use (wetlands enhancement and rice straw decomposition). Such diversions outside the irrigation season are not a part of the Sacramento River Settlement Contracts. Natomas Central MWC has two main pump stations on the Sacramento River: Prichard Lake Pumping Plant and Elkhorn Pumping Plant. Natomas Central MWC also diverts water from the Natomas Cross Channel along the Natomas Central MWC's northern boundary. Although groundwater is used in conjunction with the surface water supply, especially in dry years, the majority of water use for irrigation is supplied by surface water. Natomas Central MWC owns two wells and has 61 privately owned wells.

Natomas Central MWC uses about 36,000 acre-feet of tailwater each year as an alternative supply to Sacramento River water. A recirculation system captures all tailwater and returns it either directly to the fields or into the main irrigation canals. During a normal irrigation season, Natomas Central MWC reuses agricultural drainage water until the end of the rice irrigation season (between August 15 and September 1) before it is released to the Sacramento River. Natomas Central MWC does not supply treated water for M&I, but does provide water for landscaping. Water demand is greatest during July and August due to agricultural needs and a hot, dry climate (Reclamation et al. 2000). Generally, all agencies have a greater water demand during July and August.

4.1.2.1.4 Reclamation District 108

Reclamation District 108 has a settlement contract with Reclamation to divert water from the Sacramento River as well as CVP Project water. Reclamation District 108 operates seven pumping plants that divert water from the Sacramento River for irrigation, and one that diverts water from the Colusa Basin Drain as a supplemental irrigation supply. Reclamation District 108's permit allows 75 cubic feet per second (cfs) to be pumped from the Colusa Basin Drain. The Sacramento River supplies the majority of the district's water; groundwater development is minimal. The district owns three wells that can supply groundwater in addition to the surface water supply. Reclamation District 108 does not serve any M&I users. For 15 years prior to 1997, Reclamation District 108 was recirculating all drainage water. This practice led to a buildup of salts in the soil that effected crop production; consequently in 1997, Reclamation District 108 reduced water reuse.

4.1.2.2 Feather River

Several Feather River agencies that may sell water to the EWA, including Western Canal Water District and the Joint Water Districts, receive water stored in Lake Oroville (an SWP facility). Lake Oroville is managed for flood control, water supply, recreation, fish and wildlife enhancement, power and salinity control too. Minimum flow requirements below the Thermalito Diversion Dam and the Thermalito Afterbay Outlet are 600 cfs and 1,000-1,700 cfs, respectively. Oroville-Wyandotte Irrigation

District, that may also sell water to the EWA, has water rights to water from the South Fork Feather River watershed.

4.1.2.2.1 Western Canal Water District

Western Canal Water District (WD) has a settlement contract with DWR. The District's allocation consists of natural flow from the Feather River (an amount subject to reduction during drought) and water stored upstream in the Feather River North Fork Project (an amount not subject to reduction) (Western Canal WD 1995). Western Canal WD's allocation is available from March through October of each year. The point of diversion is provided by two outlet structures on the northwest corner of the Thermalito Afterbay (PG&E Canal and Western Canal); maximum combined outlet flows are 1,250 cfs. Western Canal WD does not own any irrigation wells; any groundwater used is from individually owned wells. The primary water use is agricultural irrigation; some water is allocated for habitat production.

4.1.2.2.2 Joint Water Districts

The Joint Water Districts include the following districts: Biggs-West Gridley Water District, Butte Water District, Richvale Irrigation District, and Sutter Extension Water District. The Joint Water Districts have an SWP settlement contract for water from the Feather River. Points of diversion are provided by two outlet structures from Thermalito Afterbay (Main Canal and Richvale Canal). The Joint Water District Board is responsible for allocating water among their member agencies; however, the Board has no authority over how the agencies use their water. The Joint Water Districts have no production wells, but some landowners have backup wells to supplement water lost during droughts, or to provide all water during droughts so that the remaining surface water can be marketed. The primary water use is agricultural irrigation; some water is allocated for habitat production.

4.1.2.2.3 Oroville-Wyandotte Irrigation District

Oroville-Wyandotte ID can divert and store South Fork Feather River water between October 1 and July 1 according to Oroville-Wyandotte ID's water rights. A water right authorizes the diversion and storage of water from Lost Creek Reservoir between October 1 and June 1 (including diversion of up to 50 cfs between April 1 and June 1). The water received from both rights is used for irrigation and domestic purposes and for recreational purposes within Oroville-Wyandotte ID's reservoirs.

Oroville-Wyandotte ID owns and operates Little Grass Valley and Sly Creek Reservoirs as storage facilities on the South Fork Feather River. The reservoirs have a combined gross storage capacity of 160,400 acre-feet. These facilities are part of Oroville-Wyandotte ID's South Fork Project, which also includes Lost Creek and Ponderosa Reservoirs and the South Fork of the Feather River. The Lost Creek and Ponderosa facilities are not storage reservoirs; they act as regulating reservoirs for the Sly Creek Reservoir, the South Fork Feather River, and the South Fork Project. Oroville-Wyandotte ID operates the South Fork Project to supply water for consumptive uses and power generation.

4.1.2.3 Yuba River

The Yuba River agency that may sell water to the EWA is the Yuba County Water Agency, which has water rights to divert and store water on the Yuba River. The Yuba County Water Agency regulates releases from New Bullards Bar Reservoir into the Yuba River. The SWRCB D-1644/Order WR 2001-08 governs instream flow requirements in the lower Yuba River. The timing and quantity of allowable flow fluctuations are described in detail in Chapter 9, Fisheries and Aquatic Ecosystems.

4.1.2.3.1 Yuba County Water Agency

The primary water project in the lower Yuba River watershed is the Yuba River Development Project, operated by the Yuba County Water Agency (Yuba County WA). This multiple-use project provides for flood control, power generation, irrigation, recreation, and protection of fish and wildlife and includes the operation of New Bullards Bar Dam and Reservoir, Colgate Powerhouse, Englebright Reservoir, Narrows II Powerhouse, and lower Yuba River diversions and conveyance facilities. Englebright Dam and Daguerre Point Dam were not constructed by Yuba County WA as part of the Yuba River Development Project, but are used by Yuba County WA in delivering water.

Groundwater accounts for about 31 percent or 130,000 acre-feet of irrigation water use in Yuba County. The Yuba County WA service area has at least 385 wells, which provide water for irrigation. In recent years, Yuba County WA has provided surface water to areas previously served by groundwater, thereby decreasing demands on the groundwater basin.

Within Yuba County, the Yuba River supplies the majority of surface water supplies. Yuba County WA is a major water right holder on the Yuba River. Various water districts, irrigation districts, water companies, and individuals contract with Yuba County WA for delivery of water. Some of the parties that receive water from Yuba County WA have their own appropriative or riparian rights for diversion of water. Other agencies and districts providing surface water for irrigation in Yuba County include the Yuba County Water District, Browns Valley Irrigation District, Camp Far West Irrigation District, and Plumas Mutual Water Company.

Yuba County WA's water rights include diversion of water from the lower Yuba River for irrigation and other uses from September 1 to June 30 and diversion of water to storage in New Bullards Bar Reservoir from October 1 to June 30 for subsequent irrigation and other uses. Yuba County WA releases some for power generation at the Colgate Powerhouse and at the Narrows 1 and Narrows 2 Powerhouses. Hydroelectric power is generated at these locations under authorization from the Federal Energy Regulatory Commission and eight water right licenses issued by the State.

Water diverted under Yuba County WA's water right permits is delivered to Brophy Water District, Browns Valley Irrigation District, Cordua Irrigation District, Dry Creek Mutual Water Company, Hallwood Irrigation District, Ramirez Water District, the

South Yuba Water District, and other smaller contractors. Browns Valley receives water at the Pumpline Diversion Facility, 1 mile upstream from Daguerre Point Dam. Cordua, Hallwood, and Ramirez receive water via the Hallwood-Cordua Canal (North Canal) from the north side of the Yuba River just upstream from the north abutment of Daguerre Point Dam. Brophy and South Yuba receive water via the South Yuba Canal (South Canal) from the south side of the Yuba River just upstream from the south abutment of Daguerre Point Dam. Several private parties pump water from the lower Yuba River downstream from Daguerre Point Dam in an area known as the Datoni Area.

4.1.2.4 American River

The 1958 Water Right Decision 893 (D-893) regulates instream flow requirements in the lower American River (minimum of 250 cfs). However, in 1990, the State Water Resources Control Board stated that the flow requirements in D-893 were not sufficient for all uses of the river. Flows have not been held to D-893 levels for many years (DWR 2002). The Department of Fish and Game, National Marine Fisheries Service, US Fish and Wildlife Service, Reclamation, and other local stakeholders, are a part of the American River Operations Group. The group advises Reclamation on flow releases to protect the aquatic resources in the river.

Folsom Lake is the only CVP facility on the American River. Folsom Lake was built by the US Army Corps of Engineers, but is operated by Reclamation. Built as a multipurpose project, Folsom Lake (and Dam) functions primarily as a flood control structure; however, Folsom Lake also provides for irrigation and domestic water supply, electrical power generation, recreation, preservation of the American River fishery, and downstream control of saltwater intrusion in the Sacramento-San Joaquin Delta.

In addition to flood control operations, Folsom Lake (and Dam) is operated to meet the objectives of the San Francisco Bay-Sacramento-San Joaquin River Delta Estuary Water Quality Control Plan, the biological opinions for winter-run Chinook salmon, Delta smelt, and splittail, and the management of Central Valley Project Improvement Act Section 3406(b)(2) water.

American River agencies that may sell water to the EWA include the Placer County Water Agency and Sacramento Groundwater Authority.

4.1.2.4.1 Placer County Water Agency

The two major surface water sources for Placer County Water Agency (Placer County WA) are the Yuba and Bear Rivers, under contract from Pacific Gas & Electric (PG&E), and the American River, from water rights from the Middle Fork Project and under contract with the CVP (DWR 1997).

Surface water accounts for the majority of the water supplies for Placer County WA's municipal, industrial, and agricultural uses. Groundwater supplies only a small fraction of the total water supply. The Drum-Spaulding Project raw water supply,

Middle Fork Project raw water supply, and CVP water supply comprise the water source allocations for western Placer County.

Placer County WA diverts water from the Yuba and Bear Rivers under contract with PG&E (Drum-Spaulding Project). The water supply is conveyed through the Drum, Bear River, and Upper Boardman canals. The Bear River Canal restricts the amount of water that can be conveyed, limiting Placer County WA to a diversion of 245 cfs (SWRI 2002).

Placer County WA's multi-purpose Middle Fork Project supplies water for irrigation, domestic and commercial uses, and power generation. Encompassing waters on the Middle Fork American River, the Rubicon River, and other tributaries, the Middle Fork Project includes two storage and five diversion dams, five powerplants, diversion and water transmission facilities, and five tunnels and related facilities. Permits from the State Water Resources Control Board allow for water diversions at Auburn, CA or at Folsom Dam. An agreement between Placer County WA and Reclamation facilitates delivery of Placer County WA's water rights water. Placer County WA has contracted transfers for a total of 25,000 acre-feet per year to San Juan Water District and 30,000 acre-feet per year to the City of Roseville. Placer County WA can also deliver up to 29,000 acre-feet per year to South Sutter Water District in years of surplus. In 1995, Placer County WA and Northridge Water District[5] entered into a 25-year water supply agreement. Placer County WA is currently providing 22,000 acre-feet per year and will increase supply by 1,000 acre-feet per year through 2009; during the last 10 years, Placer County WA supplies 29,000 acre-feet annually (DWR 1997).

The CVP supplies Placer County WA with 35,000 acre-feet per year. Placer County WA does not expect to use this allotment before using the full amount of the 120,000 acre-feet per year available from the American River (SWRI 2002). Placer County WA obtains 991 acre-feet per year from four groundwater wells.

4.1.2.4.2 Sacramento Groundwater Authority

The Sacramento Groundwater Authority (SGA) is a joint powers authority that was established in 1998 to manage and protect the north-area groundwater basin in Sacramento County. SGA is bounded by the Sacramento County line on the north and east, by the Sacramento River on the west, and by the American River on the south. SGA's 16-member board of directors is comprised of representatives from the overlying water purveyors in the basin along with an individual representative from agriculture and an individual representative from self-supplied groundwater users (mostly parks and recreational districts).

SGA member agencies serve the needs of over 500,000 people in the Sacramento area. Current water deliveries total about 300,000 acre-feet per year; about one-third of the deliveries come from groundwater pumping, and the remainder is supplied by

[5] Northridge Water District and Arcade Water District have merged to form Sacramento Suburban Water District.

surface water deliveries from the American and Sacramento Rivers pursuant to water rights or contract entitlements. Over 70 percent of the deliveries are for M&I uses and 30 percent for agriculture in the western portion of the service area.

Water districts and agencies within the area generally use a combination of groundwater and surface water. The Sacramento Groundwater Authority funds conjunctive use programs through establishing regulatory fees among purveyors. The primary objectives of the Sacramento Groundwater Authority are to 1) facilitate implementation of regional conjunctive use, 2) mitigate conditions of regional groundwater overdraft, 3) replenish groundwater extractions; 4) mitigate groundwater contamination migration, 5) monitor groundwater elevations and quality, and 6) develop relationships with State and Federal Agencies.

4.1.2.5 Merced River

The Merced River agency that may sell water to the EWA is the Merced Irrigation District, which has water rights to divert and store water on the Merced River. Lake McClure and Lake McSwain are the major reservoirs on the Merced River. Lake McClure is operated for power, recreation, irrigation, and flood control purposes. Minimum flow requirements on the Merced River are a function of the Cowell Agreement (water rights adjudication), FERC requirements, and the Davis-Grunsky contract. The flow below the Crocker-Huffman Diversion Dam must equal the greater of the Davis-Grunsky and FERC flows plus the Cowell Agreement Entitlement. The flow requirements are listed in Table 4-1.

4.1.2.5.1 Merced Irrigation District

Merced ID's water right on the Merced River is an appropriative right which authorizes diversion and storage in Lake McClure and Lake McSwain during the period October 1 through July 1. The points of diversion for this license are at the New Exchequer (Lake McClure) and McSwain Dams. Surface water available to Merced ID depends on annual runoff, the district's diversion rights, and storage from Lake McClure.

Merced ID receives water from the Merced River based on Federal and State permits and water rights and uses groundwater to supplement surface water supplies. During wet years, Merced ID supplies irrigators outside its district boundaries, but along district canals, with surface water. Some individual properties that have riparian or adjudicated water rights divert water from the Merced River.

Table 4-1. Merced River Minimum Flow Requirements				
Month	**Davis-Grunsky**	**FERC**		**Cowell Agreement Entitlement**
	Crocker-Huffman Dam to Shaffer Bridge	**At Shaffer Bridge**		
		Normal Year[1]	**Dry Year[2]**	
Oct 1-15	0	25	15	50[3]
Oct 16-31	0	75	60	50[3]
Nov	180-220	100	75	50[3]
Dec	180-220	100	75	50[3]
Jan	180-220	75	60	50[3]
Feb	180-220	75	60	50[3]
Mar	180-220	75	60	100
Apr	0	75	60	175
May	0	75	60	225
Jun	0	25	15	250[4]
Jul	0	25	15	225[4]
Aug	0	25	15	175[4]
Sep	0	25	15	150[4]

Source: MBK 2001

[1] Normal year as defined by FERC license: Forecasted April through July inflow to Lake McClure is equal to or greater than 450,000 acre-feet, as published in DWR May 1 Bulletin 120.

[2] Dry year as defined by FERC license: Forecasted April through July inflow to Lake McClure is less than 450,000 acre-feet as published in DWR May 1 Bulletin 120.

[3] Entitlement is equal to 50 cfs or the natural flow of the Merced River (inflow to Lake McClure), whichever is less.

[4] If the natural flow of the Merced River falls below 1,200 cfs in the month of June, the entitlement flows are reduced accordingly from that day: 225 cfs flow for next 31 days; 175 cfs flow for next 31 days; 150 cfs for next 30 days; 50 cfs for the remainder of September.

4.1.3 Delta

Although there are no potential acquisitions identified from in-Delta water rights holders, Delta conditions are described at length because of the potential effects of EWA actions (changes in the rate and timing of CVP and SWP south Delta pumping) upon water levels in the south Delta.

The Sacramento and San Joaquin Rivers unite at the western end of the Sacramento-San Joaquin Delta. The Delta, which comprises a 738,000-acre area, forms the lowest part of the Central Valley and is interlaced with about 700 miles of waterways. The sloughs and channels form more than 60 islands and tracts, of which about 520,000 acres are devoted to farming. An approximate 1,110-mile network of levees protects the islands and tracts, almost all of which lie below sea level, from flooding. Prior to development, which began in the mid-l9th century, the Delta was mainly tule marsh and grassland, with some high spots rising to a maximum of about 10 to 15 feet above mean sea level.

On average, about 21 million acre-feet of water reaches the Delta annually, but actual inflow varies widely from year to year and within the year. In 1977, Delta inflow

totaled only 5.9 million acre-feet, while inflow for 1983, an exceptionally wet year, was about 70 million acre-feet. On a seasonal basis, average natural flow to the Delta varies by a factor of more than 10 between the highest month in winter or spring and the lowest month in fall.

Hydraulics of the estuary system is complicated by tidal influences, a multitude of agricultural, industrial, and municipal diversions for use within the Delta itself, and by SWP and CVP exports. Tributary inflows, Delta outflows, and export pumping are the principal variables that define the range of hydrodynamic conditions in the Delta. The Tracy, Banks, and Contra Costa pumping plants' pump an average of approximately 3,300,000, 3,800,000, and 110,000 acre-feet annually, respectively. Excess outflow occurs almost entirely during the winter and spring months. Average winter outflow is about 32,000 cfs, while average summer outflow is about 6,000 cfs.

Tidal influence is important throughout the Delta. The influence of tide, combined with freshwater outflow, results in flow patterns that vary daily. The average tidal flow at Chipps Island, ebb or flood, is approximately 170,000 cfs. Historically, during summers when mountain runoff diminished, ocean water intruded into the Delta as far as Sacramento. During the winter and spring, freshwater from heavy rains pushed the saltwater back, sometimes past the mouth of San Francisco Bay.

Operations of the water facilities in the Sacramento River and San Joaquin basins and their tributaries influence the Delta greatly. With the addition of Shasta, Folsom, and Oroville Dams, saltwater intrusion into the Delta during summer months has been controlled by reservoir releases during what were the dry months under natural conditions (no dams). Flows from the East Side streams and San Joaquin River also contribute to controlling saltwater intrusion. Typically, peaks in winter and spring flows have been dampened, and summer and fall flows have been increased. The volume of runoff during very wet years, such as 1969, 1982, 1983, and 1986, has caused the upper bays to become fresh; even at the Golden Gate Bridge, the upper several feet of the water column sometimes consisted of freshwater.

The south Delta includes the San Joaquin River, Old River, Middle River, Woodward and North Victoria canals, Grant Line and Fabian Bell canals, Italian Slough, Indian Slough, Tom Paine Slough, and SWP and CVP canals. More than two-thirds of the land in the south Delta receives irrigation water from the Middle River, Old River, Grant Line Canal, and associated sloughs. The San Joaquin River is the major tributary flowing into the south Delta; however, due to flow depletions upstream from the Delta, San Joaquin River flows are often very low. At such times, water from the Sacramento River is drawn to the south Delta by a combination of SWP/CVP pumping and other diversions (Entrix 1996).

To facilitate movement of Sacramento River water to pumping facilities in the south Delta, Reclamation completed the Delta Cross Channel (DCC) near Walnut Grove in 1951. The DCC diverts water, by gravity, from the Sacramento River to Snodgrass Slough into the North and South Forks of the Mokelumne River. Sacramento River

water moves down these channels through the central Delta and into the San Joaquin River. Flows in the DCC reverse as the tide changes and, at certain stages, there is considerable flow from the channel into the Sacramento River. Two radial gates operate in the open or closed position. The channel is closed for flood control when Sacramento River flows exceed about 25,000 cfs. The gates are also closed at times to protect fish.

The Contra Costa Water District (WD) supplies CVP water to the district's water users via a pumping plant at the end of Rock Slough. Contra Costa WD also has water rights at Mallard Slough. The district has constructed and operates the Los Vaqueros Project. This has a pumping plant on Old River for diverting surplus Delta flows to reservoir storage or to Contra Costa WD users. The Los Vaqueros Project's primary purpose is water quality improvement and was not developed to increase the district's total annual water use. The North Bay Aqueduct supplies SWP water to northeastern San Francisco Bay and Napa Valley, while the Banks and Tracy pumping plants facilitate the transport of water to the San Joaquin Valley, southern California, central coast, and south San Francisco Bay. SWP and CVP contractors receive water from the Delta as releases from San Luis Reservoir or directly from the California Aqueduct or the Delta Mendota Canal. Peak deliveries occur during spring and summer.

4.1.3.1 South Delta

Water conditions in the south Delta area are influenced in varying degrees by natural tidal fluctuation; San Joaquin River flow and quality; local agricultural drainage water; CVP and SWP export pumping; local diversions; inadequate channel capacity; and regulatory constraints. These factors affect water levels and availability at some local diversion points. When the CVP and SWP are exporting water, water levels in local channels can be drawn down, causing problems for landowners that need to divert from these areas. If local agricultural drainage water is pumped into the channels where circulation is poor, such as shallow, stagnant, or dead-end channels, water quality can be affected. Channels that are too shallow and narrow also restrict flow and the volume of water available for agricultural lands.

Problems associated with diverting water from south Delta channels prompted a series of actions and agreements to address the problems. The first action occurred during the 1976-77 drought, when DWR installed a temporary rock barrier in Old River to improve water conditions in the south Delta. Additional actions and agreements include a lawsuit filed by the South Delta Water Agency, modifications to Tom Paine Slough, a Joint Powers Agreement, a Framework Agreement, and a draft settlement agreement.

4.1.3.1.1 Draft Settlement Agreement

In 1990, DWR, Reclamation, and South Delta WA agreed to a draft settlement to a 1982 lawsuit by South Delta WA against DWR and Reclamation. The draft agreement focused on short-term and long-term actions to resolve the water supply problems in the south Delta. It included provisions to test and construct barrier facilities in certain

south Delta channels. Barriers would lessen effects of Delta export pumping by raising water levels upstream from the barriers. The configuration of the barriers maintain circulation to minimize quality problems from stagnation.

The barriers testing program, referred to as the South Delta Temporary Barriers Project, involves the seasonal installation of four barriers: one in Middle River, two in Old River, and one in Grant Line Canal. Three of the barriers are designed to improve water levels and circulation for agricultural diversions; they are to be in place during the growing season. The fourth barrier, in Old River at the San Joaquin River, is designed to assist fish migration on the San Joaquin River. Water levels and water circulation in the south Delta improved with agricultural barrier installation (DWR 2000).

According to DWR's *Response Plan for Water Level Concerns in the South Delta Under D-1641* (DWR 2002),[6] prepared for the State Water Resources Control Board, south Delta water levels would be adequate for southern Delta diversions if they are forecasted to be 0.0 ft mean sea level (msl) or greater at Old River near Tracy Road Bridge, and Grant Line Canal near Tracy Road Bridge, and 0.3 ft above msl or greater at low tide at Middle River near the Undine Road Bridge. Additionally, the Response Plan recognized the potential for water levels at Coney Island/Channel 218, which is downstream from the temporary barriers, to be below those necessary for local diversions. An initial baseline water level of concern is not yet established for this location.

If it is determined by DWR, in coordination with the South Delta WA, that a landowner's ability to divert an adequate quantity of water is affected because of Project pumping, then DWR and the landowner work together to employ either temporary or permanent solutions. Temporary actions include the installation and operation of portable pumps at or near the diversion. Permanent actions include localized dredging near the affected diversion and/or modifying or relocating the diversion (DWR 2002a).

4.1.3.1.2 Joint Point of Diversion

The CVP and SWP have historically shared Delta export pumping facilities to assist with Project deliveries and to aid each Project during times of facility failures. In 1978, DWR agreed to, and the SWRCB permitted, the CVP to use SWP Banks Pumping Plant for replacement pumping (195,000 acre-feet annually) for pumping capacity lost at Tracy Pumping Plant because of striped bass pumping restrictions in D-1485. In 1986, Reclamation and DWR formally agreed that "either party may make use of its facilities available to the other party for pumping and conveyance of water by written agreement" and that the SWP would pump CVP water to make up for striped bass protection measures (Reclamation and DWR 1986). During this time frame (1970s and 1980s), the CVP regularly used SWP Banks Pumping Plant for CVP purposes (above the 195,000 acre-feet annually); however, there was some ambiguity

[6] The Response Plan only covers incremental impacts from Joint Point of Diversion/transfers.

as to whether the SWRCB had permitted such use. Reclamation filed a petition to cover such use in 1981.

After 1981, Reclamation usually filed ad hoc petitions to use Banks PP for purposes other than replacement pumping and CVP deliveries. Such uses included deliveries to the San Joaquin National Cemetery and Musco Olive Company. In 1999, the SWRCB addressed Reclamation's petition to permanently add Banks Pumping Plant and DWR's petition to permanently add Tracy Pumping Plant as a point of diversion under CVP water rights and SWP water rights, respectively. The points of diversion were added as part of the Bay Delta Hearings and included the completion of an SWRCB-directed EIR pursuant to CEQA. The hearing resulted in D-1641, which approved the Joint Point of Diversion (JPOD). D-1641 characterized the three types of JPOD use as Stage I, II, or III for the purposes of impact analysis. The stages are not sequential, but they vary as to magnitude and required mitigation (See Table 4-2).

Table 4-2 JPOD Stages

Stage	Purpose	Volume Limit	Mitigation
I	Cross Valley Canal Contractor, Musco Olive Co., SJ Nat'l Cemetery, and makeup pumping for fish protection actions	No increase to annual exports resulting from JPOD	Water Level Response Plan Water Quality Response Plan
II	Any authorized permitted purpose	Permitted pumping plant capacity	Operations Plan to protect aquatic resources and other legal users of water; or approval of minor exemptions
III	Any authorized permitted purpose	Physical pumping plant capacity	Operations Plan, and implementation of barriers or other water level protection

Stage I encompasses the historic use for those receiving CVP supplies via the SWP facilities and pumping "to make up export reductions taken to benefit fish" (Reclamation and DWR 1986). Because the SWRCB differentiated CVP JPOD according to likely environmental and economic impacts, D-1641 provides for differing mitigation requirements for the three stages.

The CALFED Record of Decision (CALFED ROD) described Delta operations for the acquisition of water for the EWA, and it described the sharing of CVP JPOD capacity between the CVP and the EWA. The EWA Operating Principles Agreement (Appendix C) stated that excess capacity for the EWA, CVP, and Level 4 refuge water has a higher priority than all non-project pumping, except for wheeling water for facility outages and for supply to CVP contractors for whom the SWP has wheeled water, specifically, San Joaquin National Cemetery, Musco Olive Co., and the users of the Cross Valley Canal. Banks Pumping Plant capacity available for Stage II and III is to be shared on a 50-50 basis (CVP receives 50 percent and the EWA and CVPIA Level 4 Refuge pumping share 50 percent).

4.1.4 Export Service Area

4.1.4.1 Santa Clara Valley Water District

Santa Clara Valley WD is responsible for water supply, flood protection, and watershed management in Santa Clara County, an area encompassing 1,300 square miles. Santa Clara Valley WD supplies water to local water retail agencies that provide water to customers in Santa Clara County. Local runoff, groundwater, and imported water comprise Santa Clara Valley WD's supplies. Local runoff is captured in ten reservoirs, with a combined capacity of 170,000 acre-feet. A total of 18 recharge ponds and three connected groundwater subbasins collect and store water for use during dry years. Both the CVP and SWP supply Santa Clara WD. Imported water is conveyed to the district through three main pipelines: the South Bay Aqueduct, which carries water from the SWP, and the Santa Clara Conduit and Pacheco Conduit, which bring water from the CVP.

Anderson Reservoir is an 89,073 acre-foot reservoir along Coyote Creek. Santa Clara Valley WD operates the reservoir for 1) impounding local surface runoff, 2) providing incidental flood control benefits, 3) providing controlled releases of reservoir water to the Almaden Valley Pipeline via the Cross Valley Pipeline and for groundwater recharge, and 4) providing source water to water treatment plants under emergency conditions. Storage space is also maintained in Anderson Reservoir for excess flows from Coyote Reservoir via Coyote Creek.

4.1.4.2 San Luis Reservoir

San Luis Reservoir is an off-stream storage reservoir operated jointly by the CVP and SWP. San Luis Reservoir has a capacity of 2,041,000 acre-feet and stores exports from the Delta to be used when the water is needed. Drawdown occurs each year; depending on hydrologic conditions and EWA actions, a low point of approximately 300,000 acre-feet could be reached in August or September. The reservoir is refilled as the Projects pump and export water from the Delta during the winter and spring.

4.1.4.3 Westlands Water District

Westlands WD supplies surface water and groundwater for agricultural irrigation as well as some M&I uses. Westlands WD comprises 604,000 acres on the west side of Fresno and King Counties. Westlands WD's primary water supply is its CVP water service contract. Water is pumped via the Delta-Mendota Canal to Westlands WD. Westlands WD's CVP supply has been unreliable; therefore, land retirement programs are ongoing because of lack of reliable water sources and drainage problems. Conjunctive use and supplemental purchases from State programs and other water agencies add to Westlands WD's supplies.

4.1.4.4 Tulare Lake Basin Water Storage District

Tulare Lake Basin Water Storage District (WSD) is located in the San Joaquin Valley; the majority of its 189,245 acres are in southeastern Kings County and the remainder in southwestern Tulare County. Tulare Lake Basin WSD supplies surface water deliveries for irrigation and groundwater recharge. Water supplies to the Tulare Lake

Basin WSD include SWP contract water; water rights on the King's, Kaweah, Kern, and Tule Rivers, as well as Deer Creek; and CVP Friant contract sources. Average annual total deliveries are about 150,000 acre-feet. Landowners supplement district surface supplies with groundwater pumping.

4.1.4.5 Kern County Water Agency

Kern County's water supply consists of both groundwater and surface water. Groundwater supplies about 43 percent of the county's water needed for domestic and agricultural purposes. Surface water supplies the remainder, delivered to the county from the California Aqueduct (SWP water), the Friant-Kern Canal (CVP water), surface flow from local streams (Poso, Cliente, Tehachapi, El Paso, and Emigdio), and from the Kern River. Potential transfers to the EWA would only involve SWP contract water or CVP floodflows. The county (Kern County WA) and the following agencies within the County are discussed in more detail in Chapter 6, Groundwater Resources.

4.1.4.5.1 Semitropic Water Storage District

Semitropic WSD is located in north central Kern County about 20 miles northwest of the City of Bakersfield, and covers an area of about 221,000 acres. Close to half the acreage within Semitropic WSD is irrigated; there are no incorporated cities within the District. Semitropic WSD receives water through an SWP allocation and groundwater for its supply. In 1995, Semitropic WSD's groundwater banking program was implemented; the storage program provides operational reliability and flexibility and promotes groundwater recharge (DWR 2001). Semitropic WSD's groundwater bank has a defined total storage capacity of 1,000,000 acre-feet. The pump back capacity of the facilities and Semitropic WSD's SWP entitlement restrict total program annual withdrawal amounts, which range from 90,000 to 290,000 acre-feet per year. The current banking partners are Metropolitan WD, Santa Clara Valley WD, Alameda County WD, Zone 7 Water Agency, and Vidler Water Company. Metropolitan WD and Santa Clara Valley WD have contracted for a total of 70% of the storage capacity.

Banking partners are able to store water in excess of their contracted limits; this excess storage is determined by the partner's withdrawal capacity. The size of the pumpback facility, scheduled SWP deliveries to Semitropic WSD, and the proportion of the total program capacity that has been contracted to other banking partners restrict total program annual withdrawal amounts. Metropolitan WD has contracted with Semitropic WSD for 350,000 acre-feet of storage space to store SWP allocated water. As of April 2000, Metropolitan WD had approximately 392,000 acre-feet stored in Semitropic WSD. The annual withdrawal capacity of Metropolitan WD's stored water similarly ranges from 31,500 acre-feet per year to 101,500 acre-feet (up to 35 percent of Semitropic WSD's overall withdrawal capacity).

Santa Clara Valley WD has contracted with Semitropic for 35 percent of the total storage capacity, or 350,000 acre-feet of storage space. As of September 2000, Santa

Clara WD had approximately 141,000 acre-feet of water in storage. The withdrawal capacity dedicated to Santa Clara Valley WD ranges from 31,500 to 101,500 acre-feet

4.1.4.5.2 Arvin-Edison Water Storage District

Arvin-Edison WSD manages the delivery of local groundwater and water imported into its service area from CVP's Millerton Reservoir via the Friant-Kern Canal. Arvin-Edison WSD is located in central Kern County and covers about 132,000 acres of primarily agricultural land. Arvin-Edison WSD operates its supplies conjunctively, storing water in the underlying aquifer when imported supplies are plentiful and withdrawing the water when the availability of imported supplies is reduced. In the 1970s, Arvin-Edison WSD entered into a number of agreements, jointly known as the Cross Valley Canal Exchange. This allows Arvin-Edison WSD to schedule water deliveries through the California Aqueduct.

The contract between Arvin-Edison WSD and Metropolitan WD extends current operations to allow Metropolitan WD to make use of the additional storage in Arvin-Edison WSD's groundwater basin. The amount of storage in Arvin-Edison WSD's groundwater basin that Metropolitan WD will use has yet to be determined. In years of plentiful supply, Metropolitan WD uses SWP supplies available above its current demands to deliver water to Arvin-Edison WSD through the California Aqueduct and Cross Valley Canal.

4.1.4.6 Metropolitan Water District of Southern California

Metropolitan WD receives water from at least five turnouts[7] from the SWP including turnouts at Castaic, Perris, and the Devil Canyon Afterbays. Metropolitan WD supplies drinking water as well as water for agriculture, M&I, and recreational purposes to parts of Los Angeles, Orange, San Diego, Riverside, San Bernardino and Ventura counties. Other water supplies include the Colorado River Aqueduct, local groundwater supplies, and water reclamation.

Castaic Lake, an SWP facility, receives SWP water from Pyramid Lake to the north and is the final reservoir on the West Branch of the SWP. It provides a major source of water to the Castaic Lake Water Agency and to the western part of the service area of Metropolitan WD. Water from Castaic Lake is used for municipal, industrial, and recreational uses. Castaic Lake is cycled annually, generally peaking in end-of-month storage in March, and then declining until a low is reached, usually in October. From this low point, the reservoir is filled to attain a high point again in March.

Lake Perris, also an SWP facility, is the southern terminus of the SWP's East Branch of the California Aqueduct. Lake Perris provides water supply for contracting users, recreation, and fish and wildlife enhancement. Maximum operating storage is 131,450 acre-feet.

Lake Mathews is in Riverside County between Interstate 15 and Interstate 215. Metropolitan Water District (WD) completed Lake Mathews in 1939 as the western

[7] Turnouts are areas where Metropolitan WD diverts from the SWP.

terminus for the Colorado River Aqueduct. Metropolitan WD operates Lake Mathews in conjunction with DWR reservoirs to meet emergency, dry-year supply, and seasonal needs (Metropolitan WD 2003).

Diamond Valley Lake, a Metropolitan WD facility, receives water from the California Aqueduct. Maximum operating storage is 800,000 acre-feet. An intertie between the Foothill Pipeline and a segment of Metropolitan WD's Inland Feeder allows Metropolitan WD to move SWP water from the East Branch of the California Aqueduct through the Foothill Pipeline and Inland Feeder into Diamond Valley Lake and the Colorado River Aqueduct. The intertie increases Metropolitan WD's ability to refill and maintain storage in Diamond Valley Lake by 260 cfs (Metropolitan WD 2003).

4.2 Environmental Consequences/Environmental Impacts

4.2.1 Assessment Methods

Under each alternative, the EWA Project Agencies would negotiate contracts with willing sellers based on a number of factors, including price, water availability, and location. These factors would change from year-to-year; therefore, the EWA Project Agencies may choose to vary their acquisition strategy in each year. To provide maximum flexibility, this analysis includes many potential transfers when the EWA Project Agencies would likely not need all transfers in a given year. Chapter 2 defines the transfers that are included in this analysis.

Effects on water supply are divided into potential effects on agencies and their users from transferring water to the EWA, water users receiving water from the EWA, and water users not selling water to the EWA.

Effects on agencies that would transfer water to the EWA are evaluated by comparing the agency's reduction in supply because of the transfer, and the demand after the transfer. Also, the evaluation compares the timing of the transfer to the timing of the demand.

Water users not selling water to the EWA are included in the analysis based on whether these users rely on supply from agencies that are selling water to the EWA. Users downstream from willing sellers and their water supply source are identified. Water budget data from the Butte County Water Inventory and Analysis (CDM 2001) is used to approximate the percentage of water that leaves an agency's boundaries and could be used downstream.

Modeling used for impact analysis accounts for all variable assets excluding relaxation of the Export/Inflow ratio.[8] (See Attachment 1 and Appendix H for modeling assumptions and the summary and technical appendix.) South Delta water

[8] See Section 2.4.2.2 for a discussion of variable assets.

level thresholds were taken from the *Response Plan for Water Level Concerns in the South Delta Under Water Rights Decision 1641*.

4.2.2 Significance Criteria

Effects on water supply and management due to program actions would be considered significant if the:

- Annual supply of water available to the CVP, SWP, or non-Project users would decrease as a result of:
  - A decrease in carryover storage[9];
  - A change in timing or rate of riverflows; or
  - A reduction in deliveries to Project contractors.
- Surface water elevations in the Delta were reduced below the following thresholds, which could adversely affect in-Delta water users:
  - Water levels at Old River near Tracy Road Bridge and Grant Line Canal near Tracy Road Bridge less than 0.0 feet msl; or
  - Water levels at Middle River near the Undine Road Bridge less than 0.3 feet msl.

Non-Project and Project contractors who participate as sellers to the EWA would receive lesser supplies. Because these sellers receive monetary compensation for their water, however, the reduction in their supply is not significant.

4.2.3 Environmental Measures Incorporated into the Project

Both the Flexible Purchase and Fixed Purchase Alternatives include refill criteria as part of the EWA project description to reduce environmental effects (as described in Section 2.4.2.1.1).

4.2.3.1 Refill Criteria

4.2.3.1.1 Feather River

The water released from Little Grass Valley and Sly Creek Reservoirs would be refilled from Feather River flows in the winter months following the transfer. Oroville-Wyandotte ID also has refill capability off of Slate Creek, a tributary to the Yuba River, via an upstream diversion operated by Oroville-Wyandotte ID.[10] The amount of storage reduction must be refilled at a time when downstream users would

[9] Carryover storage is the water that remains in a reservoir after demands on the reservoir have been met. Agencies typically maintain carryover storage as protection for low water availability during dry years.

[10] Oroville-Wyandotte ID is a senior water rights holder to Yuba County WA. Oroville-Wyandotte ID diverts water from Slate Creek for power generation and would divert the same amount of water with the EWA for refill compared to diversions without the EWA. Therefore, during refill of Sly Creek and Little Grass Valley reservoirs, Oroville-Wyandotte ID would not reduce Yuba County WA water supplies (Peterson 2002).

not have otherwise captured the water, either in downstream Project reservoirs or by Project pumps in the Delta. Typically, refill could only occur during Delta excess conditions (when more water than the Projects can pump is available) and/or when the water could not be stored in Lake Oroville. Little Grass Valley and Sly Creek Reservoirs would refill from available runoff regardless of the conditions in the Delta. Oroville-Wyandotte ID would then pay back the Projects the following summer for any quantity of water taken at a time when the Projects could have pumped the water (when the Delta is in balanced conditions).

4.2.3.1.2 Yuba River

The water released from New Bullards Bar Reservoir would be refilled from Yuba River flows in the winter and spring months following the transfer. The amount of storage reduction must be refilled at a time when downstream users would not have otherwise captured the water by exporting water from the Delta. Typically, refill could only occur during Delta excess conditions (when more water than the Projects can pump is available). New Bullards Bar Reservoir would refill from available runoff regardless of the conditions in the Delta. Yuba County WA would then pay back the Projects the following summer for any quantity of water taken at a time when the Projects could have pumped the water (when the Delta is in balanced conditions).

4.2.3.1.3 American River

The water released from French Meadows and Hell Hole Reservoirs would be refilled from American/Rubicon riverflows during the winter months following the transfer. The amount of storage reduction must be refilled at a time when 1) downstream users would not have otherwise captured the water in downstream Project reservoirs (Folsom Lake) or 2) the Delta is in excess conditions. French Meadows and Hell Hole Reservoirs would refill from available runoff regardless of downstream conditions. Placer County WA would then pay back the Projects the following summer for any quantity of water taken at a time when the Projects could have stored the water downstream in Folsom Lake. Folsom Lake storage is limited by flood control protocols that require storage to stay below certain levels throughout the wet season. Placer County WA would need to pay back the CVP for any water that was captured in French Meadows and Hell Hole Reservoirs at a time that the water could have been stored in Folsom Lake or pumped from the Delta.

4.2.4 Environmental Consequences/Environmental Impacts of the No Action/No Project Alternative

If the EWA were not implemented, actions to protect fish would continue as described in the affected environment section; fish actions would occur only in response to ESA take limits. Compliance with the biological opinions, which represent the regulatory baseline, would result in pumping reductions, resulting in reduced deliveries. Reduced deliveries would be more likely in dry years because in wet years the Projects would be more likely to be able to recover from export reductions for fish protection. DWR and Reclamation would continue to attempt to

re-operate the SWP and CVP, respectively, to avoid decreased deliveries to export users. These actions are described in Section 2.2.2.3.

Under the No Action Alternative, Stage 1 of the Joint Point of Diversion permitted the CVP/SWP to pump water using excess pump capacity to recover export reductions taken to protect fish. Stage 2 and Stage 3 would have authorized the Projects to divert water at the Tracy and Banks Pumping Plants for any purpose, provided the CVP/SWP complied with the terms of the agreement (Section 4.1.3.1.2). The operations plan required to divert water under Stage 2 and Stage 3 will have to be completed. It is likely, although not definite, that the Projects would prepare the elements necessary to divert additional water. Because it is uncertain if and when the Projects would move to Stage 2 and 3, and under what parameters, the effects cannot be stated conclusively. However, the likely outcome would be a beneficial effect on water supply because increased pumping would supply more water to the Export Service Area.

The existing conditions and the No Action/No Project Alternative are the same except for Joint Point of Diversion. The existing conditions and No Action/No Project Alternative (excluding the Joint Point of Diversion) are collectively referred to as the Baseline Condition in the following sections. The Joint Point of Diversion is evaluated compared to the existing conditions and the No Action/No Project Alternative.

4.2.5 Environmental Consequences/Environmental Impacts of the Flexible Purchase Alternative

The Flexible Purchase Alternative allows asset acquisition of up to 600,000 acre-feet[11] and does not specify transfer limits in the Upstream from the Delta Region or the Export Service Area. Total transfers made in the Upstream from the Delta Region would range from 50,000 to 600,000 acre-feet, limited by hydrologic year and conveyance capacity through the Delta. Although potential transfers would not all occur in one year, this section discusses maximum transfers to the EWA from all agencies (a transfer amount that would result in greater than 600,000 acre-feet) to provide an effect analysis of a maximum transfer scenario. Similarly, the evaluation includes an analysis of up to 540,000 acre-feet from the Export Service Area to cover a maximum transfer scenario for that region.

4.2.5.1 California Water Resources

With the EWA, the overall flow of rivers from mountainous areas down to the valley and out to the ocean through the Bay-Delta would not change. Projects would continue to move surface water from northern California to southern California. A larger amount of water would leave the Sacramento and San Joaquin River areas than under the Baseline Condition; at most this amount would equal 600,000 acre-feet. The increased flow from the Sacramento and San Joaquin Rivers would increase the amount of water passing through the Delta, reaching the Export Service Area, and

[11] Flexible Purchase Alternative acquisition amount includes variable assets.

flowing out into the Bay. Table 4-3 compares Delta inflows, outflows, and exports for the modeled Baseline Condition and the Flexible Purchase Alternative.

Table 4-3 illustrates several points of interest:

- Inflow from the Sacramento River basin increases in April, May, and June because crop idling water must be released from Lake Shasta to meet downstream standards although it cannot be pumped in the Delta;
- Increased inflow from the Sacramento River and decreased exports cause increased outflows from March through June (additional fish actions could occur in December through February, which would also cause decreased exports);
- Increased export in July through September requires carriage water and therefore an increase in Delta outflow; and
- The decreases in exports in March, April, May, and June are greater than the increases in July, August, and September because the EWA would acquire some assets from the Export Service Area that would not need to be pumped through the Delta. The combined assets acquired in the Upstream from the Delta Region and the Export Service Area would be used to pay back the Projects for the export decreases.

Table 4-3
Changes in Delta Inflows, Outflows, and Exports

Month	***Inflow from the Sacramento River (cfs)***		***Inflow from the San Joaquin River (cfs)***		***Delta Outflow (cfs)***		***Delta Exports (TAF)[1]***	
	Baseline	*Increase with Flexible Purchase*	*Baseline*	*Increase with Flexible Purchase*	*Baseline*	*Increase with Flexible Purchase*	*Baseline[2]*	*Change with Flexible Purchase*
Oct	12,029	88	3,016	203	6,430	291	506	0
Nov	14,866	15	1,980	210	8,913	225	456	0
Dec	26,703	5	3,038	0	21,387	5	554	0
Jan	39,355	3	4,505	0	36,739	2	606	0
Feb	48,222	1	6,392	0	48,088	1	512	0
Mar	40,247	2	6,361	0	40,025	1,829	490	-112
Apr	26,707	481	6,127	0	27,536	3,460	312	-177
May	19,808	352	5,482	0	20,030	2,411	259	-127
Jun	18,256	349	4,219	0	12,311	3,014	382	-159
Jul	17,824	3,142	2,314	0	7,319	592	498	157
Aug	13,839	2,167	1,696	0	3,993	358	520	111
Sep	13,847	644	1,909	0	4,953	97	546	33

All values are monthly means.

[1] Delta Exports are presented in thousands of acre-feet instead of cfs because the exports are not constant.

[2] Baseline Delta exports would be less than the following amounts because of pump reductions for ESA take limits. The reductions differ by year because of variability in fish populations; therefore, the baseline reductions could not be quantified.

The points of interest above describe trends regarding the movement of water in a big picture view under the Baseline Condition and with the Flexible Purchase Alternative. The effects of the trends are discussed in the following sections on a smaller scale; effects on the water supply for specific water agencies and users are evaluated.

4.2.5.2 Upstream from the Delta Region

Effects on water supply and management, beneficial or adverse, occur for the sellers as well as downstream users.

Water that is sold to the EWA agencies would be released as EWA assets and 1) stored in San Luis Reservoir, 2) delivered directly to the SWP, CVP, and/or water contractors, 3) stored in groundwater banks south of the Delta for later use, 4) delivered to one or more Export Service Area contractors in exchange for agreed return of the water at a future time, or 5) used directly for environmental purposes.

4.2.5.2.1 Sacramento River

EWA acquisition of water via groundwater substitution or crop idling could change the rate and timing of flows in the Sacramento River. The rate and timing of changes to flows in the Sacramento River would depend on the amount of water Glenn-Colusa ID, Reclamation District 108, Anderson-Cottonwood ID, and/or Natomas Central Mutual Water Company has sold to the EWA agencies and the scheduled release of that water. Because of flow and temperature requirements in the Sacramento River, Lake Shasta would not be able to store EWA water from groundwater substitution and crop idling in April and May. During these months, flows in the Sacramento River would increase by the amount of water purchased for crop idling[12]. In some years, (depending on hydrologic conditions) Lake Shasta would store EWA water from crop idling and groundwater substitution in June because users would not need the water released under the Baseline Condition for agricultural use. Sacramento River flows between Lake Shasta and the point of diversion would decrease in June. The decrease in flow corresponds only to the amount of water that the willing seller would have used under the Baseline Condition. The remaining river flow would supply other agencies' water needs as it would under the Baseline Condition because the timing and quantity of their water release would also be the same as under the Baseline Condition.

During July through September, water from Lake Shasta would be released into the Sacramento River; however, those agencies that have sold water to the EWA would divert less water off the river than they would under the Baseline Condition. The Sacramento River would therefore have increased flows below the point of diversion; above the point of diversion Sacramento River flows would be the same as under the

[12] Because water cannot be held in Lake Shasta in April and May, groundwater substitution would not begin until June/July when water can be held in Lake Shasta as EWA assets. If farmers were participating in crop idling, however, the water delivered under the Baseline Condition could be available as EWA assets beginning in April. Because Lake Shasta cannot hold the water during April and May, flows would increase below the point of diversion on the Sacramento River.

Baseline Condition. Also, releases from Lake Shasta would be timed to provide water when the export pumps are available, which would usually be in July and early August. Therefore, flows would also increase in July for the entire Sacramento River, and flows in August and September would vary depending on pump availability.

Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease. Therefore, the EWA acquisition of water from groundwater substitution or crop idling would have no effect on water supply on the Sacramento River system.

EWA acquisition of water via crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, under program conditions, would be idled. Glenn, Colusa, and Yolo Counties could idle up to 47,980 acres. The EWA would purchase approximately 3.3 acre-feet/acre (the amount of water consumed by the crop); however, under the Baseline Condition, water agencies divert additional water from the Sacramento River to account for system losses. System losses include conveyance losses (evaporation or percolation within the conveyance system), riparian evapotranspiration (water used by vegetation along the conveyance system), and on-farm losses (deep percolation to groundwater or tailwater runoff). The amount of diverted water varies depending on the amount of system losses.

If farmers idled their crops, their water agency would reduce diversions by the 3.3 acre-feet/acre plus the additional amount that goes to on-farm losses. Of this additional amount that is applied to fields in the Baseline Condition, a portion percolates into the groundwater aquifer below and a portion runs off the field back into the conveyance system. This "tailwater" that runs back into the conveyance system could then be used again by water users downstream on the conveyance system. Typically, downstream users within the same water agencies depend on tailwater to provide a portion of their water supply (see Figure 4-3). Some downstream water users that are outside of the agency service area also depend on tailwater supplies. If farmers idled land, tailwater would no longer be available to downstream users, both within and outside of the water agency.

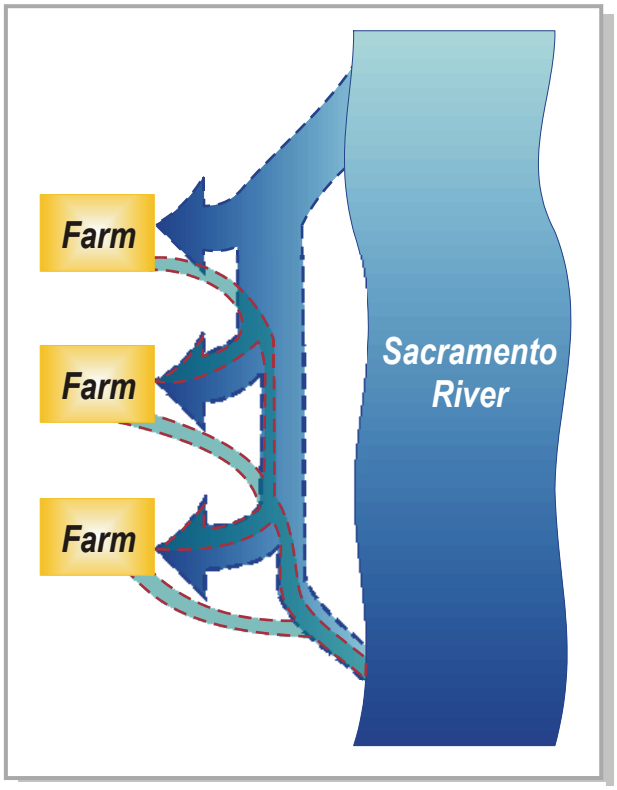

Figure 4-3
Downstream Use of Return Flows

Users within the willing seller's service boundaries would be able to contact the agency and request a water release if insufficient flows were reaching their property. However, users including farmers, refuges, duck clubs, and wetlands

downstream and outside the willing seller's service boundaries would not be able to request additional water from the agency if flows below the Baseline Condition were reaching their property.[13] This effect would be potentially significant. The mitigation measure listed in Section 4.2.8.1 would protect downstream users from effects caused by reduced availability of return flows by requiring the selling agency to maintain flows through their system. Therefore, the potential effects of a reduction in water supply caused by crop idling are less than significant.

4.2.5.2.2 Feather River

EWA acquisition of water via groundwater substitution or crop idling could change the rate and timing of flows in the Feather River. The rate and timing of flow changes in the Feather River would depend on the amount of water Western Canal WD, Joint Water Districts, and/or Garden Highway Mutual Water Company have sold to the EWA agencies and the scheduled release of that water. During April through June, Lake Oroville would store EWA water. (Groundwater would replace surface water released from Lake Oroville for agricultural use under the Baseline Condition. Surface water would therefore not be released from Lake Oroville.) During July through September, water from Lake Oroville would be released into the Feather River; under the Baseline Condition, diversion is from Lake Oroville and irrigation supply to the farmer does not enter the river. The Feather River would therefore have increased flows below Lake Oroville from July through September.

Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease. Therefore, the EWA acquisition of water from groundwater substitution or crop idling would have no effect on water supply on the Feather River system.

EWA acquisition of water via crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, under program conditions, would be idled. Butte and Sutter Counties would idle up to 38,340 acres. As described above under the Sacramento River, idling these fields would reduce tailwater, which could reduce supplies to downstream users. This effect would be potentially significant. The mitigation measure listed in Section 4.2.8.1 would reduce the potential effects to downstream users to less than significant.

EWA acquisition of stored reservoir water from Oroville-Wyandotte ID could reduce carryover storage compared to the Baseline Condition. Oroville-Wyandotte ID would release more water from Little Grass Valley and Sly Creek Reservoirs than is released under the Baseline Condition. The water released from Little Grass Valley and Sly Creek Reservoirs would be refilled from Feather River flows in the winter months following the transfer. Oroville-Wyandotte ID also has refill capability off of Slate Creek, a tributary to the Yuba River, via an upstream diversion operated by Oroville-Wyandotte ID (see footnote 9 Section 4.2.3.1.1).

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[13] Exceptions to this statement include private recreational refuges that are a part of the 1922 Agreement in which agencies have agreed to provide water for environmental purposes to lands outside their service area. If the amount of water via return flows that reached the refuges was less than the agreed upon amount, the refuges could request, and would receive, the difference.

Refill of the reservoirs would take place during the following winter and spring. Following the transfer, if insufficient water were available to refill the reservoirs (e.g., in a low runoff year), a decrease in available supply to users during the following summer could result. Oroville-Wyandotte ID would decide the amount of water to sell to the EWA (in agreement with the need of the EWA agencies). It is anticipated that Oroville-Wyandotte ID manages water effectively and would calculate the amount of carryover storage that could be released without adverse effects, factoring the potential for a dry year and less refill into the decision-making process. Oroville-Wyandotte ID would not sell water to the EWA that would be needed for its water users. Additionally, the State Water Resources Control Board would also review the reservoir release to be able to make a finding of no injury to other legal users. Therefore, EWA acquisition of stored reservoir water from Oroville-Wyandotte ID would have a less-than-significant effect on water supply.

4.2.5.2.3 Yuba River

EWA acquisition of water via groundwater substitution could change the rate and timing of flows in the Yuba River. The rate and timing of changes to flows in the Yuba River would depend on the amount of water Yuba County WA sold to the EWA agencies and the scheduled release of that water. During April through June, New Bullards Bar Reservoir would store EWA water. (Groundwater would replace surface water released from New Bullards Bar Reservoir for agricultural use under the Baseline Condition. Surface water would therefore not be released from New Bullards Bar Reservoir.) Yuba River flows would decrease between Englebright Dam (where the power facilities discharge water from New Bullards Bar Reservoir) and the usual point of diversion typically at Englebright of Daguerre Point Dams. The decrease in flow corresponds only to the amount of water that the willing seller would have used under the Baseline Condition. The remaining river flow would supply other agencies' water needs as it would under the Baseline Condition because the timing and quantity of their water release would also be the same as under the Baseline Condition.

During July through September, water from New Bullards Bar Reservoir would be released into the Yuba River; however, Yuba County WA would not divert as much water off the river, as would occur under the Baseline Condition. The releases on the Yuba River would remain relatively constant and would not vary as much as other rivers because constant flows help the fisheries on the Yuba system. The Yuba River would therefore have increased flows below the point of diversion; above the point of diversion, Yuba River flows would also be greater than under the Baseline Condition while the transfer was being delivered to the Delta because the water conserved over the entire irrigation season would be transferred in 2-3 months.

Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease. Therefore, the EWA acquisition of water from groundwater substitution would have no effect on water supply on the Yuba River.

EWA acquisition of stored reservoir water from Yuba County WA could reduce carryover storage compared to the Baseline Condition. Yuba County WA would release more water from New Bullards Bar Reservoir than it releases under the Baseline Condition. Refill of the reservoir would take place during the following winter and spring. Following the transfer, if insufficient water were available to refill the reservoir (e.g., in a low runoff year), a decrease in available supply to users during the following summer could result. Yuba County WA would decide the amount of water to sell to the EWA (in agreement with the need of the EWA agencies). It is anticipated that Yuba County WA would calculate the amount of carryover storage that could be released without adverse effects, factoring the potential for a dry year and less refill into the decision-making process. Yuba County WA would not sell water to the EWA that would be needed for its water users. Additionally, the State Water Resources Control Board would also review the reservoir release to be able to make a finding of no significant effect to supply or to other legal users. Therefore, EWA acquisition of stored reservoir water from Yuba County WA would have a less-than-significant effect on water supply.

4.2.5.2.4 American River

EWA acquisition of water via crop idling could change the rate and timing of flows in the American River. The rate and timing of flow changes in the American River would depend on the amount of water Placer County WA sold to the EWA agencies and the scheduled release of that water. During April through June, Folsom Lake would store EWA water (water released under the Baseline Condition for agricultural use would not be needed because of crop idling and would therefore be held in Folsom Lake). American River flows would increase between the point of diversion and Folsom Lake. The increase in flow corresponds only to the amount of water that the willing seller would have used under the Baseline Condition. The flow would supply other agencies' water needs as it would under the Baseline Condition because the timing and quantity of their water release would also be the same as under the Baseline Condition.

During July through September, water from Folsom Lake would be released into the American River that, under the Baseline Condition, would have been used for rice crops. The American River would therefore have increased flows below Folsom Lake compared to the Baseline Condition.

Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease. Therefore, the EWA acquisition of water from crop idling would have no effect on water supply on the American River.

EWA acquisition of stored reservoir water from Placer County WA could reduce carryover storage compared to the Baseline Condition. Placer County WA would release more water from French Meadows and Hell Hole Reservoirs than is released under the Baseline Condition. The reservoirs would refill during the following winter and spring. Following the transfer, if insufficient water were available to refill the reservoirs (e.g., in a low runoff year), a decrease in available supply to users during

the following summer could result. Placer County WA would decide the amount of water to sell to the EWA (in agreement with the need of the EWA agencies). It is anticipated that Placer County WA and PG&E would calculate the amount of carryover storage that could be released without adverse effects, factoring the potential for a dry year and less refill into the decision-making process. Placer County WA would not sell water to the EWA that would be needed for their water users. Additionally, the State Water Resources Control Board would also review the reservoir release to be able to make a finding of no injury to other legal users. Therefore, EWA acquisition of stored reservoir water from Placer County WA would have a less-than-significant effect on water supply.

EWA acquisition of water via crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, under program conditions, would be idled. Placer County could idle up to 3,280 acres. As described above under the Sacramento River, idling these fields would reduce tailwater, which could reduce supplies to downstream users. This would be a potentially significant effect. The mitigation measure listed in Section 4.2.8.1 would reduce the potential effects to downstream users to less than significant.

4.2.5.2.5 Merced River

EWA acquisition of water via groundwater substitution could change the rate and timing of flows in the Merced River. The rate and timing of flow changes in the Merced River would depend on the amount of water Merced ID sold to the EWA agencies and the scheduled release of that water. During April through September, Lake McClure would store EWA water (water released under the Baseline Condition for agricultural use would not be needed because of groundwater substitution and would therefore be held in Lake McClure). Merced River flows would decrease between New Exchequer Dam and the point of diversion, typically Lake McSwain. The decrease in flow corresponds only to the amount of water that the willing seller would have used under the Baseline Condition. The flow would supply other agencies' water needs as it would under the Baseline Condition because the timing and quantity of their water release would also be the same as under the Baseline Condition.

During October and November, water from Lake McClure would be released into the Merced River. Water released during this timeframe would increase Merced River flows compared to the Baseline Condition downstream from New Exchequer Dam.

Although there would be a change in timing and rate of riverflows, the annual supply of water to Project or non-Project users would not decrease. Therefore, the EWA acquisition of water from groundwater substitution would have no effect on water supply on the Merced River.

4.2.5.3 Delta

EWA acquisitions through stored reservoir water, groundwater substitution, crop idling, and stored groundwater purchase from sellers in the Upstream from the Delta Region would change the rate and timing of Delta inflows and the amount and timing of diversions from the

Delta for the EWA at the SWP or CVP pumps. Increased water transfers change the timing of diversions and alter the amounts of water diverted for agricultural, municipal, industrial, and ecosystem purposes. Export pumping compared to the Baseline Condition would increase July through October, although the majority of the water would be pumped July through September (as shown in Table 4-3). Under certain conditions where the incremental effects on fish would be negligible by the Management Agencies, EWA water could be transferred through the Delta as early as June or continue until November or December. Conversely, if the transfer could result in an adverse incremental effect on fish, transfer of EWA water through the Delta could be delayed in July, or discontinued temporarily if the effect developed after the transfer had started.

Poor circulation in the south Delta is an existing concern; increased export pumping would not exacerbate the situation above the Baseline Condition. An increase in pumping could affect water levels, however, which could affect water users. South Delta agricultural diverters would be affected if EWA actions resulted in lower water levels compared to the Baseline Condition in the south Delta that were also below the thresholds identified in Section 4.2.2. When water levels are too low, a sufficient pump draft cannot be maintained and diverters could experience an interruption to irrigation.

According to DWR's Response Plan for Water Level Concerns in the South Delta Under D-1641 (DWR 2002), prepared for the State Water Resources Control Board, South Delta water levels would be adequate for southern Delta diversions if they were 0.0 ft mean sea level (msl) or greater at Old River near Tracy Road Bridge and Grant Line Canal near Tracy Road Bridge, and 0.3 ft above msl or greater at Middle River near the Undine Road Bridge. The Coney Island/Channel 218 location also has water levels that fall below those necessary for local diversions. An initial baseline water level of concern is not yet established for the Coney Island/Channel 218 location.

Figures 4-4 through 4-7 show the water levels at four locations of concern identified in the Response Plan. The modeling data show the monthly mean of the daily averages with the operation of the temporary barriers. As the figures show:

- December through June, water levels with the EWA would be equal or higher than under the Baseline Condition;
- July through November, water levels would be equal or lower with the EWA than under the Baseline Condition).

Because daily averages include tidal influences (both high tide and low tide), the minimum daily water levels are not represented on Figures 4-4 through 4-7. It is important to consider the minimum daily water levels because the potential for effects would be greatest at these levels.

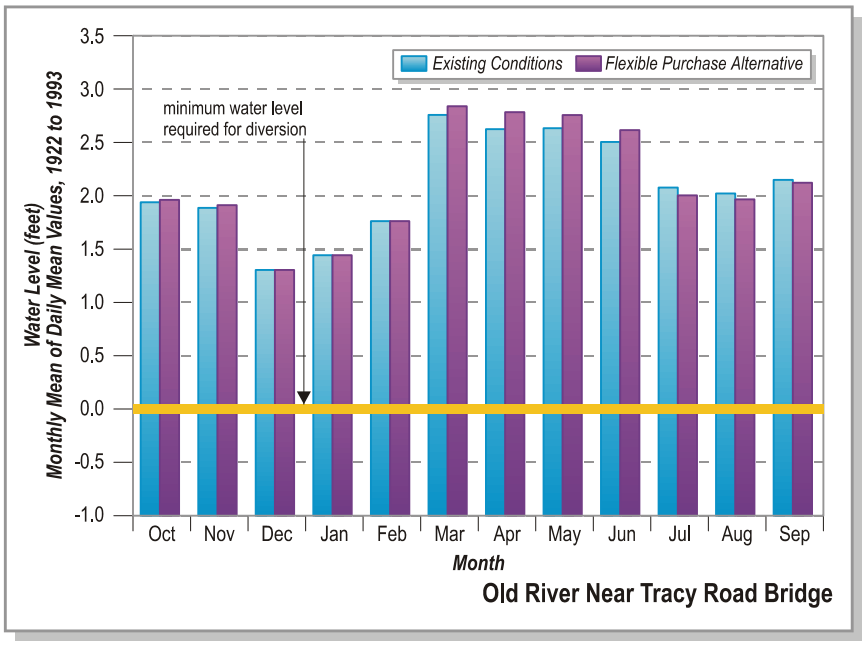

Figure 4-4
Water Levels at Old River Near Tracy Road Bridge

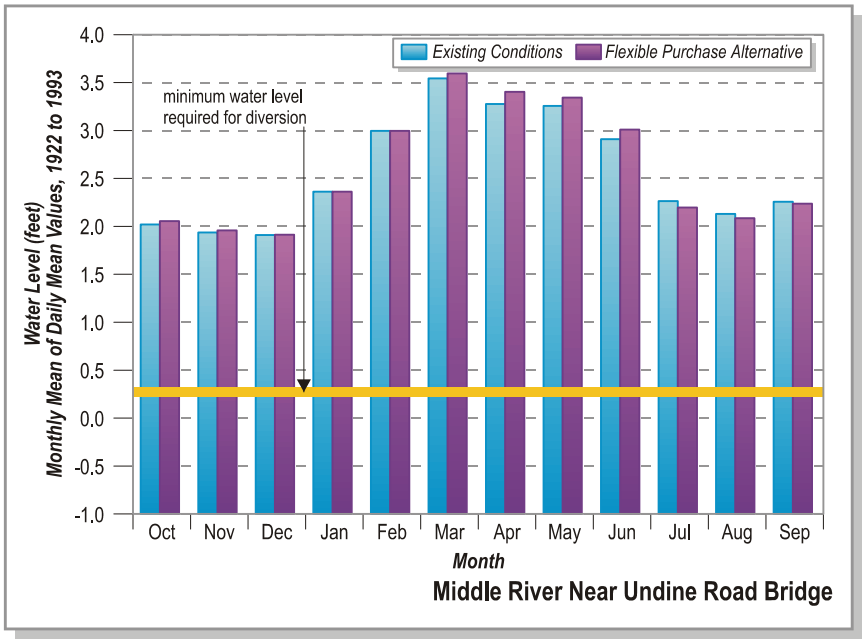

Figure 4-5
Water Levels at Middle River Near Undine Road Bridge

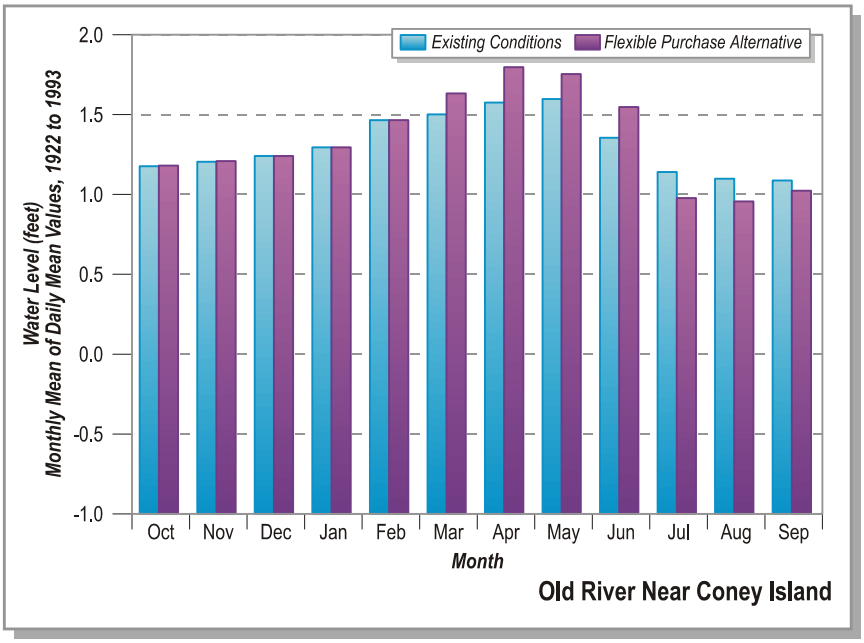

Figure 4-6
Water Levels at Old River Near Coney Island

Figures 4-8 and 4-9 show the monthly mean of the daily minimum values, representing the lowest water levels at the same locations as Figures 4-6 and 4-7. (Figures for the monthly mean of the daily minimum values are not shown for the locations shown in Figures 4-4 and 4-5. The temporary barriers at these locations maintain water levels above the threshold.) The data in Figures 4-8 and 4-9 show that under the Baseline Condition, water levels would be lower than the threshold (water levels are less than 0.0 msl).[14]

[14] As stated in Section 4.2.3.1, the initial baseline water level of concern for Coney Island/Channel 218 has not yet been determined.

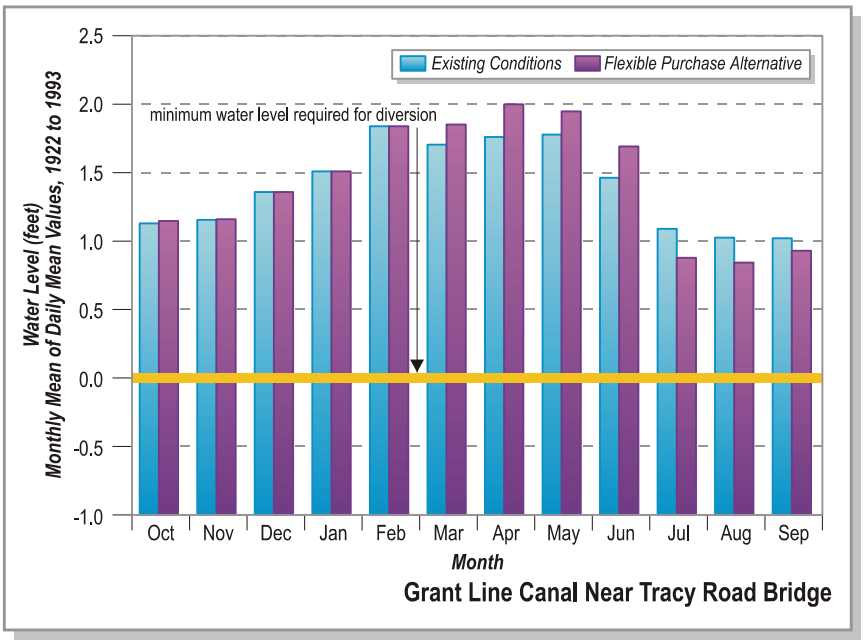

Figure 4-7
Water Levels at Grant Line Canal Near Tracy Road Bridge

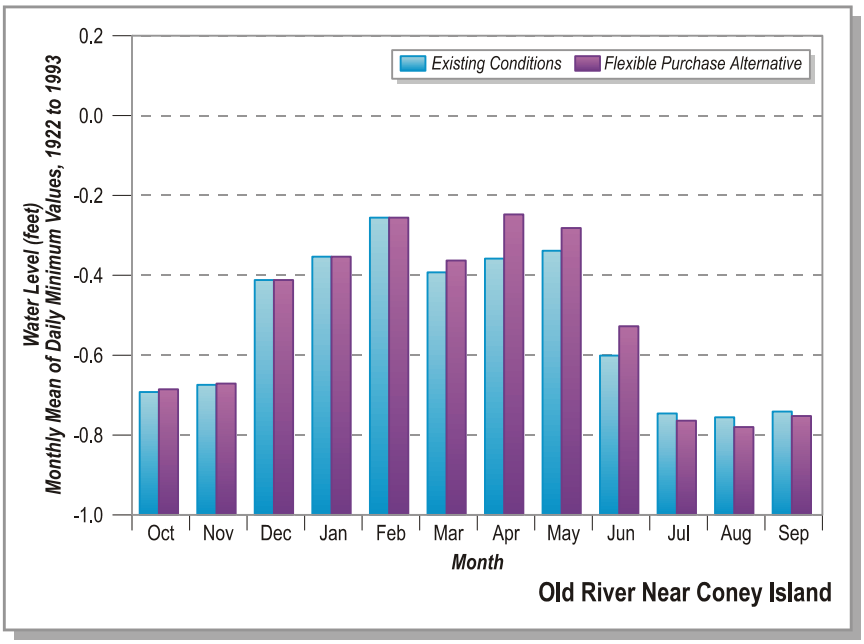

Figure 4-8
Minimum Water Levels at Old River Near Coney Island

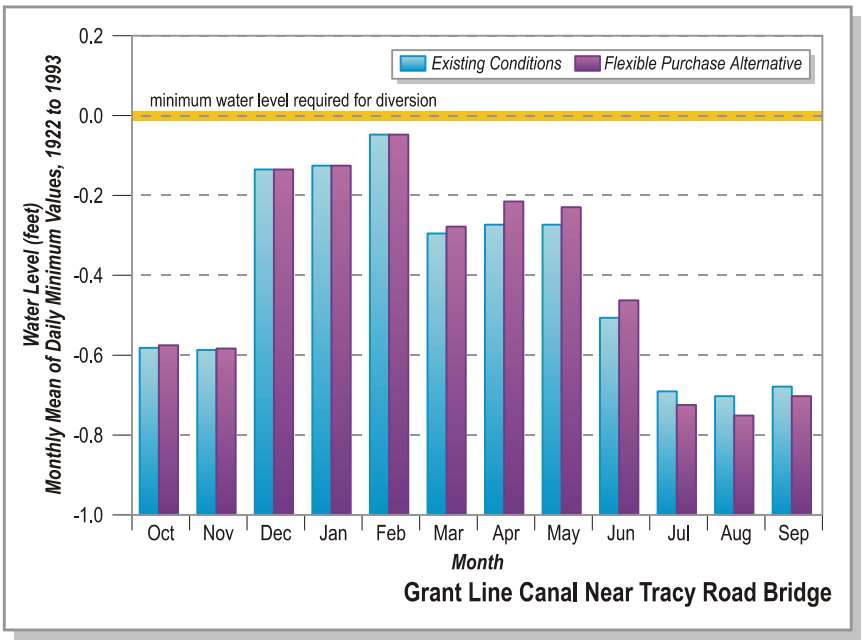

Figure 4-9
Minimum Water Levels at Grant Line Canal Near Tracy Road Bridge

During July through September, when the EWA would increase export pumping, south Delta water levels would be lower than under the Baseline Condition. As displayed in the figures, the difference between the Baseline Condition and the condition with EWA pumping would be slight; levels with the EWA could be less than 1 inch below the already low Delta water levels. This slight decrease could, however, affect water supplies to landowners and therefore would be a potentially significant effect. Because south Delta water levels are below the threshold even under the Baseline Condition, practices exist to reduce effects. As mentioned in Section 4.2.3.1, DWR installs temporary pumps to make irrigation possible at low water levels; permanent solutions, such as dredging, are also being considered. These practices would continue with the EWA such that the water supply would not be decreased to south Delta water users. The mitigation measure listed in Section 4.2.8, along with current DWR practices would reduce these potentially significant effects to less than significant.

EWA acquisition of water through variable assets, specifically Joint Point of Diversion, would change the available pump capacity for the CVP. Under the Flexible Purchase Alternative, the CVP and EWA could use SWP excess pump capacity (shared on a 50-50 basis). The EWA agencies would likely maximize use of available pumping capacity at Banks Pumping Plant because transfers originating in the Upstream from the Delta Region are typically less expensive. Under existing conditions, the CVP has used Stage 1 and Stage 2 of JPOD to pump water through Banks Pumping Plant to make up for pumping reductions that benefit fish and increase CVP supplies, respectively. Under the No Action/No Project Alternative, the CVP would have the potential to increase use of JPOD to reach the maximum volumes allowed in Stage 2. It is unclear to what

extent the CVP would have implemented these stages of the JPOD and, if the CVP did reach these stages, if the CVP would use the full capacities of Banks Pumping Plant.

The CALFED ROD included sharing available capacity 50-50 between an EWA and CVP with an EWA program designed to acquire approximately 185,000 acre-feet (35,000 upstream from the Delta and 150,000 in the Export Service Area). The CALFED ROD also stated that the EWA has exclusive rights to 500 cfs of the Banks Pumping Plant capacity above the permitted capacity of 6,680 cfs for three months in the summer. Because the 500 cfs capacity can be used to export 50,000 to 60,000 acre-feet, the CALFED agencies did not identify any impacts to the CVP because of sharing available capacity with the EWA. The CALFED ROD acknowledged the 35,000 acre-feet purchase was a first-year purchase and higher amounts could be transferred in subsequent years, but the scope of upstream from the Delta transfers would still be smaller than the Flexible Purchase Alternative. Given there was additional capacity between 35,000 acre-feet and the 500 cfs capacity, it was anticipated that even if purchases increased, they would be covered under the 500 cfs capacity with a small amount of additional pumping using JPOD.

The incorporation of functional equivalence into the Flexible Purchase Alternative would increase the EWA's use of JPOD when capacity is available. The EWA pumping would represent an equal priority sharing of available excess capacity with the CVP, and so could change the CVP's current use of the JPOD and ultimately could affect the full implementation for the CVP's use of JPOD at the physical pumping plant capacity (Stage 3). Quantifying these lost opportunities is speculative, but given that the JPOD response plans will be in place and historically the CVP did utilize Banks Pumping Plant to meet water supply allocations, some lost opportunities would occur as a result of the sharing of excess capacity with EWA.

4.2.5.4 Export Service Area

The EWA program would likely result in increased reliability of water supplies to SWP/CVP contractors. Under the Baseline Condition, water users in the Export Service Area are subject to reductions in their water supply due to ESA take limits for Delta pumping reductions. The EWA agencies aim to assure that there would be no uncompensated water cost to the CVP or SWP relative to the baseline requirements. Furthermore, with the EWA, water supply would not be affected by pump reductions because EWA assets would repay the CVP and SWP for the loss of supply caused by reduced Project pumping. The Projects' annual supply would be equal to or greater than it would be without the EWA, therefore ensuring greater reliability. The amount of annual reductions under the Baseline Condition is difficult to predict because of variability in the system. The determination of pumping reductions is linked to fish, which are not a predictable resource. Because there is no quantitative baseline for pumping reductions, increased reliability is not discussed quantitatively.

The EWA would increase water supply reliability to the CVP and SWP.

The amount of assets the EWA has under the Flexible Purchase Alternative would help prevent moving to Tier 3.[15] If the EWA does move from Tiers 1 and 2 into Tier 3, the amount of assets the EWA would have under the Flexible Purchase Alternative would supply a greater assurance that the Projects would be compensated for fish actions.

Because the CVP and SWP would be repaid for water lost during pump reductions, additional reductions could be taken compared to the Baseline Condition with no consequence to the Projects, thereby increasing the benefits to fish. A more reliable water source would benefit all water users, including agricultural, environmental, and urban. The increased reliability in water supply to the Export Service Area, facilitated by the elimination of CVP and SWP water loss during ESA reductions, is a beneficial effect.

4.2.5.4.1 Santa Clara Valley Water District

EWA agencies' management of water via source shifting would change the pattern of reservoir level fluctuations. Santa Clara Valley WD could source shift a maximum of 20,000 acre-feet of water, using Anderson Reservoir for supply until water from San Luis Reservoir was delivered later in the year. Per District Resolution 605, the Santa Valley WD would not draw down the reservoir below its minimum summer pool of 20,000 acre-feet, which is necessary to maintain recreational opportunities. The source-shifting amount is within normal operations for the reservoir; therefore, there would be a less-than-significant effect on water supply.

EWA agencies' management of water via predelivery would change the pattern of reservoir level fluctuations. Water would be supplied to Santa Clara Valley WD prior to when it would be supplied under the Baseline Condition. Santa Clara Valley WD would store the water for use later in the year. Because Santa Clara Valley WD would be receiving the water earlier than it would under the Baseline Condition, the effect on water supply is beneficial.

4.2.5.4.2 Metropolitan Water District

EWA agencies' management of water via source shifting would change the pattern of reservoir level fluctuations. Metropolitan WD has adequate alternative supplies and storage to provide for the maximum 200,000 acre-feet of water that may be necessary for source shifting. It is anticipated that Metropolitan WD would not participate in source shifting if adequate supplies were not available for their water users. The 200,000 acre-feet represent about 10 percent of the Southern California storage capacity available to Metropolitan WD. Because of the relatively small quantity of water being deferred and the large variety of local sources for providing a temporary in-lieu supply during the period of deferment, the action would not affect the reliability of Metropolitan WD's water supplies. Therefore, the effect on water supply is less than significant.

[15] See Section 2.1.3 for description of Tiers 1, 2, and 3.

EWA agencies' management of water via predelivery would change the pattern of reservoir level fluctuations. EWA water would be supplied to Metropolitan WD from San Luis Reservoir (to protect water from spilling from San Luis Reservoir) prior to when it would be supplied under the Baseline Condition. Metropolitan WD would store the water for use later in the year. Because Metropolitan WD would be receiving the water earlier than it would under the Baseline Condition, the effect on water supply is beneficial.

4.2.6 Environmental Consequences/Environmental Impacts of the Fixed Purchase Alternative

The Fixed Purchase Alternative specifies purchases of 35,000 acre-feet[16] in the Upstream from the Delta Region and 150,000 acre-feet in the Export Service Area. While the amounts in each region are fixed, the acquisition types and sources could vary. This section analyzes the effects on each potential transfer to allow the EWA Project Agencies maximum flexibility when negotiating purchases with willing sellers. These transfers are the same actions as those described for the Flexible Purchase Alternative, but the amounts are limited by the total acquisition amount in each region (35,000 acre-feet in the Upstream from the Delta Region and 150,000 acre-feet in the Export Service Area).

4.2.6.1 California Water Resources

Although the amounts listed in Table 4-3 apply only to the Flexible Purchase Alternative, the trends discussed in Section 4.2.5.1 for the Flexible Purchase Alternative would also occur under the Fixed Purchase Alternative. The effects of the trends on the water supply for specific water agencies and users are evaluated in the following sections.

4.2.6.2 Upstream from the Delta Region

4.2.6.2.1 Sacramento River

EWA acquisition of water via groundwater substitution or crop idling would change the rate and timing of flows in the Sacramento River. The changes in timing of flows in the Sacramento River would be the same for the Fixed Purchase Alternative as described in Section 4.2.5.2.1 for the Flexible Purchase Alternative. The amount of water acquired however, would be less under the Fixed Purchase Alternative. There were no effects on water supply on the Sacramento River system under the Flexible Purchase Alternative from groundwater substitution or crop idling; there would therefore be no effects under the Fixed Purchase Alternative.

EWA acquisition of water via crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, under program conditions, would be idled. Glenn, Colusa, and Yolo Counties would idle up to 10,600 acres. As described in Section 4.2.5.2.1, idling these fields could reduce tailwater, which could reduce supplies to downstream users. This would be a potentially significant effect.

[16] The Fixed Purchase Alternative acquisition amount includes variable assets.

The mitigation measure listed in Section 4.2.8.1 would reduce the potential effects to downstream users to less than significant.

4.2.6.2.2 Feather River

EWA acquisition of water via groundwater substitution or crop idling would change the rate and timing of flows in the Feather River. The changes in timing of flows in the Feather River would be the same for the Fixed Purchase Alternative as described in Section 4.2.5.2.2 for the Flexible Purchase Alternative. The amount of water acquired however, would be less under the Fixed Purchase Alternative. There were no effects on water supply on the Feather River system under the Flexible Purchase Alternative from groundwater substitution or crop idling; there would therefore be no effects under the Fixed Purchase Alternative.

EWA acquisition of water via crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, under program conditions, would be idled. Butte and Sutter Counties would idle up to 10,600 acres. As described above under the Sacramento River, idling these fields would reduce tailwater, which could reduce supplies to downstream users. This effect would be a potentially significant. The mitigation measure listed in Section 4.2.8.1 would reduce the potential effects to downstream users to less than significant.

EWA acquisition of stored reservoir water from Oroville-Wyandotte ID could reduce carryover storage compared to the Baseline Condition. Oroville-Wyandotte ID would release more water from Little Grass Valley and Sly Creek Reservoirs than is released under the Baseline Condition. The water released from Little Grass Valley and Sly Creek Reservoirs would be refilled from Feather River flows in the winter months following the transfer. Oroville-Wyandotte ID also has refill capability off of Slate Creek, a tributary to the Yuba River, via an upstream diversion operated by Oroville-Wyandotte ID (see footnote 9, Section 4.2.3.1.1).

Following the transfer, if insufficient water were available to refill the reservoirs (e.g., in a low runoff year), a decrease in available supply to users during the following summer could result. It is anticipated that Oroville-Wyandotte ID would calculate the amount of carryover storage that could be released without adverse effects, factoring the potential for a dry year and less refill into the decision-making process. Oroville-Wyandotte ID would not sell water to the EWA that would be needed for its water users. Additionally, the State Water Resources Control Board would also review the reservoir release to be able to make a finding of no significant effect to supply or to other legal users. Therefore, EWA acquisition of stored reservoir water from Oroville-Wyandotte ID would have a less than significant effect on water supply.

4.2.6.2.3 Yuba River

EWA acquisition of water via groundwater substitution would change the rate and timing of flows in the Yuba River. The changes in timing of flows in the Yuba River would be the same for the Fixed Purchase Alternative as described in Section 4.2.5.2.3 for the Flexible Purchase Alternative. The amount of water acquired however, would be less under the Fixed Purchase Alternative. There were no effects on water supply on the

Yuba River system under the Flexible Purchase Alternative from groundwater substitution; there would therefore be no effects under the Fixed Purchase Alternative.

4.2.6.2.4 American River

EWA acquisition of water via crop idling would change the rate and timing of flows in the American River. The changes in timing of flows in the American River would be the same for the Fixed Purchase Alternative as described in Section 4.2.5.2.4 for the Flexible Purchase Alternative. The amount of water acquired would be the same under both alternatives. There were no effects on water supply on the American River system under the Flexible Purchase Alternative from crop idling; there would therefore be no effects under the Fixed Purchase Alternative.

EWA acquisition of stored reservoir water from Placer County WA could reduce carryover storage compared to the Baseline Condition. Placer County WA would release more water from French Meadows and Hell Hole Reservoirs than is released under the Baseline Condition. Following the transfer, if insufficient water were available to refill the reservoirs (e.g., in a low runoff year), a decrease in available supply to users during the following summer could result. It is anticipated that Placer County WA and PG&E would calculate the amount of carryover storage that could be released without adverse effects, factoring the potential for a dry year and less refill into the decision-making process. Placer County WA would not sell water to the EWA that would be needed for its water users. Additionally, the State Water Resources Control Board would also review the reservoir release to be able to make a finding of no significant effect to supply or to other legal users. Therefore, EWA acquisition of stored reservoir water from Placer County WA would have a less-than-significant effect on water supply.

EWA acquisition of water via crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, under program conditions, would be idled. Placer County could idle up to 3,280 acres. As described above under the Sacramento River, idling these fields would reduce tailwater, which could reduce supplies to downstream users. This would be a potentially significant effect. The mitigation measure listed in Section 4.2.8.1 would reduce the potential effects to downstream users to less than significant.

4.2.6.2.5 Merced River

EWA acquisition of water via groundwater substitution would change the rate and timing of flows in the Merced River. The changes in timing of flows in the Merced River would be the same for the Fixed Purchase Alternative as described in Section 4.2.5.2.5 for the Flexible Purchase Alternative. The amount of water acquired would be the same under both alternatives. There were no effects on water supply on the Merced River system under the Flexible Purchase Alternative from groundwater substitution; there would therefore be no effects under the Fixed Purchase Alternative.

4.2.6.3 Delta

EWA acquisitions through stored reservoir water, groundwater substitution, crop idling, and stored groundwater purchase would change the rate and timing of Delta inflows. Increased water transfers change the timing of diversions and alter the amounts of water diverted for agricultural, municipal, industrial, and ecosystem purposes.

Figures 4-4 through 4-9 show the effects of the Flexible Purchase Alternative on south Delta water levels. The Fixed Purchase Alternative would export less water than modeled under the Flexible Purchase Alternative. Although there are no modeling results for the Fixed Purchase Alternative, increased pumping over the Baseline Condition could lower south Delta water levels below the Baseline and below the thresholds identified in Section 4.2.2. This would be a potentially significant effect. Mitigation measures discussed in Section 4.2.8, such as installation of temporary pumps, would reduce any potentially significant effects to less than significant.

EWA acquisition of water through variable assets, specifically Joint Point of Diversion, could change the available Banks pump capacity for the CVP. Under the Fixed Purchase Alternative, the CVP and EWA could use SWP excess pump capacity (shared on a 50-50 basis). The CALFED ROD included sharing available capacity 50-50 between EWA and JPOD with an EWA program designed to acquire approximately 185,000 acre-feet (35,000 upstream from the Delta and 150,000 in the Export Service Area). The EWA program was described as having exclusive rights to 500 cfs of the Banks Pumping Plant capacity above the permitted capacity of 6,680 cfs for three months in the summer. If renewed, the 500 cfs capacity can be used to export 50,000 to 60,000 acre-feet (the maximum transfer in the Upstream from the Delta Region under the Fixed Purchase Alternative). Therefore, the Fixed Purchase Alternative would have no effects on other users of JPOD.

4.2.6.4 Export Service Area

The EWA program would likely result in increased reliability of water supplies to SWP/CVP contractors. Under the Baseline Condition, water users in the Export Service Area are subject to reductions in their water supply due to Endangered Species Act take limits for Delta pumping reductions. With the EWA, water supply would not be affected by these pump reductions. EWA assets would repay the CVP and SWP water for the loss of supply caused by reduced Project pumping. Furthermore, because the CVP and SWP would be repaid for water lost during pump reductions, additional reductions could be taken compared to the Baseline Condition with no consequence to the Projects, thereby increasing the benefits to fish. The increased reliability in water supply to the Export Service Area, facilitated by the elimination of CVP and SWP water loss during ESA reductions, is a beneficial effect.

If the EWA moves from Tiers 1 and 2 into Tier 3,[17] the cuts under Tier 3 would either be uncompensated or the Projects would be paid back for water lost during pump reduction. The water supply reliability under the Fixed Purchase Alternative would be greater than under the Baseline Condition.

[17] See Section 2.1.3 for description of Tiers 1, 2, and 3.

4.2.6.4.1 Santa Clara Valley Water District

EWA agencies' management of water via source shifting would change the pattern of reservoir level fluctuations. The same amount of water could be source shifted by Santa Clara Valley WD under the Fixed Purchase Alternative as was evaluated under the Flexible Purchase Alternative in Section 4.2.5.4.1. There was a less-than-significant effect on water supply under the Flexible Purchase Alternative; there would therefore be a less than significant effect on water supply under the Fixed Purchase Alternative.

EWA agencies' management of water via predelivery would change the pattern of reservoir level fluctuations. Water would be supplied to Santa Clara Valley WD prior to when it would be supplied under the Baseline Condition. Santa Clara Valley WD would store the water for use later in the year. Because Santa Clara Valley WD would be receiving the water earlier than it would under the Baseline Condition, the effect on water supply is beneficial.

4.2.6.4.2 Metropolitan Water District

EWA agencies' management of water via source shifting would change the pattern of reservoir level fluctuations. Metropolitan WD has adequate alternative supplies and storage to provide for the maximum 200,000 acre-feet of water that may be necessary for source shifting. It is anticipated that Metropolitan WD would not participate in source shifting if adequate supplies were not available for their water users. The 200,000 acre-feet represent about 10 percent of the Southern California storage capacity available to Metropolitan WD. Because of the relatively small quantity of water being deferred and the large variety of local sources for providing a temporary in-lieu supply during the period of deferment, the action would not affect the reliability of Metropolitan WD's water supplies. Therefore, the effect on water supply is less than significant.

EWA agencies' management of water via predelivery would change the pattern of reservoir level fluctuations. Water would be supplied to Metropolitan WD prior to when it would be supplied under the Baseline Condition. Metropolitan WD would store the water for use later in the year. Because Metropolitan WD would be receiving the water earlier than it would under the Baseline Condition, the effect on water supply is beneficial.

4.2.7 Comparative Analysis of Alternatives

This chapter has thus far analyzed the effects of many potential transfers, looking at the "worst-case scenario" that would occur if all acquisitions happened in the same year. This approach ensures that all effects of transfers are included and provides the EWA Project Agencies the flexibility to choose transfers that may be preferable in a given year. The EWA, however, would not actually purchase all this water in the same year. This section provides information about how EWA would more likely operate in different year types. A further comparison of the alternatives is listed in Table 4-4.

Acquisitions of water as EWA assets would enable the EWA agencies to repay the SWP/CVP for water not pumped during pump reductions. The Flexible Purchase Alternative would acquire more assets than the Fixed Purchase Alternative; therefore, the Flexible Purchase Alternative would be able to repay the Projects for a greater number of pump reductions for fish actions. If the Fixed Purchase Alternative used its assets and fish actions were still needed, Tier 3 would be implemented. Under Tier 3, either additional EWA assets could be acquired or pump reductions would continue uncompensated, resulting in less water supply reliability. Because there is an increased probability of reaching Tier 3 under the Fixed Purchase Alternative, the Fixed Purchase Alternative would provide less water supply reliability compared to the Flexible Purchase Alternative.

4.2.7.1 Upstream from the Delta Region

In the Upstream from the Delta Region, under the No Action/No Project Alternative, surface water supply would be greater in wet years than dry years. Less precipitation in dry years would result in lower reservoir and river levels, which would decrease available supplies to all water users.

The Fixed Purchase Alternative would be limited to a maximum acquisition of 35,000 acre-feet from all sources of water. The Flexible Purchase Alternative could involve purchase of up to 600,000 acre-feet of water from all sources upstream from the Delta in drier years.

The Flexible Purchase Alternative would acquire more assets through stored reservoir water than the Fixed Purchase Alternative, thus having a greater potential for effects on water supply due to lower non-Project reservoir levels. However, the project description includes refill criteria that would result in no adverse effects caused by either the Fixed Purchase or Flexible Purchase Alternatives.

The Flexible Purchase Alternative would acquire more assets through crop idling than the Fixed Purchase Alternative, especially in dry years. Crop idling would decrease return flows, potentially affecting downstream users. Mitigation measures listed in Section 4.2.8 would reduce the effects of both alternatives to less-than-significant levels.

4.2.7.2 Delta

During wet years, the Fixed and Flexible Purchase Alternatives would have no effects on the available Banks pumping capacity for the CVP. During dry years, the EWA would export more water and therefore there could be some lost pumping opportunities for the CVP under the Flexible Purchase Alternative. The Fixed Purchase Alternative would have no effect on CVP pumping capacity even in dry years.

The amount of variable assets the EWA could acquire would differ in different year types. For example, in wet years, the SWP pumps could have less excess capacity, and therefore, excess SWP pumping capacity to be shared by the CVP, EWA, and Level 4 refuge water under JPOD would be less than in dry years. The potential for

acquiring variable assets is the same under the Flexible and Fixed Purchase Alternatives. However, the Flexible Purchase Alternative could take greater advantage of JPOD and the 500 cfs pumping capacity than the Fixed Purchase Alternative because these variable assets only supply the capacity; the EWA must move EWA water. Because the Flexible Purchase Alternative could acquire more water than the Fixed Purchase Alternative, the Flexible Purchase Alternative has the potential to move more water with the variable assets.

The amount of Delta export pumping affects south Delta water users. The Flexible and Fixed Purchase Alternatives would have similar effects on south Delta water levels during wet years. During dry years, the Flexible Purchase Alternative would export more water through the Delta than the Fixed Purchase Alternative, which could lower south Delta water levels further than the Fixed Purchase Alternative.

4.2.7.3 Export Service Area

Under the No Action/No Project Alternative, reduced deliveries would be more likely in dry years because in wet years the Projects would be more likely to be able to recover from export reductions for fish protection.

EWA asset acquisitions in the Export Service Area under the Fixed Purchase Alternative would be limited to 150,000 acre-feet. EWA asset acquisitions in the Export Service Area under the Flexible Purchase Alternative would be dependent on the water year type north of the Delta. Export pump capacity during wet years would limit the ability of the EWA Project Agencies to move assets through the Delta, requiring reliance on greater purchase amounts from Export Service Area sources.

Source shifting would occur under both the Flexible and Fixed Purchase Alternatives; however, source shifting would occur more often with the Fixed Purchase Alternative.

4.2.8 Mitigation Measures

4.2.8.1 Return Flows

Crop idling would reduce tailwater, which could reduce supplies to downstream users. The EWA agencies will require the willing seller of water for crop idling to maintain their drainage systems at a water level that would not reduce the supplies of downstream users.

4.2.8.2 Impacts to South Delta Water Levels:

Increased export pumping from the Delta in July through September compared to the Baseline Condition could lower south Delta water levels and affect irrigation supply for agricultural water users. Actions taken by DWR, such as installation of temporary pumps or dredging, would reduce effects to South Delta water users. If EWA pumping decreases south Delta water levels, the EWA agencies will pay their share for additional actions needed to increase south Delta water levels to the Baseline Condition.

4.2.9 Potentially Significant Unavoidable Impacts

There are no significant unavoidable impacts.

4.2.10 Cumulative Effects

The Sacramento Valley Water Management Agreement, Dry Year Purchase Program[18], Drought Risk Reduction Investment Program (DRRIP), Central Valley Project Improvement Act Water Acquisition Program, and Environmental Water Program could acquire water in the Upstream from the Delta Region. These programs all include stored reservoir water, and many include other acquisition types such as groundwater substitution, groundwater purchase, and crop idling.

Programs that acquire water through stored reservoir water could draw reservoirs down below the Baseline Condition, lessen the possibility of refill, and affect water supply for users the following year. However, as stated in Sections 4.2.5.2 – 4.2.5.4, it is anticipated that the agencies selling water to the EWA would manage their water responsibly, whether the water was sold for one program or for multiple programs. Therefore, these programs would cumulatively have a less-than-significant effect on water supply.

Programs in addition to the EWA that would acquire water through groundwater substitution and crop idling would create additional changes in the timing and quantity of water released from reservoirs, altering riverflows. However, the flow representing only the seller's supply would be altered. Groundwater substitution and crop idling would not cause a cumulatively significant effect because the associated flow changes would not affect nonparticipating users' water supply.

Crop idling would reduce the water supply for users not participating in the EWA who rely on return flows from fields that, with the EWA, would be idled. Crop idling under programs in addition to the EWA could further reduce return flows causing a cumulative impact. However, the EWA includes mitigation measures to maintain return flows; therefore, the EWA would not be contributing to a cumulative impact.

[18] Transfers negotiated between CVP and SWP contractors and other water users, such as the Forbearance Agreement with Westlands WD and the recent crop idling acquisition by Metropolitan WD from water agencies upstream from the Delta, are part of the Dry Year Program.

Table 4-4
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Water Supply

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Condition*	*Fixed Purchase Alternative Change from Baseline Condition*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Upstream from the Delta							
Sacramento River	Crop idling	Willing sellers do not divert water for irrigation.	Cropped fields that supplied tailwater under the Baseline Condition would be idled and would not supply tailwater for downstream use.	Farmers and other water users not participating in the EWA could receive less water because of reduced tailwater supplies.	Farmers and other water users not participating in the EWA could receive less water because of reduced tailwater supplies.	PS;[19] LTS[20] with mitigation measures.	PS; LTS with mitigation measures.
	Groundwater substitution/ Crop Idling	Water is released from Lake Shasta in July through September.	Water is not diverted for irrigation.	Sacramento River increases below point of diversion.	Sacramento River increases below point of diversion.	No effect	No effect
		Water held in Lake Shasta in June.	Slower decrease in water levels in Lake Shasta in June, compared to the Baseline Condition.	Sacramento River decreases from release to point of diversion.	Sacramento River decreases from release to point of diversion.	No Effect	No effect

[19] PS = Potentially Significant
[20] LTS = Less Than Significant

Table 4-4
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Water Supply

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Condition*	*Fixed Purchase Alternative Change from Baseline Condition*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Upstream from the Delta							
Feather River	Stored reservoir water	Water is released from Sly Creek and Little Grass Valley Reservoirs.	Sly Creek and Little Grass Valley Reservoir levels decrease from December until refill.	Sly Creek and Little Grass Valley Reservoirs decrease in storage and elevation from December until refill compared to the Baseline Condition.	Sly Creek and Little Grass Valley Reservoirs decrease in storage and elevation from December until refill compared to the Baseline Condition.	LTS	LTS
			Increased flows in the Feather River upstream from Lake Oroville in November and December	Feather River increases below Little Grass Valley and Sly Creek Reservoirs downstream to Lake Oroville.	Feather River increases below Little Grass Valley and Sly Creek Reservoirs downstream to Lake Oroville.	No effect	No effect
			Lake Oroville levels increase in November and December compared to the Baseline Condition.	Lake Oroville storage and elevation increase by the amount released by Little Grass Valley and Sly Creek Reservoirs.	Lake Oroville storage and elevation increase by the amount released by Little Grass Valley and Sly Creek Reservoirs.	No effect	No effect
	Groundwater substitution/Crop Idling	Water is held in Lake Oroville	Slower decrease in water levels in Lake Oroville from April – June, compared to the Baseline Condition.	Lake Oroville storage and elevation is increased compared to the Baseline Condition.	Lake Oroville storage and elevation is increased compared to the Baseline Condition.	No effect	No effect
		Water is released from Lake Oroville	Feather River flows downstream from Lake Oroville increase July – September.	Feather River increases below Lake Oroville due to release of water held in April through June.	Feather River increases below Lake Oroville due to release of water held in April through June.	No effect	No effect

Table 4-4
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Water Supply

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Condition*	*Fixed Purchase Alternative Change from Baseline Condition*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Upstream from the Delta							
Feather River	Crop Idling	Willing sellers do not divert water for irrigation.	Cropped fields that supplied tailwater under the Baseline Condition would be idled and would not supply tailwater for downstream use.	Farmers and other water users not participating in the EWA could receive less water because of reduced tailwater supplies.	Farmers and other water users not participating in the EWA could receive less water because of reduced tailwater supplies.	PS; LTS with mitigation measures.	PS; LTS with mitigation measures.
Yuba River	Stored Reservoir Water	Water is released from New Bullards Bar Reservoir.	Yuba River flows increase July – September.	Yuba River flows increase below New Bullards Bar.	Yuba River flows increase below New Bullards Bar.	No effect	No effect
			New Bullards Bar water levels would be lower July – refill compared to the Baseline Condition.	New Bullards Bar storage and elevation are lower compared to the Baseline Condition.	New Bullards Bar storage and elevation are lower compared to the Baseline Condition.	LTS	LTS
	Groundwater Substitution	Water is held in New Bullards Bar Reservoir.	Slower decrease in water levels in New Bullards Bar Reservoir from April – June, compared to the Baseline Condition.	New Bullards Bar Reservoir storage and elevation are increased compare to the Baseline Condition.	New Bullards Bar Reservoir storage and elevation are increased compare to the Baseline Condition.	No effect	No effect
			Yuba River flows decrease April – June	Yuba River flow decreases because of water not released.	Yuba River flow decreases because of water not released.	No effect	No effect
		Water is released from New Bullards Bar Reservoir.	Yuba River flows increase July - September	Yuba River flow increases because of release of water held April through June.	Yuba River flow increases because of release of water held April through June.	No effect	No effect

Table 4-4
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Water Supply

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Conditions*	*Fixed Purchase Alternative Change from Baseline Conditions*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Upstream from the Delta							
American River	Stored Reservoir Water	Water is released from French Meadows and Hell Hole Reservoirs	French Meadows and Hell Hole Reservoir water levels decrease June – refill	French Meadows and Hell Hole Reservoirs decrease in storage and elevation compared to the Baseline Condition.	French Meadows and Hell Hole Reservoirs decrease in storage and elevation compared to the Baseline Condition.	LTS	LTS
			Flows in the American River between French Meadows/Hell Hole Reservoirs and Folsom Lake are increased July – September	American River flow increases because of release of stored reservoir water.	American River flow increases because of release of stored reservoir water.	No effect	No effect
	Stored Reservoir Water and Groundwater Purchase	Water is held in Folsom Lake.	Folsom water levels increase in the summer due to slower release during groundwater purchase. Levels also increase because of stored water release from upstream reservoirs held temporarily in Folsom Lake.	Folsom Lake has increased storage compared to the Baseline Condition.	Folsom Lake has increased storage compared to the Baseline Condition.	No effect	No effect
		Water is released from Folsom Lake.	American River flows downstream from Folsom Lake increase June – December.	Folsom River flow increases compared to the Baseline Condition.	Folsom River flow increases compared to the Baseline Condition.	No effect	No effect
	Crop Idling	Willing sellers do not divert water for irrigation.	Cropped fields that supplied tailwater under the Baseline Condition would be idled and would not supply tailwater for downstream use.	Farmers and other water users not participating in the EWA could receive less water because of reduced tailwater supplies.	Farmers and other water users not participating in the EWA could receive less water because of reduced tailwater supplies.	PS; LTS with mitigation measures.	PS; LTS with mitigation measures.

Table 4-4
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Water Supply

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Conditions*	*Fixed Purchase Alternative Change from Baseline Conditions*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Upstream from the Delta							
Merced/San Joaquin River	Groundwater Substitution	Water is held in Lake McClure	Slower decrease in water levels in Lake McClure in April through October, compared to the Baseline Condition.	Lake McClure increases in storage and elevation compared to the Baseline Condition.	Lake McClure increases in storage and elevation compared to Baseline Condition.	No effect	No effect
			Merced River flows decrease April – October.	Merced River flow decreases below Lake McClure to the point of diversion.	Merced River flow decreases below Lake McClure to the point of diversion.	No effect	No effect
		Water is released from Lake McClure	Merced River flows increase in October.	Merced River flow increases below point of diversion.	Merced River flow increases below point of diversion.	No effect	No effect
Delta Region							
Delta	Crop idling, Groundwater substitution, Stored groundwater purchase, Stored reservoir water	Water released from reservoirs creates increased inflow for Delta export.	Increased Delta exports July – September.	South Delta water levels decrease compared to the Baseline Condition.	South Delta water levels decrease compared to the Baseline Condition.	PS; LTS with mitigation measures	PS; LTS with mitigation measures
	Management of variable assets	CVP and EWA could use SWP excess pump capacity shared on a 50-50 basis.	Change in available Banks pump capacity for the CVP.	Some lost CVP pumping opportunities will occur as a result of sharing excess capacity with the EWA.	No change in CVP available Banks pump capacity.	Loss of opportunity	No effect

Table 4-4
Comparison of the Effects of the Flexible and Fixed Purchase Alternatives on Water Supply

Region	*Asset Acquisition or Management*	*Result*	*Impacts*	*Flexible Purchase Alternative Change from Baseline Conditions*	*Fixed Purchase Alternative Change from Baseline Conditions*	*Significance of Flexible Purchase Alternative*	*Significance of Fixed Purchase Alternative*
Export Service Area							
Export Service Area	Source Shifting	Water is drawn from Metropolitan or Santa Clara Valley WDs' alternate supply sources.	Metropolitan WD could draw water from Castaic Lake, Lake Perris, Diamond Valley Lake, or other supply sources. Santa Clara Valley WD would draw water from Anderson Reservoir.	Storage and elevation are reduced in reservoirs until water is paid back.	Storage and elevation are reduced in reservoirs until water is paid back.	LTS	LTS
	Predelivery	EWA water is moved to reservoirs for later return in same year; or water is moved to agricultural contractor for return in future wet year.	Water would increase reservoir levels until water returned; reduced groundwater pumping for agriculture in current year.	Storage and elevation are increased in reservoirs or groundwater pumping.	Storage and elevation are increased in reservoirs or groundwater pumping.	LTS	LTS
	Borrowed Project Water	Water is released from San Luis Reservoir	Decreased water levels in San Luis Reservoir	Decreased water levels in San Luis Reservoir would affect the low point problem in the same manner as under the Baseline Condition.	Decreased water levels in San Luis Reservoir would affect the low point problem in the same manner as under the Baseline Condition.	LTS	LTS

The Sacramento Valley Water Management Agreement, DRRIP, Central Valley Project Improvement Act Water Acquisition Program, and Environmental Water Program would acquire water in the Upstream from the Delta Region and would need Delta pump capacity to transfer water to the Export Service Area. Programs, in addition to the EWA, that transferred water to the Export Service Area would further increase water supply reliability to the region, creating a potentially beneficial cumulative effect. Conversely, a potentially adverse cumulative effect on south Delta water users could occur because of the increased export pumping. Although increased export pumping by many programs could cause a cumulative effect, the EWA's contribution is not cumulatively significant because the EWA would contribute to its share of mitigation costs to allow DWR to continue practices that alleviate water level concerns.

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